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THE

SECOND SUPPLEMENT

TO THE

PENNY CYCLOPÆDIA

OF

THE SOCIETY

FOR THE

DIFFUSION OF USEFUL KNOWLEDGE.

COMPLETE IN ONE VOLUME.

LONDON:
PUBLISHED BY KNIGHT & CO., 90, FLEET STREET.
MDCCCLVIII.

LONDON:
BRADBURY AND EVANS, PRINTERS, WHITEFRIARS.

JUN 10 1921
Mrs. A. E. Proudfit.

NOTICE.

THE FIRST SUPPLEMENT of the 'Penny Cyclopædia,' in Two Volumes, was published in 1846. THE SECOND SUPPLEMENT, now completed in One Volume, follows the same plan as that of the original Work, comprising under one Alphabetical Arrangement, the accumulated information of the twelve years which have elapsed since the publication of the First Supplement. A limited number only of this Volume has been printed; and it will not be kept on sale after that number has been disposed of.

CHARLES KNIGHT.

May 28, 1858.

SECOND SUPPLEMENT

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[The abbreviation *S.* 1, in the references and elsewhere, refers to the First Supplement; *S.* 2, to the present Second Supplement. The references without either of these additions are to the 'Penny Cyclopædia' as distinct from the two Supplements.]

AACHEN. [Aix-la-Chapelle.]

ABACO. [Bahamas.]

ABATEMENT. Pleas in abatement for misnomer have been abolished (3 & 4 Will. IV. c. 42), and an objection thus taken to the nonjoinder or misjoinder of parties is no longer of any avail in a civil action, the courts having now ample powers of amendment. (Common Law Procedure Act, 1852.) A similar observation applies to pleas in abatement to an indictment or information. (14 & 15 Vict. c. 100.)

ABBEY-HOLME. [Cumberland.]

ABBEYLEIX. [Queen's County.]

ABBOT'S BROMLEY. [Staffordshire.]

ABEAHKEUTAH, a large walled town, on the west bank of the river Agonce, which separates it from the kingdom of Dahomey, about 60 miles inland from Lagos, in the Bight of Benin, and about 150 miles from Abomey, the capital of Dahomey. It is in the petty kingdom of Egba, which is tributary to Yorribah, but the town itself, which has sprung up within the last forty years, is independent, and is governed by a chief who is not a king. The inhabitants amount to upwards of 50,000, and are composed of the natives of Egba, a great number of liberated blacks, many of them from Sierra Leone, and several missionaries, who report that their labours have been highly successful. The King of Dahomey has more than once attacked the town in vain. In 1848 one of his Amazonian regiments was almost entirely destroyed by the Abeahkeutahns in one of these attempts. In June, 1850, when Captain F. E. Forbes and Mr. Becroft were at Abomey, Mr. Becroft was told by the King himself to warn the missionaries to withdraw, as he was going to make war upon the town, when it was explained to him that the town was in alliance with Great Britain, and that there were great numbers of free negroes and several missionaries there. Nevertheless, he invaded their territory at the head of a large slave-hunting force, a great part consisting of Amazons, and met with a severe defeat under its walls, on March 3rd, 1851, which is said to have greatly crippled his power. The name of Abeahkeutah, which means 'under the stone,' has reference to a large natural cave within the town walls, wherein the market is held. A new species of silk from Houssa in the interior, and a peculiar description of wool, from Quotta to the westward of Abeahkeutah, have been introduced as articles of trade into England, and are likely to prove valuable.

A'BECKET, GILBERT ABBOTT, born in Golden-square, London, in the year 1810, was the son of a respectable solicitor, and was educated at Westminster School. He very early displayed great talent as a humourist. As early as 1825 eight of his dramatic productions, in prose and verse, but all of a burlesque character, were published in Duncombe's 'British Theatre;' in 1828-29 nine more appeared in Cumberland's 'British Theatre;' and in 1837 four others were printed in Webster's 'Acting Drama;' most of which had attained some success on the stage. In 1843 he produced 'The Mirror, or Hall of Statues,' a musical burlesque. In connection with the drama, also, he published in 1844 'Scenes from the Rejected Comedies by some of the Competitors for the Prize offered by Mr. Webster;' these 'Scenes' were a series of parodies upon living dramatists (including one of himself), which had appeared in 'Punch' previous to their publication in a separate form. In 1846 he published 'The Quizziology of the British Drama.' In conjunction with his schoolfellow, Mr. Henry Mayhew, he started several comic periodical works, of which 'Figaro in London,' begun about 1830, was undoubtedly the precursor of 'Punch.' When that work had swallowed up its rivals, Mr. A'Becket became a constant contributor to it, and the adventures, the epistles, and anecdotes of Mr. Dunup were among the most laughable morceaux of that publication. He took a pride in the work, and it was his boast that, till the period of his death, no number appeared without something, however small, from his pen. His humour was without malice, and displayed a varied reading, with considerable knowledge of the law. In the midst of his ebullitions of fancy he had not neglected the more serious studies of his profession. He was trained as a lawyer; and in March 1846 his reputation induced Mr. Charles Buller to intrust to him the investigation of the iniquities practised in the Andover Union workhouse. This he conducted in a satisfactory manner, and in his report he displayed a clear and solid judgment in sober and well-chosen language. Some leaders in 'The Times' on the same subject have been also attributed to him. He had previously been an occasional contributor to that journal. His conduct of the Andover inquiry led to his appointment in 1849 as magistrate of the police-court of Greenwich and Woolwich, whence he was removed in 1850 to that of Southwark—positions which he held in an irreproachable manner. Besides an edition of 'The Small Debts Act, with Annotations and Explanations,' published in 1845, he produced the 'Comic Blackstone,' which was published in 1844-46; a 'Comic History of England,' published in monthly parts, forming a volume completed in 1848; and a 'Comic History of Rome,' also in monthly parts, completed in 1852. He likewise, in 1845, edited George Cruikshank's 'Table Book.' After a very short illness he died at Boulogne, on the 28th of April 1856.

ABERAVON. [Glamorganshire.]

ABERAYRON. [Cardiganshire.]

ABERDARE. [Glamorganshire.]

ABERNETHY. [Perthshire.]

ABORTION, a term used in Botany and Horticulture. In Botany, Abortion is employed to express the absence of an organ in relation to an ideal type. Thus the flowers of

Scrophulariaceæ and *Lamiaceæ* have their sepals and petals arranged with the number five. According to a very general law the stamens equal in number the petals and sepals, but in this case they do not. In the majority of instances the stamens are but four: hence it is said that one stamen is aborted, or there is an abortion of one stamen. The want of harmony between the parts of the flower generally is thus spoken of. In other instances, where the ovules are numerous and the seeds only one, two, or three, the remaining ovules are aborted.

In Horticulture, the premature development of the fruit, or any defect in it, is called Abortion.

ABRAMIS. [Bream.]

ABRAXAS, a genus of Nocturnal *Lepidoptera*, to which belongs the common Magpie Moth, *A. grossulariata*. The caterpillar of this moth attacks the leaves of gooseberry and currant bushes at the beginning of the summer. It is of a yellowish-white colour, with an orange stripe on each side, and covered with black spots. The chrysalis is black, relieved at its pointed end with orange circles. The expanded fore-wings of the perfect insect measure about one inch and a half across. The wings are of a yellowish-white colour, variously spotted with black. The fore-wings have a band of pale orange. The body is orange, spotted with black. The eggs are deposited on currant or gooseberry leaves in July or August, and the caterpillars are hatched in September. To get rid of the attacks of these creatures, they may be picked off, or dusted with the powder of white hellebore, or the leaves of the plants attacked may be burned.

ABROMA (from *a* and *βρῶμα*, 'not fit for food,' in opposition to *Theobroma*, 'food for gods'), a genus of plants belonging to the natural order *Byttneriaceæ*. The species consist of small trees, with hairy lobed leaves and extra-axillary or terminal few-flowered peduncles at the tops of the branches.

Abroma augusta is a handsome tree, with drooping purple flowers, seated on peduncles opposite the leaves. It is a native of the East Indies. The fibrous tissue of the bark of this plant is manufactured into cordage.

ABRUS (from ἁβρὸς, soft), a genus of plants belonging to the papilionaceous division of the order *Leguminosæ*. The calyx is bluntly 4-lobed, with the upper lobe broadest. The legume is oblong, compressed, and 4-6-seeded. There is but one species, *A. precatorius*, which is a delicate twining shrub, with abruptly pinnate leaves, bearing many pairs of leaflets. It is a native of the East Indies, but is also found in the tropical parts of Africa and America, where perhaps it has been introduced. The seeds of the commoner variety are red, with a black spot, whilst other varieties produce various coloured seeds. These seeds are in much request as ornaments amongst the inhabitants of the countries where they grow. They are strung as beads, with shells, and other hard seeds. They are brought to Europe from Guinea and the East and West Indies. They are used frequently as beads for rosaries; hence the name *precatorius* given to this species. The leaves and roots of this plant secrete the sweet substance which characterises the liquorice plant (*Glycyrhiza glabra*). In the West Indies it is called Wild Liquorice, and used for the same purposes as the common liquorice. The seeds have been accused of possessing narcotic properties, but this is an error. When swallowed they are very indigestible.

ABSINTHINE. [Chemistry, *S.* 2.]

ABUTILON (ἀβύτιλον, the Greek for mulberry-tree, which the species of this genus resemble), a genus of handsome plants, belonging to the natural order *Malvaceæ*. The species of this genus, amounting to about 80, have been removed from *Sida*. They have a naked five-cleft calyx, with a multifid style, capsular one-celled carpels, 5-30 in a whorl. Several of the species are cultivated in this country. *A. striatum* blossoms freely nearly all the year round, when turned out under a wall in Hampshire. *A. vitifolium*, *A. venosum*, *A. rufinerve*, and *A. pæoniflorum*, are also tolerably hardy species. The plant known as Bencão de Deos, in the province of Rio Janeiro, in Brazil, is the *A. esculentum*. It has large purple solitary axillary flowers, which are dressed and eaten with their viands by the inhabitants of Rio. In cultivation the species require a light rich loam and peat-soil, and should be propagated by striking cuttings in sand in a close frame or under a glass in summer.

ACCIPITER. [Falconidæ.]

ACCRINGTON, Lancashire, a manufacturing town of recent growth, in the parish of Whalley and higher division of Blackburn hundred, is situated in a deep valley surrounded by hills on the banks of the Hindburn, or Accrington brook, in 53° 45′ N. lat., 2° 22′ W. long., distant 19 miles N. from Manchester, 207 miles N.W. by N. from London by road, and 210 miles by the North Western and East Lancashire Railways. The population of the town in 1851 was 7481. The livings are perpetual curacies in the archdeaconry and diocese of Manchester.

Accrington possesses two churches of the Establishment; one, the parochial chapel, is a plain building; the other, Christ Church, is a spacious gothic edifice erected in 1838, at an expense of about 8000*l.* The Wesleyan Methodists, Independents, Baptists, Roman Catholics, and Swedenborgians have places of worship. There are national schools, schools attached to some of the dissenting chapels, a subscription library, two news-rooms, and a savings bank. The town is paved, lighted with gas, and well supplied with water. The general aspect of the town is good, and the inhabitants claim for it the distinction of being the cleanest town in Lancashire. It requires, however, many sanitary improvements, especially in the smaller streets and lanes. The drainage is very defective. Accrington is considered to be the centre of the cotton-printing business. There are two large print works, employing upwards of 1000 hands, 10 cotton factories, employing about 1500 persons, and extensive bleaching works. The neighbouring coal-mines employ many of the inhabitants.

ACERAS, a genus of Orchidaceous Plants, of which one species, the *A. anthropophora*, is found growing in Great Britain. It is a small plant, from 8 to 12 inches in height. It has a long lax spike of greenish-yellow flowers, the parts of which are so arranged as to give them the appearance of the small figure of a man: hence this plant has been called the Man-Orchis.

ACETAL. [Chemistry, *S.* 1.]

ACETONE. [Chemistry, *S.* 1.]

ACETONITRYLE. [Chemistry, *S.* 2.]

ACETYLE. [Chemistry, *S.* 2.]

ACHILL, an island off the west coast of the barony of Burrishoole in the county of Mayo, in Ireland. With the adjoining peninsula of Corraun Achill it constitutes the parish of Achill, and one electoral division of the Poor-Law Union of Newport. It is separated from the mainland by a narrow arm of the sea, called Achill Sound, connecting Clew Bay with Blacksod Harbour. The length from Achill Beg island at the extremity of the Sound, on the south, to Achill Head, at the Atlantic extremity of the island on the west, is 15¾ miles; breadth from Achill Beg on the south to Ridge Point in Blacksod Bay on the north, 12½ miles. It lies between 53° 51′ and 54° 5′ N. lat., and 9° 55′ and 10° 15′ W. long. The area is 35,283 acres. The population of Achill Island in 1841 was about 5000; in 1851 about 4000.

The island, the name of which signifies 'Eagle,' is in form nearly a right-angled triangle, of which one side extends from south to north, facing the mainland, from Achill Beg to Ridge Point; another from east to west, from Ridge Point to Achill Head, constitutes the southern boundary of Blacksod Harbour; and the third side, forming a re-entrant irregular coast-line of about 35 miles, and having the Bay of Tramore about midway, is washed by the Atlantic. The surface, which is excessively wild, barren, and boggy, rises towards the north and west into mountains of 2000 feet and upwards; and at one point near the western extremity of the island, Tonacroghaun, the cliff towards Blacksod Bay descends precipitously from the highest point of the island, forming a shelving face of rock, of the extraordinary height of 2208 feet. Achill Head, at the extreme west, consists of a narrow ridge of rock, of about a mile in length, and from 300 to 400 feet in height, the summit of which is in some places but a few yards in width. The coast on the south-western side is also very precipitous: the cliff at Dooega Head, which forms the eastern boundary of Tramore Bay, rises 818 feet over the Atlantic, and is nearly perpendicular. The geological structure of the island is simple; the whole being a mass of mica slate.

Of the entire surface of Achill Island and Corraun Achill, comprising an area of 51,523 acres, and inhabited in 1841, by a population of 6392 persons, there were only 554 acres under cultivation in 1848, and in 1851 the population of the parish had fallen to 4950. The hamlets consist of the most wretched hovels huddled together without the least regularity. In the district between Tonacroghaun and Achill Head, at Boley, some of the huts still inhabited are built of drystone in the beehive form. There are three considerable villages; one at Keem, on the south-west, where there is a good boat-harbour; another at Keel, on the sandy beach of Tramore; and a third at Doogort, at the opposite side of the island on a similar sandy beach in Blacksod Bay. About half a mile from Doogort, on the eastern slope of the mountain of Sleivemore, stands the missionary colony of the Rev. Mr. Nangle, a clergyman of the Established Church. The Achill mission consists of a row of several substantial slated houses, standing in the midst of about 40 acres of cultivated land, and comprises a church, dispensary, tuck-mill, corn-mill, schools, and a printing establishment.

(*Ordnance Survey of Ireland; Parl. Returns; Tour in Connaught.*)

ACHIME'NES (from α, prefix, and χεῖμα, winter), a genus of plants belonging to the order *Gesneraceæ*. The species of this genus are very numerous, and, although not useful, they are many of them extensively cultivated, on account of the beauty of their flowers. In consequence of their general culture, a great many varieties of the species are becoming known. After flowering, the stems die down; and the tubers should be dug up, and kept free from frost and wet till January, when, by planting them in succession, flowers may be obtained till the summer. They may be planted in a mixture of loam and leaf-mould, with a little silver sand. They can be placed out in the summer, but require shading on hot days.

ACHLYA, a genus of Cryptogamous Plants, belonging to the order *Confervaceæ*. It is composed of a single tubiform cell, which expands at the end into a large cell, which is cut off from the lower portion of the tube by the formation of a partition. In this enlarged cell a circulation of granular particles has been observed. In the course of time cells are formed in this enlarged cavity, and fill it up. The parent cell eventually bursts at some spot, and allows of the escape of the enclosed cells; but before this takes place the cells in the interior move about, and, after their escape, exhibit for a considerable time an active movement. They are good examples of the *Zoospore*. They soon attach themselves to some fitting object, and grow into little plants, like their parent. A similar process goes on in most of the *Algæ*, but is not so easily observed as in this case.

The only species of *Achlya* which has been described is the *A. prolifera*, which is found parasitic upon fish and other aquatic animals. This plant is more especially developed on fish and aquatic reptiles kept in confinement. It was first observed on gold fish, but several writers have described it as existing on other animals, as the Stickleback, Water Salamander, Frog, and Newt.

ACIDS, ORGANIC. [CHEMISTRY, *S.* 2.]

ACONCAGUA, a province of Chili, in South America, extends southwards from the river Chuapa between 31° 30′ and 33° 20′ S. lat., 70° and 72° W. long. Its length from N. to S. exceeds 120 miles; towards the east the province extends to the crest of the Andes, between which and the Pacific the width is about 100 miles. The area exceeds 12,000 square miles: the population in 1847 was 91,022.

In the range of the Andes, which separates this province from the Argentine province of Mendoza, is the volcanic Peak of Aconcagua, which has given its name to the department and to its principal river. The Peak of Aconcagua is the highest of all known volcanoes; it is said to be 23,200 feet above the sea-level. From the Andes many lateral ranges run off westward, which are very high near the Cordilleras; they grow lower in proceeding farther west, but even at a distance of a few miles from the shores of the Pacific their elevation rarely sinks below 2000 feet, and often exceeds 3000 feet. The coast itself is generally bold and high, barren and uninteresting. Between the lateral ranges which traverse the country there are a few cultivated valleys. The most extensive of these valleys, which receive their names from the rivers that drain them, are Quilimari, Longotomo, La Ligua (these open into each other near the shores of the Pacific), and Aconcagua. The three first are of moderate extent, but the valley of the Aconcagua is mostly 2 or 3 miles wide, and expands near its middle to a plain, 15 miles in length and 13 miles wide. Where the plain contracts again, at its western extremity, the valley of the river Putaendo opens into it from the north. This valley, though less wide than that of the Aconcagua, is yet of considerable extent, and both together contain probably two-thirds of the population of the province. Its soil is rather fertile, and the greatest part may be irrigated. The cultivation is extensive. The crops generally raised are wheat, maize, pumpkins, melons, beans, and other garden produce. Orchards and vineyards are numerous; lucerne is sown to a great extent for fattening cattle and for their maintenance during the winter. In summer cattle find excellent pastures on the declivities of the Andes, which however during four or five months are covered with snow. Hemp is also cultivated in some parts of the valleys. Great quantities of apples, pears, peaches, nectarines, figs, walnuts, muscatel grapes, and strawberries are sent to Santiago and Valparaiso. The sugar-cane is cultivated in the valley of La Ligua, but no sugar is made, the green shoots being taken to Santiago for sale.

The hills and mountains, which inclose the valleys and cover by far the greater portion of the surface of the country, are stony, mostly round-topped, and of gentle slope, except towards the Andes where they are steep. Their soil consists of a hard red clay, which is thinly covered with a few bushes and stunted trees, and many cactuses. The ravines present a few evergreen trees and shrubs. The nature of the soil and the scarcity of rain combine to render these hills nearly useless as pasture ground. In some places however near the coast there are some more fertile tracts, on which wheat is raised without irrigation. They are found on the gentle slopes of the hills, and have mostly a stiff clayey soil and a subsoil moistened by springs so small as never to issue from the surface. These tracts are distinguished in the country by the denomination of La Costa, but the quantity of corn raised is not great.

The chief metals are gold and copper. Gold is found in the districts north of the valley of Aconcagua; it is collected chiefly in the mountains surrounding Petorca at La Ligua and La Dormida. Copper ores are met with in most parts of the province, but mines are worked only in the mountains near the sea-coast.

The climate of this country differs considerably in different parts. On the coast, in the northern districts, there is somewhat less rain than in the southern; but even here there are seldom more than fourteen rainy days in the year. In summer the heat is not excessive, as a fresh southern breeze always prevails, by which it is moderated. In the interior, and especially in the wider part of the valley of Aconcagua, which is about 2500 feet above the sea, no rain falls, but in winter (June and July) there are heavy dews, which appear as a hoar-frost. The days at this season are very pleasant. In summer the heat is here excessive, the thermometer frequently rising above 90° in the shade. The southern winds blowing along the coast are interrupted by the intervening mountains, and a dead calm prevails during the day, but no sooner has the sun disappeared than a delightful current of air blows from the westward towards the cordilleras, which renders the evenings and nights very pleasant. Thus the climate of this valley resembles that of the southern parts of Italy. The scarcity of rain renders cultivation impossible without irrigation.

Aconcagua has no ports. The coast has no indentations of any extent in which vessels may be sheltered from the heavy swell which sets in continually from the south-west. The port of Quintero formerly had from one and a half to two fathoms water, but by the earthquake of 1822 its bottom was raised, with the adjacent coast, from four to five feet, so that it is now too shallow for vessels of any size. North of Quintero are the road-steads of Horcon and Papudo, with good landing places; and farther north the cove of Pichidanque, from which much copper is shipped.

The principal towns of the province, like most of those in Chili, are regularly built and on a uniform plan; so much so that a general description of one will suffice for all. In the centre is the Plaza or principal square, one side of which is formed by the cathedral or church and the buildings connected therewith; a second side is formed by the Cabildo, or municipal offices; on the other sides, which in most instances are fronted with piazzas, are the theatre, coffee-houses, and the principal shops. The area of the Plaza serves frequently during the early part of the day as a fruit and vegetable market; in the evening it forms a fashionable promenade; and during all political and religious festivals it is the great centre of attraction. From the Plaza branch off the principal streets, straight, wide, regular, and crossed by others at right angles and at measured intervals. The houses, as is usual in countries subject to earthquakes, are only one story high; they are built of sun-dried bricks, and in the Spanish fashion. Towards the street they present generally a blank wall, pierced only by a wide doorway or gate leading into a patio, or court-yard, on which the principal apartments open. Beyond this patio there is another, round which the private apartments are built, and beyond this even another quadrangle, containing the kitchen and servants' rooms. The patios are frequently roofed over with trellis-work, along which vines are trained to grow; and when water is abundant there is a pond or a jet-d'eau, or both, in the centre. To go from one part of the house to another the patio must be crossed. When we have added that each house has a garden or vineyard behind it, an idea may be formed of the great extent covered by a town of even a small population. Another distinguishing feature of these towns is the Alameda, or public walk. This consists mostly of shady alleys formed by trees regularly planted near a river, and on such a site as to command a succession of picturesque or sublime views. Near the Alameda is the exercising ground for militia or military parades. The streets seem to foreigners dull and lifeless in general; the Plaza and the Alameda, during the hours when they are frequented, are the chief sources of amusement and gratification, and this they often afford in a high degree; as during the hours of recreation in the evening the whole population, rich and poor, flock thither, with the exception of the very old or very young, who however indemnify themselves by enjoying the fresh air on the flat roofs of the houses. *San-Felipe-de-Aconcagua*, the capital of the province, situated on the right bank of the Aconcagua, at a distance of 50 miles due N. from Santiago, the capital of Chili, and the same distance W. by S. from the Peak of Aconcagua, has about 13,000 inhabitants. *Santa-Rosa*, 20 miles higher up the river, and E.S.E., of San-Felipe, has a population of 6000. *Petorca*, situated 50 miles N. by W. from San-Felipe, in the richest mining district of the province, is a small place, with hardly more than 1000 inhabitants.

The road from Santiago to San-Felipe crosses the range of hills called Cuesta-de-Cachabuco at the height of 2896 feet above the sea, and is continued northward through Petorca to La Serena. Another road leads down the valley of the Aconcagua through Quillota to Valparaiso, distant about 60 miles. The communication with the Argentine Provinces is kept up chiefly by the road up the valley of the Aconcagua and across the Andes by the Pass of La Cumbre (12,454 feet above the sea) through Uspallata to Mendoza. Another road, branching off from the northern road at the village of San-Antonio, about 10 miles N. from San-Felipe, and running up the left bank of the Putaendo, crosses the Andes by the Patos Pass, and leads to the Argentine town and province of San-Juan. The road by the Cumbre Pass is open for mules from November to the end of May; for the rest of the year it is closed to all but foot-passengers, and the crossing is then very dangerous. It was by the Patos Pass that General San Martin marched over the Andes into Chili with the army of Buenos Ayres in 1817.

(Miers, *Travels in Chili and La Plata;* Meyen's *Reise um die Erde;* Pöppig's *Reise in Chile, Peru und auf dem Amazonenflusse;* Parish, *Buenos Ayres and the Provinces of La Plata; Surveying Voyages of the Adventure and Beagle.*)

ACONITINA. [CHEMISTRY, *S.* 1.]

ACORI'NÆ, ACORI'DEÆ, or **ACORA'CEÆ,** a small natural order of Endogens, with the following essential character:—The flowers are hermaphrodite, surrounded with scales. The spathe is leaf-like, but not rolled up. The stamens are complete, placed opposite the scales, and have two-celled anthers which are turned inwards. The ovaries are distinct. The fruit is baccate, juicy at first, but finally juiceless. The seeds have the embryo seated in the axis of a copious albumen. The rootstock is jointed; the leaves sword-shaped, and embracing each other in the bud. Such is the character given this order, which was first separated from *Araceæ* by Agardh, and the separation was afterwards adopted by Schott, Link, and Lindley. The genera assigned to this order by Lindley were *Acorus, Gymnostachys, Tupistra,* and *Aspidistra.* The two last genera are now assigned by the same author to the order *Liliaceæ.* This small group of plants in its geographical distribution is confined to the eastern hemisphere. None of them have the acrid properties of some of the *Araceæ.* The *Acorus Calamus* is a British plant, and has slightly aromatic properties.

ACRITA (from ἄκριτος, indistinct), a division of the class *Radiata*, adopted by Owen, and applied to the *Acalephæ*, the *Polypifera*, except the *Bryozoa*, the *Polygastrica*, and certain forms of *Entozoa*, in none of which are the indications of a nervous sytem decided, and they constitute the lowest forms of the radiate group of animals.

ACROGENS. [POLYPODIACEÆ.]

ACROLEINE. [CHEMISTRY, *S.* 2.]

ACRYLE. [CHEMISTRY, *S.* 2.]

ACTION AT LAW. The procedure in personal actions has been much simplified by the Common Law Procedure Act, 1852; many of the old rules of pleading having been at the same time abolished. The Common Law Procedure Act of 1854 has conferred powers on the courts of common law to restrain the repetition or continuance of wrongful acts by *Writ of Injunction*, by a process analogous to the injunction granted by the Court of Chancery. The remedy by *Writ of Mandamus* to enforce the performance of duties has also been extended by the same statute; both of these writs being now obtainable in and by an ordinary action at law.

ADAIR, SIR ROBERT, was the son of Robert Adair, sergeant-surgeon to George III., by a daughter of the second Earl of Albemarle, through whom he became connected with many families of political influence. He was born in London on May 24, 1763, and was educated at Westminster School, whence he proceeded to Göttingen to complete his studies. On his return in 1780 he became acquainted with Mr. Fox, took his side in politics, and wrote a pamphlet or two, one of which, a letter to Mr. Burke, brought on him the ridicule of Canning in the 'Anti-Jacobin.' But in February, 1806, when Fox succeeded to power, he was sent as minister to Vienna, where he conducted himself ably, and of which mission he published a memoir in 1845; and in 1808, Canning, when in office, though he had ridiculed his appointment to Vienna, selected him for a special mission to the Porte, with Mr. Canning (now Lord Stratford de Redcliffe) and Mr. Morier as assistants, where he negociated the treaty of the Dardanelles, concluded in 1809, and of this mission he has also published an account. On its successful termination he was made a Knight Grand Cross of the Order of the Bath. In April, 1809, he was appointed ambassador at Constantinople, which office he held till 1811. In July, 1831, he was despatched by Earl Grey on a special mission to Belgium, where Prince Leopold, recently elected to the throne of that kingdom, was besieged in Liege by the Dutch troops under William Prince of Orange. Sir Robert urged Prince Leopold to fly; but he declined, saying, that 'flight ought not to be the first act of his reign; he was ready to fight, but would allow him to negociate,' and Sir Robert fastening a handkerchief to a ramrod, sought the hostile army, and in an interview with Prince William, succeeded in gaining his connivance for Leopold to withdraw to Malines, whither he accompanied him. In this post he remained till 1835, when he retired with the rank of privy councillor, and a pension of 2000*l.* per annum. He died on October 3, 1855, after a short illness. Sir Robert had represented Appleby in 1802, and Camelford in 1806 and 1807. In 1805 he had married Angelique Gabrielle, daughter of the Marquis of Hazincourt, but left no issue. Sir Robert possessed a wide range of information, and his views with regard to Russia have since been remarkably confirmed.

ADAMS, JOHN QUINCY, the eldest son of John Adams, the second President of the United States, was born in Massachusetts, June 11, 1767. Some of his early years were spent in Europe, whither he accompanied his father. In 1801 and 1802 he was minister plenipotentiary from the United States to Berlin, and during this time he travelled through Silesia, which country, its manufactures, and more particularly its educational establishments, were described by him in a series of letters addressed to his brother at Philadelphia. These letters, which were originally published in a journal called 'The Portfolio,' were collected in a volume and published in 1804. During the presidency of Jefferson, Adams was recalled from his embassy at Berlin. Upon his return he became a professor in Harvard College, and was subsequently elected a deputy to Congress for Massachusetts. Having been previously attached to the federalist party, he now allied himself to the democratic party. He was next charged with a mission to Russia, and in 1814 joined the Congress at Vienna as plenipotentiary of the United States. In 1815 he was ambassador at the Court of St. James's. In 1817 he became secretary of state for the interior; and in 1825 he succeeded Mr. Monroe as President of the Union. He was not however re-elected, his place being supplied by General Jackson. In 1830 he was elected deputy to Congress, where he distinguished himself until his death by his advocacy of the abolition of slavery. He died at Washington, February 17, 1848.

ADARE. [LIMERICK.]

ADDISON'S DISEASE. [Medicine, *S.* 2.]

ADMINISTRATION AND ADMINISTRATOR. The whole jurisdiction of the Ecclesiastical Courts in the grant and withdrawal of administrations, and the superintendence of administrators, has been transferred to the Court of Probate. (20 & 21 Vict. c. 77. [Probate, Court of, *S.* 2.] The customs of London, York, &c., (P. C. vol. i. p. 125) have been abolished, and the distribution of the estates of intestates thus rendered uniform throughout England. (19 & 20 Vict. c. 94; 'Blackstone's Comm.,' Mr. Kerr's ed., vol. ii. p. 554.)

ADMIRALTY, COURT OF. The jurisdiction of this Court in matters of wreck and salvage is regulated by the statute 9 & 10 Vict. c. 99. Questions relating to the attack and capture of pirates may now also be determined by this Court or the Vice Admiralty Courts abroad. (13 & 14 Vict. cc. 26, 27.)

ADOLPHUS, JOHN, was born in 1770 and died July 17, 1845. Mr. Adolphus was a barrister of high standing in the criminal courts, and at his decease was father of the Old Bailey bar. He was a keen advocate, a fluent speaker, and a good lawyer. His practice, previously very considerable, was highly increased by the manner in which he distinguished himself as leading counsel for Thistlewood and the other prisoners charged with a treasonable conspiracy in 1820, though he was retained on their behalf only a few hours before the trial. As a literary man Mr. Adolphus is best known as the author of the 'History of England from the Accession of George III.,' originally published in 3 volumes in 1805, but which he subsequently revised and greatly extended. Of this enlarged edition the seventh volume appeared just before his death, but it left the work unfinished, and the conclusion has not been published. It is a work of considerable research and very carefully executed, but it does not exhibit very high historical powers. He was also the author of 'Biographical Memoirs of the French Revolution;' 'Political State of the British Empire,' 4 vols. 1818; 'Memoirs of John Bannister;' and some fugitive pieces and pamphlets.

ADULTERY. The action of damages for criminal conversation, or *crim. con.*, has been abolished by the statute 20 & 21 Vict. c. 85, creating 'the Court for Divorce and Matrimonial Causes.' The injured husband, in applying to this Court for a divorce or a judicial separation, may claim damages, which however can only be awarded to him by the verdict of a jury, and the Court may then direct in what manner the damages are to be disposed of; for the whole or any part thereof may be settled on the children of the marriage, or as a provision for the maintenance of the wife. [Divorce, *S.* 2; Separation, Judicial, *S.* 2; Husband and Wife, *S.* 2.]

ÆGOPODIUM (from αἴξ, a goat, and πόδιον, a little foot), a genus of plants belonging to the order *Umbelliferæ*. One species, *Æ. podagraria*, is common throughout the whole of Europe, and grows abundantly in Great Britain. It has a stem one or two feet high, with furrows. The leaves are two or three times ternate; the leaflets unequal at the base and acutely serrate. It has a creeping root, and grows in damp places. Although well known, and having the names of Goat-Weed, Ash-Weed, Herb Gerard, and Wild Masterwort, it seems to possess no medicinal properties. Linnæus says that it is boiled when young, and eaten as greens in Sweden.

ÆTHERS, SILICIC. [Chemistry, *S.* 1.]

AFFIRMATION (in Law). Every person who has conscientious objections to taking an oath, may now be permitted to make a solemn affirmation in lieu thereof, the effect of which is the same as if the testimony were given on oath. (Common Law Procedure Act, 1854.)

AFFRE, DENIS AUGUSTE, archbishop of Paris, was born at St.-Rome, in the department of Tarn, Sept. 27, 1793. At an early age he evinced a desire to devote himself to the Church, and he became a student at the seminary of St.-Sulpice. He was ordained priest in 1818, and discharged a variety of ecclesiastical functions till he became archbishop of Paris in 1840. Although a man of ability and learning, and the author of several treatises (amongst which was one on Egyptian hieroglyphics), he would scarcely have found a place in the history of his times, but for the lamentable circumstance of his death on the 27th June, 1848. Paris was then the scene of a fearful contest between the soldiery and a vast body of insurgents. The archbishop was induced to apply to General Cavaignac, proposing to stand between the contending bodies as a messenger of peace. The general told him that the course was full of danger. "My life," he replied, "is of small consequence." Some hours afterwards the firing of the soldiery having ceased at his desire, the archbishop mounted a barricade erected at the entrance of the Faubourg St. Antoine: he was preceded by M. Albert, a national guard, wearing a workman's dress, carrying in his hand a green branch as an emblem of peace; and he had at his side a faithful servant named Pierre Sellier. The devoted ecclesiastic was not received with the confidence that he expected to inspire. Some indeed of the combatants stretched out their hands, but others remained silent, while others groaned and hooted. The prelate endeavoured to speak a few words; but the insurgents, fancying themselves betrayed, opened a fire upon the Garde Mobile, and the archbishop fell. Then a cry of horror went up from the crowd, and many, even of the insurgents, rushed to his aid. Albert and Sellier were leading him away, when Sellier was also struck by a ball. The insurgents who surrounded the archbishop cried out that the Garde Mobile had inflicted the wound, and that they would avenge him. "No, no, my friends," he replied; "there has been blood enough shed; let mine be the last that is spilt." He was carried to the archiepiscopal palace, and died the same day. The National Assembly issued a decree announcing its profound grief at the event of his death, and his public funeral took place on the 7th of July, amidst the deepest feelings of popular regret. (*Nouvelle Biographie Universelle*, 1852.)

AFREEDIS, an Afghan clan, sometimes spoken of under the more general name of Kyburees, inhabit the Kyber hills on the confines of Cabul and the Panjab. They command the passes in these hills, for a safe conduct through which their Maliks, or chiefs, consider themselves entitled to demand a toll. The toll for the celebrated Kyber Pass was formerly paid by the rulers of Cabul, and the non-payment of it after the restoration of Shah Soojah to the throne excited the furious hostility of the Afreedis against the British and their auxiliaries. They resisted the march of Colonel Wade and the Sikh auxiliaries through the pass in July, 1839, but were compelled to evacuate the fort, Ali-Musjid, the key of the pass, which, with other posts between Peshawur and Jellalabad, was garrisoned by small detached parties. At a subsequent period of the Afghan war, January 19, 1842, they defeated two Sepoy regiments advancing under Brigadier Wild from Peshawur to the relief of two other Sepoy regiments under Colonel Moseley in Ali-Musjid, which had seized that fort some days before, and had been robbed of their provisions on their way. Cut off from all communication with the brigadier, and short of provision, Moseley evacuated the fort on the 24th, which was immediately seized by the Afreedis. On General Pollock's advance from Peshawur to the relief of Jellalabad, in the spring of 1842, the Afreedi chiefs offered to clear the pass from Jumrood to Dhaka for 50,000 rupees; but Pollock chose to force his way, sweeping the heights on each side of the defile with his light troops, whilst the main body advanced through the pass, having demolished the barrier raised by the enemy across the entrance. Before Pollock reached Ali-Musjid the Afreedis had evacuated it; it was then held by a strong force till the final withdrawal of the British troops from Afghanistan, when it was blown up. We next hear of the Afreedis in connection with another pass on the road from Peshawur to Kohat, leading to the Salt Range. On February 2, 1850, about 1000 Afreedis plundered the camp of a party of British Sappers employed in making a road through this pass, about 18 miles south from Peshawur, and killed several of the men. To avenge this massacre a strong force, under Colonel Bradshaw, scoured the hills in the neighbourhood, destroying six villages and a great number of the enemy, who however made some resistance on the return of the troops through the passes.

To the west of the Kyber hills, on the Cabul side, the Momund clan dwells along the banks of the Cabul River. Their chief place, Lalpoorah, the residence of the Malik, is opposite Dakha.

AFRICA. At the period when the article Africa in the 'Penny Cyclopædia' was written, the descent of the Quorra, or Niger, had recently been accomplished by the brothers Richard and John Lander. In a subsequent article, Quorra, additional details are given respecting the river and the countries through which it flows; and the discoveries brought down to the year 1840. At that time an expedition was in preparation by the British government, the object of which was to check and supersede the foreign trade in slaves by the establishment of a commerce along the banks of the Quorra, which should be more beneficial to the native chiefs than the cruel traffic in slaves. This expedition, consisting of three steam-vessels, began the ascent of the river in 1841, but a fatal sickness unhappily seized the greater part of the crews and officers, and they were unable to ascend the river so far even as had been previously reached by the disastrous expedition of 1832. The failure of these two expeditions, attended as they both were by a fearful loss of life, prevented any renewal of the attempts to ascend the Quorra till the year 1854, when Dr. Baikie made his successful ascent of the river and its great eastern tributary, the Tchadda or Benuè. This ascent was made in Mr. McGregor Laird's screw-steamer the Pleiad, flat-bottomed and of a peculiar construction suitable for ascending a shallow river against a powerful current. In the first instance Lieutenant Lyons M'Leod, R.N., was to have had the command, his project of exploring the countries between the Quorra and the Gambia having been abandoned; but afterwards Mr. Becroft, already well acquainted with the Quorra, was appointed the chief. Mr. Becroft, however, died before the Pleiad had reached the mouth of the river, and the command was then assumed by Dr. Baikie, surgeon, R.N. The expedition occupied about four months, from July 12 to November 7, and ascended 250 miles of the course of the Tchadda above Dagbeh, which was the farthest point reached by Allen and Oldfield in 1832, and is about 100 miles from the confluence of the Tchadda and Quorra. The point reached by Dr. Baikie was only fifty-five miles from the place where Dr. Barth afterwards crossed the Benuè, thus proving that the Benuè of Central Africa is the same river as the Tchadda. Dr. Baikie is now (January 1858) engaged in another similar expedition, in which he hopes to ascend the Tchadda to a still higher point. He had ascended the Quorra to some distance above Rabba, when his steamer was wrecked by striking on a sunken rock in the bed of the river. All the persons, however, were saved, and they had everywhere entered into friendly relations with the natives. A new steam-vessel, suitable for navigating the Tchadda, has been sent out to replace the one which has been lost.

We now proceed to notice the discoveries made in the southern, central, and eastern parts of the continent since the publication of the article AFRICA, in the 'Penny Cyclopœdia.'

In the years 1835 and 1836 Dr. Andrew Smith made a journey in South Africa, during which he visited the sources of the rivers Caledon and Maputa, ascended the mountains of Caffraria, and advanced in the tracks of the traders as far north as the Tropic of Capricorn. He was unsuccessful, however, in the principal object of his journey, which was to reach a large lake in the interior, the lake Ngami, since discovered by Messrs. Livingstone, Oswell, and Murray. In 1836 and 1837 Captain J. E. Alexander explored the countries inhabited by the Namaquas, Bushmen, (Bosjesmans), and Hill Damaras, extending on the western side of Africa from about 30° to 23° S. lat.

At the end of May, 1849, while the Rev. Dr. Livingstone was residing as a missionary at a station named Kolobeng, he was visited by Mr. Oswell and Mr. Murray, two gentlemen who had come from the East Indies, partly for the purpose of hunting and partly of making geographical discoveries. They agreed to accompany him in a journey which he was desirous of making in search of a large lake, the position of which had long been known from the reports of the natives. Mr. Oswell undertook to defray the expenses of the journey, which was long, and rendered difficult by the Kalahari Desert lying between Kolobeng and the lake. This large district, however, is not absolutely a desert, but is without running water. On the 1st of June, 1849, the party commenced their journey, and managed to obtain water by digging, till, on the 4th of July, they reached a fine river named the Zouga. There they met with some friendly natives, who informed them that the river flowed out of the Lake Ngami, and that by tracing it upwards they would reach the lake. On the 1st of August they arrived at the north-east end of the lake, whence the river flows, and beheld a fine expanse of water. They could form no idea of its extent except from the reports of the natives, who professed to go round it in three days, whence they estimated the circuit to be from 70 to 90 miles. Mr. Macabe, who afterwards travelled round it, estimates the circuit at 90 or 100 miles. The lake is shallow, and the banks are flat. When full, the water is quite fresh, but brackish when low, and it is then difficult to reach through the boggy and reedy banks. The elevation above the sea was estimated at a little over 2000 feet and they had descended about 2000 feet in travelling to it from Kolobeng. The latitude of the upper end of the lake is 20° 20′ S., and the longitude probably between 22° and 23° E. The lake receives the Teoughe, a large river, at the north-western end, and discharges itself by the Zouga at the north-eastern end. The Zouga, soon after leaving the lake, receives the Tamunakle, which, as well as the Teoughe, flows from the north. The Zouga continues for a considerable distance to be a fine river, broad and deep, with beautifully wooded banks, but receiving no more affluents, becomes gradually narrower in its descent of about 200 miles in a winding south-easterly direction. It then flows into Lake Kumadau, which is about 12 miles in length, and 3 or 4 broad, and the water is there dissipated, gradually becoming more and more salt as evaporation proceeds. In September Lake Ngami becomes very low, and the rivers are dried up. The water begins to flow again in April, but makes little progress in filling Lake Kumadau till the end of June. The Bataoana tribe of natives live at the eastern end of the lake, where they have their principal village. After a short stay there, the party returned, and arrived at Kolobeng, October 10. There are prodigious numbers of the elephant, rhinoceros, and other large animals, in the vicinity of the lake and its rivers. The name Ngami is pronounced Ingámi, the first syllable very short. Dr. Livingstone paid another short visit to Lake Ngami in 1850, accompanied by his wife and three children.

In June, 1851, Dr. Livingstone, accompanied by Mr. Oswell, again started for the north. This time their route was in a more easterly direction, and they succeeded in pushing their researches northward to 17° 25′ S. lat., and between 24° 30′ and 26° 50′ E. long., traversing a considerable tract watered by deep and constantly flowing streams, which they believe to be feeders of the river Zambesi. They passed over a large salt incrustation of about 100 miles in length and 15 miles in width, and saw many others lying to the north of the spot where the Zouga terminates. Considerably to the north of these great natural salt-pans, in the country watered by the supposed tributaries of the Zambesi, the inhabitants are more intelligent than most of the native tribes of South Africa.

In 1851 Mr. Francis Galton left England with the intention of following up Dr. Livingtone's discoveries, but for certain reasons this project was abandoned, and, instead, he proceeded to Walfisch Bay on the western coast of Africa, north of the Tropic of Capricorn. He was accompanied by Mr. Andersson, a native of Sweden, and they explored the region between the bay on the south, and Ondonga, in 17° 58′ S. lat., near the river Nourse on the north, and as far inland as 21° E. long. Through this journey we obtain a description of the Damara people, who, though a race of fine stature, are in a low moral state, and likely to be extinguished by their more centralised, powerful, and intelligent neighbours on the north, the Ovampo. The high table-land, which was traversed to reach the Ovampo, is cut through by deep ravines, the chief of which serve as escapes for the periodical flood of the rivers. In delineating the moral character, as well as the physical conformation of the different tribes of South Africa, it is interesting to observe, from the observations of Mr. Galton, how their differences are connected with the form, subsoil, and vegetation of their respective lands. Thus, the arid inland plateaus, covered only with thick jungle and short brushwood, hold the dwarfed and sinewy Bushmen; the more open, hilly, and undulating pasture-lands, the Damaras; whilst the rich corn-lands on the north are occupied by the race which is the most civilised and advanced, the Ovampo. Ondonga, the capital of this people, is estimated to be about 70 or 80 miles to the south of the great river Amorongo Achilunda, the Nourse of our maps. The table-land inhabited by the Damaras rises in some points to 5000 and 6000 feet above the sea. Mr. Galton afterwards, in September and October, 1851, proceeded as far eastward as Tonnobis, a distance of 500 miles from the coast, on the road to Lake Ngami, distant about 180 miles. Mr. Galton did not reach Lake Ngami, having made an engagement to embark at Walfisch Bay in a vessel which was expected, and the specified time not allowing him to remain longer. Mr. Andersson however afterwards proceeded again to Tonnobis, and thence to Lake Ngami, from which he ascended some distance the river Teoughe, the principal affluent of Lake Ngami. Mr. Andersson reached the Lake at the end of July, 1853. Mr. Galton and Mr.

Andersson have each published a volume giving an account of their travels.

We shall now give an account of the missionary explorations from the eastern coast, and of the expedition to Central Africa.

The zealous and enterprising missionaries, Krapf and Rebmann, stationed at Rabbai 'Mpia, near Mombas, in about 4° S. lat., began their journeys into the interior of the continent in 1847. In that year Mr. Rebmann penetrated westward to Teita, a "country whose mountains rise to such a height out of the vast surrounding plains, that on some eminences near Rabbai 'Mpia they are to be seen at a distance of 90 miles;" and in the April following (1848), the same missionary performed a journey farther into the interior, to the still more elevated country of Djagga, where, at a distance of rather more than 200 geographical miles from the coast, in a direction about W.N.W. from Mombas, he made the remarkable discovery of a lofty mountain, named Kilimandjáro, of which the summit is covered with perpetual snow. The existence of snow on Kilimandjáro has been disputed in Europe, though it is difficult to say on what reasonable ground. However, on subsequent journeys, both Mr. Rebmann and his colleague Dr. Krapf satisfied themselves of the fact; and unless it be intended absolutely to impugn their veracity, their evidence cannot be rejected. In April, 1849, he again set out on his way into the interior, but was unable to proceed beyond Djagga. In November and December of the same year Dr. Krapf successfully penetrated as far as Ukambáni, a country situated northward of Djagga. Of the geographical results of this journey, one of the most important is the discovery of another snowy mountain, named Kénia, of larger size if not greater elevation than Kilimandjáro. Kénia, is thus described by Dr. Krapf:—"The sky being clear, I got a full sight of the snow mountain. . . . It appeared to be like a gigantic wall, on whose summit I observed two immense towers, or horns as you may call them. These horns or towers, which are at a short distance from each other, give the mountain a grand and majestic appearance, which raised in my mind overwhelming feelings. Kilimandjáro in Djagga has a dome-like summit; but Kénia has the form of a gigantic roof, over which its two horns rise like two mighty pillars, which I have no doubt are seen by the inhabitants of the countries bordering on the northern latitudes of the equator. Still less do I doubt that the volume of water which Kénia issues to the north runs towards the basin of the White Nile." In Rebmann's map ('Church Missionary Intelligencer') Kénia is placed in 1° S. lat., 35° 10′ E. long., at a distance of 320 geographical miles north and 55 west from Mombas. This position, however, can only be considered as a rough approximation. In the last journey of Dr. Krapf he again visited the country of Ukambáni and the river Dana, as the upper course of the Ozi is called. On this journey the enterprising traveller was subjected to the greatest hardships and sufferings, and indeed barely escaped with his life. No fresh discoveries were made in this journey, but some farther information was collected respecting the river which flows from the Kénia (Ndukenia or Kirenia) northward, and forms most probably one of the head-waters of the Nile.

The expedition to Northern and Central Africa, conducted by Mr. Richardson, accompanied by Drs. Barth and Overweg, is one of great importance. This expedition originated with Mr. Richardson, who, after having returned from his travels in the northern portion of the Sahara in 1845 and 1846, induced the English government to send him out for the purpose of concluding commercial treaties with the chiefs of the desert-regions between Tripoli and Lake Tchad. Through the lively interest taken in it by Chevalier Bunsen, Baron Humboldt, and Professor Ritter, it was arranged that Dr. Barth and Dr. Overweg, two Germans, should accompany Mr. Richardson for the purpose of making scientific observations. Lord Palmerston sanctioned this proposal, and afforded the two travellers pecuniary assistance, in addition to their own private means and to grants from the Geographical Society in Berlin and the King of Prussia.

The three travellers departed from this country at the latter end of 1849, and arrived in Tripoli in the beginning of the following year. Previously to starting from that place, the mountainous region to the south was thoroughly explored and surveyed by the two Germans within a radius of 60 to 90 miles from the town. [Tripoli.] An unexpected degree of cold was experienced in these excursions. On one day the thermometer, before sunrise, stood as low as 26° Fahrenheit, and on the 2nd and 3rd of February, the snow obliged the travellers to remain in their tents. After their return to Tripoli, several weeks were required for their preparations; and the transport of a boat for navigating Lake Tchad caused considerable difficulty. For this purpose a beautiful wherry had been constructed by the direction of the admiral at Malta, broad in the beam, and very light on water; but it was necessary to take it to pieces, and several camels were requisite to convey it across the burning sands of the Sahara.

The travellers started at last on the 24th of March, 1850, the great caravan having departed before them; but the party formed a small caravan of itself, having about 40 camels laden with their effects and merchandise. Every possible assistance was rendered by her Majesty's consuls in Tripoli and Murzuk to the undertaking, so that the expedition started under the most favourable circumstances.

The direction of the route to Murzuk was almost due south from Tripoli, beyond the Gharian defile, the country consisting of a continuous table-land, of an average elevation of 2000 feet. As far as the well of Taboniyah, many deep wâdis intersect this table-land, and the ruins of several Roman monuments and columns were discovered by the travellers. Southward of that place is a table-land, or Hamadah, an immense desert of considerably greater elevation, and extending for about 110 geographical miles in the same direction. As far as the eye can reach, neither trees nor indications of wells are visible, and the scanty vegetation which occurs is only found scattered in the trifling irregularities of the surface. The ground is covered with small stones, pyramids of which, erected with great labour, serve as roadmarks to the intrepid camel-drivers by day, while the polar star and Antares are their guides by night. After a journey of six days the expedition reached the southern edge of this table-land, which descends in perpendicular walls to the Wâdi el Hessi. Following the descent for about 60 geographical miles, the travellers came to the Wâdi Shi'ati, over another plateau of equally dismal aspect. It is composed of a black sandstone, the disintegration of which forms a dark yellow sand, covering the inequalities of the stony surface, from which stands out prominently the black rock, in high cones of the most fantastic forms, strikingly resembling basaltic rocks. They reached Murzuk on the 6th of May, and remained there till the 13th of June, collecting much important information respecting the countries and nations to the south. Murzuk is very unhealthy and dangerous for Europeans, but happily none of the party suffered during their stay.

On the 13th of June they set off for Ghat, which they reached on the 18th of July. The most interesting result of this journey was the discovery of several curious sculptures on the rocks of the Wâdi Felisjareh. One of them consists of two human figures with the heads of birds, and a bull, armed with spears, shields, and arrows, and fighting for a child; the other is a fine herd of oxen going to a watering-place, most skilfully grouped and executed. In the opinion of the travellers the two works bear a striking and unmistakeable resemblance to the sculptures of Egypt. They are evidently of much higher antiquity than many other sculptured tablets found by the travellers, on which camels formed generally the principal objects.

The party started from Ghat, after a stay of some days, for the kingdom of Aïr or Asben. They had to cross a vast desert, totally uninhabited, for about 250 geographical miles, and succeeded in reaching Taghajit, the first inhabited place in Aïr, on the 22nd of August.

The route from Ghat to Aïr is described by Dr. Overweg as a mountain-path leading over ridges, table-lands, and deep-cut rocky valleys. Wherever the wâdis become broader, and through the agency of rain are covered with disintegrated rocks and sand, they show a scanty vegetation of grass and trees. The geognostical character of the country is here of much greater interest. From Murzuk to Ghat, and farther to the south, the prevailing formation consists of sandstone of various colours, with throughout the same petrographical aspect of the rocks, the same slopes of the mountains and intersections of the valleys, and the same horizontal strata. At Aggeri, about 70 miles to the south of Ghat, the entire scene suddenly changes. The mountains are now rounded, and strata forming projecting terraces are no longer seen. The travellers found themselves all at once in the regions of granite, the whole country between Aggeri and Aïr consisting of crystalline primitive rocks, with mica-slate and enormous masses of granite in great diversity of mountain-forms. From Ghat the general surface of the country continues to rise, and at Selufiet the travellers saw around them the highest mountain-masses met with on their journey. After the middle of August they experienced the influence of the Soodan rains; the atmosphere then beginning to be humid, and the evenings or mornings being accompanied by fogs. Frequent thunder-storms and heavy rains also occurred. Under the influence of these rains the aspect of the wâdis became completely changed, luxuriant plantations of palms being everywhere met with to the south of Taghajit. According to the natives the rainy season lasts till the end of September. At Taghajit, near the frontiers of Soodan, the travellers having accomplished the exceedingly difficult and dangerous journey across the Great Desert, believed themselves to be in perfect safety from the attacks of considerable numbers of furious Tuaricks, who had for some time followed their caravan, with the intent to murder and plunder them. Between Taghajit and Selufiet, however, at a place about 60 geographical miles farther to the south, on the 25th of August, they were attacked the first time by 40, and the second time by 100 armed men, mounted on camels. By their own courage, however, and the bravery of the Kelowis, their companions, their lives were saved at the expense of a high ransom, and they reached Tintellust, the residence of the Prince Annoor, on the 4th of September. By this prince, to whom they were strongly recommended, they were very kindly received. In Tintellust, which is situated in 18° 34′ N. lat., the travellers staid till the end of November, and collected a great deal of information respecting Northern Africa.

The inhabitants of Tintellust and the country around live entirely on the productions of Soodan, in exchange for which they supply Soodan with salt. Every year the Prince Annoor takes to the south from 2000 to 3000 camels laden with salt, and returns with slaves and provisions. While the expedition remained at Tintellust, Dr. Barth made a successful journey to Agades, the capital of the kingdom of Aïr or Asben, which occupied him from the 4th to the 30th of October. [AGADES, *S.* 2.] On the 12th of December, 1850, the travellers left Aïr on their route to Lake Tchad, and arrived at Damergu by the end of December. Here the travellers separated, Mr. Richardson going by the most direct route to Kuka, Dr. Barth southward to Kano, and Dr. Overweg south-west to Mariadi and Guber, two states of independent Pagans, where the latter explorer was very kindly received, and obtained much curious information. Kuka, the capital of Bornou, had been fixed as the rendezvous of the three travellers, and Drs. Barth and Overweg safely met there again in April, 1851, but Mr. Richardson unhappily died on the road to Kuka, at Unguratua, about 100 geographical miles W.N.W. from that place, on the 4th of March. The political objects of the expedition devolving now upon the two scientific travellers, Dr. Barth, who arrived first at Kuka, presented himself at the sheikh's palace as one of the surviving Christians who had come from England to bring presents from her British Majesty. Dr. Overweg also soon arrived. The two travellers were kindly received by the sheikh and his vizier, and were assisted in all their objects and wishes. Preparations were forthwith made for exploratory tours; and while Dr. Barth was absent on his journey to Adamaua, Dr. Overweg put the boat together, and launched it on Lake Tchad. Dr. Overweg embarked, and explored the lake, visiting the Biddumas, who inhabit the islands, of which there are about 100 large ones scattered over the lake.

On the 29th of May, 1851, Dr. Barth started on his adventurous journey to Adamaua, and on the 18th of June reached the great river Benuè, (which is the native name there given to the Tchadda) at the confluence of another large river called the Faro. This point of the Benuè is about 55 miles higher up than the point reached by Dr. Baikie in his voyage in 1854, previously noticed. The Benuè is here half a mile wide, and about 11 feet deep, running in a general direction from east to west, at the rate of about 3½ miles an hour. It is about 800 feet above the level of the sea. The banks are from 25 to 30 feet high. The Faro joins the Benuè from the south-east, and is from two to four feet deep, running with great rapidity. During floods the Benuè inundates the country on both sides. Dr. Barth crossed both the rivers, and proceeded in a south-west direction about forty miles to the town of Yola, which is the capital of Adamaua. It is situated in 9° 25′ N. lat., 12° 10′ E. long., and is a large open place, consisting mostly of conical huts surrounded by spacious courtyards. It is about three miles long from east to west, but does not contain more than 12,000 inhabitants. The huts have clay walls, and are thatched. The town has no industry, and the market is small. The province of Adamaua, of which the proper native name is Fúmbina, is very fertile, well cultivated, and full of villages. Dr. Barth arrived at Kuka, on his return from Adamaua on the 22nd of July.

On the 11th of September, 1851, Dr. Barth set out on an expedition to Kánem, a district on the eastern side of Lake Tchad. On the 18th of September Dr. Overweg joined Dr. Barth, accompanied by an escort of horsemen. They reached Kuka on their return October 14, after having been exposed to much danger from hostile natives.

On this expedition Dr. Barth had a favourable opportunity of investigating Lake Tchad. It is a vast lagoon without any outlet, of little depth and ever-varying extent. The circuit, when moderately full, is about 400 miles, travelling distance, or twenty days journey of about twenty miles a day. It receives only one perennial river, the Shary, which is very large, and in the wet season pours in a large quantity of water. The Shary comes from the south, and enters Lake Tchad at the south end. Another considerable river, the Yeou, or Yow, comes from the west, and enters the lake on the west side. The Yow ceases to flow in the dry season. Many of the numerous islands in the lake are permanently inhabited. The swampy parts, near the shores, contain large numbers of crocodiles and hippopotami, and elephants are very numerous in the vicinity of the eastern side of the lake. On one occasion Dr. Barth saw a herd of elephants proceeding to the lake for the purpose of drinking. The number amounted to ninety-five, and they were walking in a long line, like a regiment of soldiers, the males being in the front, the young ones in the centre, and the females in the rear.

On the 25th of November, 1851, Dr. Barth again left Kuka, in order to join a warlike expedition to the country called Mandara. The expedition started on the 8th of December, and on the 30th reached the village of Demmo, when Dr. Barth saw a broad watercourse flowing slowly from S.W. to N.E., shallow, but deep enough for canoes, and more than two miles in width. This watercourse appears to join the Serbewel, or upper course of the river of Logón, which is the chief affluent of the river Shary. At Demmo a considerable number of females and children were captured. The whole village was destroyed by fire, and made desolate. Slaughtered men, with their limbs severed from their bodies were seen lying about in all directions. The greater part of the men however escaped across the river. There was some fighting, and a few of the Bornu army were slain. The expedition reached Kuka, on its return, February 1, 1852.

On the 4th of March, 1852, Dr. Barth set out on an expedition to the kingdom of Bagirmi. On the 13th of March he arrived at Logón Bírni, capital of the territory of Logón. It is situated in 11° 47′ N. lat., 14° 56′ E. long., near the west bank of the river Logón, an affluent of the Shary, 350 or 400 yards wide. The population of Logón Bírni is about 15,000. On the 18th of March he reached the river Shary, 600 yards wide, and was passed over in a large canoe. On the 27th of April he arrived at Maseña, the capital of Bagirmi, in 11° 38′ N. lat., 16° E. long., and was not allowed to leave the place till the 10th of August. The town of Maseña was formerly much larger, and the extent of the wall has been reduced, but is still much too large for the town, and in the utmost state of decay. The town extends over a circumference of about seven miles; but only about half of this area is inhabited, the principal quarter being in the centre, and on the north and west sides of the palace of the Sultan of Bagirmi. A deep trough-like depression intersects the town from east to west, which, during the rainy season is filled with water, and in the dry season covered with the richest verdure. The surface within the wall is broken into many other hollows, which contain the wells.

On the 6th of July Dr. Barth received despatches from the Foreign Office of the British government, which were forwarded to him from Kuka, and which authorised him to carry out the objects of the expedition, and supplied him with the means. Lord Palmerston, in his despatch, allowed Dr. Barth, after he had completed the survey of Lake Tchad, either to proceed to the eastern coast of Africa, or westwards to Timbuctu. He decided on making the journey to Timbuctu.

On the 10th of August Dr. Barth was permitted to leave Masseña, and on the 14th of August crossed the Shary on his return. The rains had then commenced, and the river was above 1000 yards wide, very deep, and flowing at a rate of about three miles an hour. He crossed the Logón river on the 15th of August, and arrived at Kuka on the 21st.

On the 20th of September, Mr. Overweg died of an attack of fever. This date closes the 3rd volume of Dr. Barth's 'Travels and Discoveries in North and Central Africa,' 3 vols. 8vo., 1857. Dr. Barth left Kuka on his journey to Timbuctu on the 28th of November, 1852, and the other two volumes, which are to comprise his travels to Timbuctu, his residence there, journey back to Kuka, where he arrived December 11, 1854, and his return to England, have not yet (Jan. 1858) been published.

In February, 1853, Dr. Edward Vogel, a young German, employed at Mr. Bishop's Observatory, Regent's Park, London, was sent to join Drs. Barth and Overweg. He was accompanied by two volunteers from the corps of Sappers and Miners. They reached Lake Tchad on the 6th of January, 1854, and were received kindly by the sheikh and his vizier. Dr. Barth was then absent on his journey to Timbuctu. Dr. Vogel is stated to have been put to death by the Sultan of Waday, and his papers have not yet been recovered, nor his fate ascertained with certainty. One of the Sappers and Miners has returned to England; the other, Corporal Maguire, appears to have been assassinated in the vicinity of Kuka. Dr. Vogel had sent to England a few notices of his explorations, had visited Yacoba, and on the 30th of April, 1855, had crossed the Tchadda at the place where Dr. Baikie had been, in the Pleiad steamer, in 1854.

In January, 1853, accounts were received by the Royal Geographical Society of London, which were subsequently confirmed in April, of the successful issue of a commercial journey across the continent of Africa by a Moorish caravan, trading for ivory and slaves. It had started from Zanzibar on the east coast (5° S. lat., 39° E. long.), and had reached Benguela on the west coast (12° S. lat., 15° E. long.). The journey occupied six months; a day and a night were occupied in crossing the great lake of Tanganna, also called Nyassi, Zewa, and Maravi. In one part of the journey no inhabitants were seen for fifteen days.

We now proceed to give an account of Dr. Livingstone's long and hazardous journeys from the interior to the west and east coasts of Africa, the greater part of which were through countries never before seen by any European.

In April, 1852, Dr. Livingstone proceeded to Cape Town, with his wife and children, and sent them home to England. He then returned in order to explore the country in search of a healthy district, which might prove a centre of civilisation, and open up the interior by a path to either the east or west coast. When he reached Kuruman, on his return, he learnt by a letter from the chief Sechele that the natives had been attacked at Kolobeng by the Boers of the Cashan Mountains; that the village of Kolobeng had been burnt, about sixty of the males slain, many women and about 200 of the school children carried off for slaves, and his own residence plundered of everything.

Having returned to Kolobeng, and remained a few days with the wretched Bakwains, he proceeded northwards on the 15th of January, 1853. The Bamangwato Hills, between Kolobeng and Lake Ngami, are part of a range called Bakaa, which rises about 700 or 800 feet above the plains, and is composed of great masses of black basalt. This mass of basalt, about six miles long, has tilted up the rocks both on the east and west. Passing on to Letloche, about 20 miles beyond the Bamangwato, they found a fine supply of water. This spot was Mr. Gordon Cumming's farthest station north. Farther on they came to the hill Ngwa, 18° 27′ 20″ S. lat., 24° 13′ 36″ E. long. It is 300 or 400 feet high, and was the only hill they had seen since leaving the Bamangwato Hills. As they approached Linyanti, they found the river-beds filled by the annual inundation, and flowing into the Chobe, which is itself an affluent of the Leeambye. With some difficulty they reached Linyanti, May 23, 1853. Linyanti is the capital town of the Makololo, and is situated in 18° 17′ 20″ S. lat., 23° 50′ 9″ E. long. The chief of the Makololo, named Sekeletu, a young man of 18 years of age, and the whole population of Linyanti, numbering 7000 or 8000, received Dr. Livingstone, whom they were expecting, with enthusiastic welcome. The Makololo are the most northerly of the Bechuanas.

Having waited a month at Linyanti, Dr. Livingstone, attended by a party of the natives, set out from Sesheke, for the purpose of ascending the Leeambye. Sesheke is about 100 miles east from Linyanti. Linyanti is on the northern bank of the Chobe. The country between the two places is perfectly flat, except patches which are only a few feet above the general level. From Sesheke they ascended the river Leeambye to Nariele or Naliele, the capital of the Barotse country, situated in 15° 24′ 17″ S. lat., 23° 5′ 54″ E. long. The general course of the Leeambye from the Victoria Falls, below Sesheke, to Nariele is N.W. by N. Having procured a sufficient number of canoes, they began to ascend the Leeambye. They had 33 canoes, and about 160 men, Sekeletu and a large party of natives going with them to Nariele. The river, never before seen by European, is magnificent, often more than a mile wide, and having islands of from three to five miles in length. The banks and islands are richly wooded.

From the bend up to the north, called Katima-Molelo ('I quenched fire'), the bed of the river is rocky, and the stream runs fast, forming a succession of rapids and cataracts, which prevent continuous navigation when the river is low. The rapids are not visible when the river is full, but the cataracts of Nambwe, Bombwe, and Kale, must always be dangerous. The fall at each of these is between four and six feet. But the falls of Gonye present a much more serious obstacle. There they were obliged to take the canoes out of the water, and carry them more than a mile by land. The fall is about thirty feet. The main body of water, which comes over the ledge of rock when the river is low, is collected into a space of 70 or 80 yards before it takes the leap, and a mass of rock being thrust forward against the roaring torrent, a loud sound is produced.

The rocks here are of reddish, variegated, hardened sandstone, with madrepore holes in it. This and broad horizontal strata of trap, sometimes 100 miles in extent, and each layer having an inch or so of black silicious matter on it, as if it had floated there while in a state of fusion, form a great part of the bottom of the central valley. These rocks, in the southern part of the country especially, are often covered with 12 or 15 feet of soft calcareous tufa. The banks of the river in this part, viewed from the flat reedy basin in which it flowed, seemed prolonged into wooded ridges 200 or 300 feet high, and stretched away to the N.N.E. and N.N.W. until they were 20 or 30 miles apart. The intervening space, nearly 100 miles in length, with the Leeambye winding gently near the middle, is the true Barotse valley. It bears a close resemblance to the valley of the Nile, and is inundated annually, not by rains, but by the Leeambye, exactly as Lower Egypt is flooded by the Nile. The villages of the Barotse are built on mounds, and during the inundation the whole valley assumes the appearance of a large lake, with the villages on mounds like islands, just as occurs in Egypt with the villages of the Egyptians. The Barotse are strongly attached to this fertile valley. They say, "Here hunger is not known." There are no large towns, the mounds being all small. Nariele (Naliele) is built on a mound artificially constructed. When the river is compressed between the high rocky banks near Gonye, it rises 60 feet. The river presented the same appearance of low banks without trees as it assumed when they came to 16° 16′ S. lat., until they arrived at Libonta, 14° 59′ S. lat. Twenty miles beyond that there was forest down to the water's edge, and then there were tsetse. No locality can be inhabited by Europeans where that scourge exists.

Finding that he was now near the confluence of the river of Londa or Lunda, named Leeba, or Loiba, and the chiefs of that country being reported to be friendly to strangers, Dr. Livingstone pushed on to latitude 14° 11′ 3″ S. There the Leeambye assumes the name of Kabompo, and seems to be coming from the east. It is a fine large river, about 300 yards wide. The Leeba is about 250 yards wide, and comes from the N.N.W. The Loeti, about 200 yards wide, enters here from the W.N.W. The waters of the Loeti are of a light colour, and those of the Leeba of a dark mossy hue. The Loeti enters the Leeambye a little lower down than the Leeba.

The numbers of large game above Libonta are prodigious, and they are remarkably tame: 81 buffaloes defiled in slow procession before their fire one evening, within gun-shot; and herds of splendid elands stood by day without fear at 200 yards' distance. The lions were in great numbers, as is always the case in Africa where game abounds. A party of Arabs from Zanzibar were in the vicinity at this time. After remaining some days in this country, Dr. Livingstone returned to Linyanti, and made preparations for his journey to Loanda, on the west coast of Africa, as soon as the cooling influence of the rains should be felt in November.

He had few scientific instruments, but they were of the best kind—a sextant by Troughton, a chronometer by Dent, a thermometer by Dollond, a compass from the Cape Observatory, and a small telescope.

On the 11th of November, 1853, he left the town of Linyanti, accompanied by Sekeletu and his principal men, to embark on the Chobe. They crossed five branches. When the branches unite or re-enter it is a fine deep river. The banks are of soft calcareous tufa, like those of the Zouga. The bed is deep, and the sides perpendicular. The course is extremely tortuous.

The actual point of confluence of the Chobe with the Leeambye is ill defined, on account of each dividing into several branches before they unite, but when the whole body of water collects into one bed, it is very wide, and is a goodly sight for one who has spent many years in the thirsty south. Turning round they began to ascend the Leeambye, and on the 19th of November reached the village of Sesheke. After a short stay they proceeded up the Leeambye. Their progress was slow, owing to their waiting at the different villages for food.

Dr. Livingstone, in his journey to the west coast, was accompanied by a band of 27 men, belonging to the Makololo. It was the dry season. Parts of the river were only about 300 yards wide, and very deep. In other parts it is spread out to more than a mile, and the water flows rapidly over the rocky bottom. It requires great skill and care to manage the canoes in these shallow parts. The rapids are caused by rocks of dark-brown trap, or of sandstone stretching across the stream. In some places they form miles of the rocky bottom, with islets covered with trees. Libonta is the last town of the Makololo, and is situated on a mound like the rest of the villages in the Barotse valley.

On the 27th of December, 1853, they were at the confluence of the Leeba and Leeambye, 14° 10′ 52″ S. lat., 23° 35′ 40″ E. long. From the confluence down to Mosioatunya there are many long reaches where a vessel equal to the Thames steamers plying between the bridges could run as freely as they do on the Thames. It is often, even here, as broad as that river at London Bridge, and perhaps as deep. There are, however, many and serious obstacles to a continued navigation for hundreds of miles at a stretch. About ten miles below the confluence of the Loeti, for instance, there are many large sand-banks in the stream; then there are a hundred miles to the river at Simah, where a Thames steamer could ply at all times of the year; but again, the space between Simah and Katima-Molelo has five or six rapids, with cataracts, one of which, Gonye, could not be passed at any time without portage. Between these rapids there are reaches of quiet and deep water of several miles in length. Beyond Katima-Molelo to the confluence of the Chobe there are nearly 100 miles again of a river capable of being navigated in the same way as in the Barotse valley.

They now began to ascend the Leeba. The water is black in colour as compared with the Leeambye, which here assumes the name of Kabompo. The Leeba flows placidly, and, unlike the main river, receives numbers of little rivulets from both sides. It winds slowly through the most luxuriant meadows, each of which has a soft sedgy centre, or a large pond, or else a gentle rill flowing down the middle. The meadows are probably inundated, as the trees are on spots elevated three or four feet above the meadows. The rains were now set in, and the travellers were much drenched.

When they had ascended somewhat more than one-third of the Leeba, they left the river, and travelled overland on the eastern side by the village of the chief Shinte, till they came to the Lake Dilolo. On their route they crossed several affluents of the Leeba, and travelled over extensive plains, much of which was under water.

On the 20th of February, 1854, they reached the small end of the Lake Dilolo. Dr. Livingstone, being exhausted by fever and abstinence, could not visit the wider end. After passing a little farther to the N.W., they came to rivers which flowed northwards into the fine river Kasai, or Lokè, which has a northern course, while all the rivers they had previously passed flowed southwards; thus showing that the flooded plains in which the Lake Dilolo stands are an elevated flat which forms the water-parting of the streams that flow to the north and south respectively.

On the 4th of April they reached the banks of the Quango (Coango), a river 150 yards wide, and very deep. This fine river flows among extensive meadows clothed with gigantic grass and reeds, in a direction nearly north. They crossed it after a dangerous contention with the natives, and passed on westwards to the village of Cassange (pronounced Cassanje), which is the farthest station eastward of the Portuguese. They were now safe, and in the kingdom of Angola. Cassange is situated in 9° 37′ 30″ S. lat., 17° 49′ E. long. The distance to Loanda is about 300 miles. On the 14th of May they reached the village of Golungo Alto, 9° 8′ 30″ S. lat., 15° 2′ E. long., and on the 31st of May arrived at Loanda.

St. Paul de Loanda has been a very considerable city, but is now in a state of decay. It contains about 12,000 inhabitants, most of whom are people of colour. It possesses two cathedrals, one of which, formerly a Jesuits' college, is now a workshop. The forts are in a good state of repair. The Portuguese bishop of Angola resides at Loanda, and was very kind to Dr. Livingstone. The harbour is formed by a low sandy island, between which and the mainland is the station for ships. There was not a single English merchant there, and only two American merchants. Mr. Gabriel, the British commissioner for the suppression of the slave-trade, treated Dr. Livingstone with great kindness and hospitality.

On the 20th of September, 1854, Dr. Livingstone and his party of Makololo departed from Loanda on their return to Linyanti. They passed round to the mouth of the river Bengo, and ascending that river, arrived at Icollo i Bengo, and on the 28th of September at Kalungwembo, on the same path by which they came. There are plantations of fine coffee, and sugar is also cultivated. Dr. Livingstone proceeded in a canoe down the river Lucalla to Massangano. The river is about 85 yards wide, and navigable for canoes from its confluence with the Coanza to about six miles above the point where it receives the Luinha. Massangano stands on a tongue of rather high land formed by the left bank of the Lucalla and right bank of the Coanza. It has more than 1000 inhabitants. The latitude is 9° 37′ 46″ S. The fort is small, but in good repair. The lands on the north side of the Coanza belong to the Quisamas (Kisamas), an independent tribe whom the Portuguese have not been able to subdue. Returning to Golungo Alto he found several of his men ill of fever.

On the 14th of December, Dr. Livingstone and his men, having recovered from severe attacks of fever, proceeded to Ambaca, 9° 16′ 35″ S. lat., 15° 23′ E. long. On crossing the Lucalla they made a detour to the south in order to visit the famous rocks of Pungo Adongo, the fort of which stands in 9° 42′ 14″ S. lat., 15° 30′ E. long. It is situated in the midst of a group of curious columnar-shaped rocks, each of which is upwards of 300 feet in height. They are composed of conglomerate in a matrix of dark red sandstone, and rest on a thick stratum of this sandstone, with very few of the pebbles in its substance. Cambambe, to which the navigation of the Coanza reaches, is reported to be thirty leagues below Pungo Adongo.

On the 1st of January, 1855, they departed from Pungo Adongo. Their path lay along the right bank of the Coanza. On reaching the confluence of the Lombe, they left the river, and proceeded in a north-easterly direction. Passing over the heights of Tala Memgongo, 9° 42′ 37″ S. lat., 17° 27″ E. long. (Jan. 15), they arrived again at Cassange.

On the 28th of January they crossed the Quango in canoes. Having reached the eastern side of the river, they ascended the eastern acclivity which bounds the Cassange valley, and found it to be 5000 feet above the level of the sea, the bottom of the valley being 3500 feet. They crossed the Loange, a deep but narrow stream, by a bridge. It is the boundary of Londa on the west. On the 25th of March they crossed the Chikapa, and then the Kamane, an affluent of the Chikapa, coming from the S.S.W. On the 30th of April they reached the Loajima, where they had to form a bridge to cross.

On the 7th of May they arrived at the Moamba, a stream 30 yards wide, which they crossed by canoes, and arrived at Cabango, a village on the banks of the Chihombo, in 9° 31′ S. lat., 20° 31′ E. long.

On the 24th of May they left Cabango, and on the 28th reached the village of the chief Bango, 12° 22′ 53″ S. lat., 20° 58′ E. long. On the 30th of May they left the village of Bango, and proceeded to the river Loembwe, which flows to the N.N.E., 60 yards wide, and 4 feet deep. Having passed the Loembwe, they reached (June 2) the village of Kawawa, who wished to detain them, but borrowing one of his hidden canoes by night, they crossed to the southern bank of the river Kasai.

After leaving the Kasai they entered upon the extensive level plains which they had formerly found flooded. On the 8th of June they forded the Lotembwa, there about a mile wide and three feet deep, and regained their former path. It is N.W. of Lake Dilolo, and seems to flow from it northwards, and enter the Kasai, whilst another river Lotembwa flows from the other end of the lake southwards. Thus, this little Lake Dilolo, by giving a portion of its contents to the Kasai, and another to the Zambesi, distributes its waters to the Atlantic and Indian Oceans. From these elevated plains all the rivers seem to unite in two main drains, the one flowing to the north, and the other to the south. The northern drain finds its way out by the Congo to the west, and the southern by the Zambesi to the east. Dr. Livingstone was thus on the watershed, or highest part, of those two great river-systems, but still not more than 4000 feet above the level of the sea, and 1000 feet lower than the top of the western ridge they had already crossed. Instead of lofty snow-clad mountains appearing to verify the conjectures of the speculative, there were extensive plains, over which a person may travel a month without seeing anything higher than an ant-hill or a tree.

Sir Roderick Murchison, in his Address, as President, to the Royal Geographical Society, in 1852, explains the peculiar geological structure of the African continent. "Such as South Africa is now, such have been her main features during countless past ages, anterior to the creation of the human race. For the old rocks which form her outer fringe unquestionably circled round an interior marshy or lacustrine country, in which the dicynodon flourished, at a time when not a single animal was similar to any living thing which now inhabits the surface of our globe. The present central and meridian zone of waters, whether lakes or marshes, extending from Lake Tchad to Lake Ngami, with hippopotami on their banks, are therefore but the great modern residual geographical phenomena of those of a mezozoic age. The differences, however, between the geographical past of Africa and her present state are enormous. Since that primeval time the lands have been much elevated above the sea-level, eruptive rocks piercing in parts through them; deep rents and defiles have been suddenly formed in the subtending ridges through which some rivers escape outwards. Travellers will eventually ascertain whether the basin-shaped structure which is here announced as having been the great feature of the most ancient as it is of the actual geography of South Africa (that is, the primeval times to the present day), does or does not extend into Northern Africa. Looking at that much broader portion of the continent, we have some reason to surmise that the higher mountains there also form, in a general sense, its flanks only."

The elevated partition in the great central valley of Africa seems to be between 6° and 12° S. lat., and thence in all probability the head-waters of the great rivers of the Nile as well as the Zambesi have their origin.

The Lake Dilolo is a fine sheet of water, 6 or 8 miles long, and 1 or 2 broad, and somewhat of a triangular shape. A branch proceeds from the southern angle, and flows into the southern Lotembwa.

The town of the chief Shinte, which they left July 6, 1855, is in 12° 37′ 35″ S. lat., 22° 47′ E. long. They descended the Leeba by canoes. The river seemed to be upwards of 200 yards wide. They reached Linyanti early in September.

Dr. Livingstone having resolved to make a journey to the east coast of Africa, two routes offered themselves, one in a direction N.E. by the town of Cazembe and the southern end of the Lake Taganyenka to Zanzibar; the other nearly east by the course of the Zambesi. He chose the latter.

On the 3rd of November, 1855, he left Linyanti, and commenced his journey to the east coast. Having descended the river to the commencement of the rapids, and to a point where they intended to strike off to the north-east, Dr. Livingstone resolved to visit the Falls of Victoria, called by the natives Mosioatunya (Mosi oa tunya, 'smoke sounds here'). This is the connecting point between the known and unknown portions of the Zambesi. The name Falls of Victoria is the only one which Dr. Livingstone affixed to any part of the country. After twenty minutes' sail they came in sight, for the first time, of the columns of vapour, appropriately called 'smoke,' rising at a distance of five or six miles, exactly as when large tracts of grass are burned in Africa. Five columns of vapour arose, and bending in the direction of the wind, they seemed placed against a low ridge covered with trees. The tops of the columns at that distance appeared to mingle with the clouds. They were white below, and higher up became dark, so as to resemble smoke very closely. The whole scene was extremely beautiful. The banks and also the islands scattered over the river were adorned with abundance of trees and other vegetation of great variety of form and colour. No one can imagine the beauty of the view from anything witnessed in England. The only want felt is that of mountains in the back-ground. The Falls are bounded on three sides by ridges 300 or 400 feet high, which are covered with forest. When about half a mile from the Falls Dr. Livingstone left the canoe by which they had come down thus far, and embarked in a lighter one, with men well acquainted with the rapids, who by passing down the centre of the stream in the eddies and still places caused by many jutting rocks, brought him to an island situated in the middle of the river, and on the edge of the lip over which the water rolls. The water was low. If it had been high it would have been impossible to have reached the island without being precipitated down the Falls. But though they had reached the island, and were within a few yards of the edge of the Falls, no one could perceive where the vast body of water went; it seemed to lose itself in the earth, the opposite lip of the fissure into which it disappeared being only 80 feet distant. Dr. Livingstone could not comprehend it, until, creeping with awe to the verge, he peered down into a large rent which had been made from bank to bank of the broad Zambesi, and saw that a stream of 1000 yards broad leaped down 100 feet, and then became suddenly compressed into a space of 15 or 20 yards. The entire falls are simply a crack made in a hard basaltic rock from the right to the left bank of the Zambesi, and then prolonged from the left bank away through 30 or 40 miles of hills. In looking down into the fissure on the right of the island, nothing is seen but a dense white cloud, which at the time had two bright rainbows on it. From this cloud rushed up a great jet of vapour exactly like steam, and it mounted 200 or 300 feet high. There condensing, it changed its hue to that of dark smoke, and came back in a constant shower, which soon wetted them to the skin. On the left of the island the water is seen at the bottom, a white rolling mass moving away in the prolongation of the fissure, which branches off near the left bank of the river. The walls of this gigantic crack are perpendicular, and composed of one homogeneous mass of rock. The edge over which the water falls is partly worn and broken, so as to have a serrated appearance. The other edge is straight, except at the left corner, where a rent appears. The rock is dark brown in colour. The columns of vapour are evidently formed by the compression suffered by the force of the water's own fall into an unyielding wedge-shaped space. Of the five columns two were on the right side of the island, and two on the left, and these were larger than the central column. It was low water in the Leeambye, but there was a flow of 500 or 600 yards of water, which at the edge of the fall seemed at least 3 feet deep. Farther to the eastward the fissure is said to be very much deeper. Dr. Livingstone could not obtain an observation of the moon to determine the position of the Falls, but that of Kalai, about 10 miles N.W. from the Falls, is 17° 51′ 54″ S. lat., 25° 41′ E. long.

Sekeletu and his large party having conveyed Dr. Livingstone thus far, and furnished him with 114 men to carry the elephants' tusks to the coast, on the 20th of November, 1855, he bade adieu to the Makololo, and proceeded northwards to the river Lekone. Both the Lekone and Unguesi flow back towards the centre of the country; so that it was obvious that they were then ascending the farther they went eastward. The country around was very beautiful, and was once well peopled with the tribes called Batoka, who possessed large herds of cattle. There is abundant evidence that a vast freshwater lake once existed in this part of Africa, extending from about 17° to 21° S. lat., and 22° to 26° E. long. The Barotse valley was another similar lake. These lakes were let out by means of cracks or fissures made in the subtending sides by the upheaval of the country. The fissure made at the Victoria Falls let out the water of this great valley, and left a small patch in what was probably its deepest part, and is now called Lake Ngami. The Falls of Gonye furnished an outlet to the lake of the Barotse valley, and so of the other great lakes of the remote times.

The party travelled in a direction E.N.E., leaving the Zambesi a considerable distance to the south. From the 24th of November to the 18th of December, they crossed several rivers flowing southwards into the Zambesi, and passed on their route numerous villages inhabited by the Batoka. On the 18th of December they reached the bank of the Kafue, a river upwards of 200 yards wide, and full of hippopotami. The Kafue there enters a narrow gorge, 15° 48′ 19″ S. lat., 28° 22′ E. long. They crossed it by a ford 250 yards broad, but rocky and shallow. They then went along the left bank (the northern) and approached nearer the Zambesi. They struck upon the river about eight miles east of the confluence of the Kafue. It appeared to be broader here than above the Victoria Falls. There were vast numbers of water-fowl.

January 14th, 1856. The party reached the confluence of the Loangwa with the Zambesi. They found the remains of a church, with a broken bell, having the letters I.H.S. and a cross, but no date. The church stands in 15° 37′ 22″ S. lat., 30° 32′ E. long. This was at Zumbo, which is situated in the angle of the confluence of the two rivers, and was formerly a commercial station, for which it is admirably suited. From this point the merchants had water communication in three directions beyond, namely from the Loangwa to the N.N.W., by the Kafue to the W., and by the Zambesi to the S. W. Their attention, however, was chiefly attracted to the north, or Londa, and the principal articles of trade were ivory and slaves. It was a Portuguese colony, and, like the rest, military. The Zambesi is very broad here, about 1200 yards, and contains many inhabited islands.

January 15th. They crossed the Loangwa in a canoe, and on the 24th of January passed in canoes from the north bank of the Zambesi to the south. They then proceeded at some considerable distance from the bank of the river.

On the 3rd of March they arrived at the Portuguese settlement at Tetè (16° 9′ 3″ S. lat., 33° 28′ E. long.), and were very kindly received and treated by the commandant. The village of Tetè is built on the south side of the Zambesi, on a long slope down to the river, the fort being close to the water. The rock beneath is grey sandstone. The rocks at the top of the slope are much higher than the fort, and of course command it. The whole of the adjacent country is rocky and broken, but every available spot is under cultivation. The stone houses are cemented with mud instead of lime, and thatched with reeds and grass. There are about 30 European houses; the rest are native, and of wattle and daub. The population is about 4500. Only a small proportion of these live on the spot, the majority being engaged in agricultural operations in the adjacent country. Generally there are not more than 2000 resident; for, compared with what it was, Tetè is now a ruin. The fort of Tetè has been the salvation of the Portuguese power in this quarter. It is a square building. The guns are in a much better state than any seen in Angola. The country around, as indeed all the district lying N. and N.W. of Tetè, is hilly; and the hills being covered with trees, the scenery is very picturesque. The soil of the valleys is very fruitful, and well cultivated. There is coal in the vicinity, which might be easily wrought.

On the 22nd of March they left Tetè, and sailing down the river, arrived at Senna on the 27th (17° 27′ 1″ S. lat., 35° 10′ E. long.). It was found to be 23½ hours sail from Tetè. Dr. Livingstone thought the state of Tetè quite lamentable, but that of Senna was much worse. The fort, built of sun-dried bricks, was in a wretched state. The village of Senna stands on the right bank of the Zambesi.

The Zambesi at Mazaro, where the delta begins, is a magnificent river, more than half a mile wide, and without islands. The delta is an immense flat, covered with high coarse grass and reeds.

Sailing down the branch of the river on which Kilimane stands, they reached that village, it being then May 20, 1856, only a few days less than four years since Dr. Livingstone started from the Cape. Kilimane is in 17° 53′ 8″ S. lat., 36° 40′ E. long. The village stands on a great mud-bank, and is surrounded by extensive swamps and rice-grounds. Dr. Livingstone waited there about six weeks, when her Majesty's brig Frolic arrived off Kilimane, and took him on board. There is a dangerous bar at the mouth of the Kilimane branch.

Dr. Livingstone left Kilimane, July 12, 1856, and arrived at Mauritius, August 12. He returned by the Red Sea and the Overland route, and arrived in England on the 12th December, 1856.

The preceding sketch of Dr. Livingstone's arduous journeys is taken from his interesting volume, 'Missionary Travels and Researches in South Africa, including a Sketch of Sixteen Years' Residence in the Interior of Africa, and a Journey from the Cape of Good Hope to Loanda on the west coast; thence across the continent down the river Zambesi to the Eastern Ocean,' 8vo. 1857.

Dr. Livingstone is at present (Jan. 1858) in London, making preparations to return to the Zambesi, in order to form an establishment in a healthy locality, and to enter into friendly commercial relations with the natives. He will be supported by the British government, and his project has received the sanction of the King of Portugal. A suitable steam-vessel has been prepared for him, and he will be accompanied by three or four scientific gentlemen, who will assist him in his well-intentioned labours.

In 1854, Lieutenant Burton of the army of the East India Company, who had previously distinguished himself by his hazardous journeys to Mecca and Medina, performed a short but still more perilous journey to Harar in the Somanli peninsula, of which he has given an account in his 'First Footsteps in Eastern Africa.' Though at no great distance from the torrid coast-line, its elevation of 5000 feet above the sea gives to this country a comparatively temperate climate. Fortified sufficiently to repel the incursions of the surrounding savage tribes, and under the rule of a young and very arbitrary sovereign, Harar is the rude emporium of a considerable traffic in choice products, more particularly coffee. [HARAR, *S.* 2.] Lieut. Burton has since undertaken a journey from the eastern coast of Africa in the direction of the Lake Nyassi, yet unvisited by Europeans, and may possibly reach the sources of the White Nile, and thus solve a question which has excited the curiosity of the learned world from the time of Herodotus to the present day.

AGADES, or, as the Tuaricks call it, Ekade, is a town of Africa, situated in 16° 33′ N. lat., 7° 30′ E. long., on a Hamadah, or high plain, consisting of sandstone. It is the capital of the kingdom of Aïr or Asben, with which we have recently become acquainted through the travels of Dr. Barth, who visited Agades in 1850. No author is known who has mentioned this place before Leo Africanus, in whose time it was a flourishing town. Agades from its situation, must always have formed an important central place between the Kelowis and the tribes inhabiting the districts to the south and west. There are traditions among the inhabitants of the place that it owes its origin chiefly to some tribes coming from the north, probably belonging to the Berber race. There is, no doubt, a good deal of slave blood among the present inhabitants of Agades, as is the case with the whole population of the south-eastern portion of Aïr; but there must have been a very ancient stock of indigenous black people, who have transmitted a peculiar language of their own, which is the same language as that spoken by the people of Timbuctu.

Agades formerly contained not less than from 50,000 to 60,000 inhabitants. Dr. Barth was assured by the Turvati, one of whom had been at Timbuctu seven times, that it was much larger than that place. At present the appearance of the town is that of an almost ruined place, scarcely the sixth part of it, namely about 700 houses, being inhabited. The number of the inhabitants is estimated to be from 7000 to 8000, who are partly merchants and partly artisans. The merchants seem to visit only the markets of Katsena, Tasawa, Marado, Kano, and Sacotu, and do not go to the northern markets of Ghat or Murzuk, unless on a journey to Mecca. There exists no intercourse with Timbuctu. The commerce of Agades itself is principally in millet, which constitutes the principal food of the inhabitants. The manufactures are very limited, consisting of leather-work and mats. The saddles made in Agades, particularly those used in riding upon the meheris, or swift camels, and also the sandals, are far famed.

Respecting the degree of civilisation of the inhabitants, it may be mentioned that there are five or six schools in Agades, where the boys are taught to read the Koran, and to write. The women seem to enjoy great freedom. Some of them are pretty, and have Arab features; and among the men Dr. Barth observed fine faces and good figures. The population is so mixed that it would be difficult to make out the type of the original stock.

The houses are generally spacious, built of clay, and a few are whitewashed; they are all flat-roofed, the roof being formed by planks of the doom palm covered with mats, over which earth is thrown. Agades has a tower, which is from 90 to 95 feet high. For such a place, situated in the midst of warlike hordes, a tower is of the greatest importance, in order to be aware beforehand when a razzia or a caravan is approaching. There are wells of very good water near the town, and there is also plenty of brushwood.

AGDE. [Herault.]

AGNES, St. [Cornwall.]

AGRICULTURAL IMPLEMENTS. Few of the productive arts have made more signal progress within the last few years than those relating to the cultivation of the soil. In the application of chemical science to practical farming, and in that of mechanical science to implement-making, this advance has been equally observable. When the corn-laws were repealed, and agriculturists were deprived of the support—or, perhaps it would be more correct to say, relieved from the incubus—of protection, a wonderful amount of energy was thrown into those two departments of industry. As a consequence, greater improvements have been developed in twelve years, than in twice or thrice that space of time under the old order of things.

When the jurors prepared their report on the Agricultural Implements displayed at the Great Exhibition in Hyde Park in 1851, they grouped them all under certain headings, according to the kind of service they were intended to render in field and farm operations; such as Instruments of Tillage; Implements used in the Cultivation of Crops; Harvesting Implements; Preparations for Market; Machines for Preparing the Food of Stock; and Draining. Such will also be a convenient mode of grouping to adopt here.

Instruments of Tillage.

Ploughs.—Until about the year 1840, four-horse ploughs were still used in many parts of England; notwithstanding that in the very same parishes ploughs with two horses had been shown to be equally efficient. The cumbrous plough had been adopted for clay soils, when such formed the chief corn-lands throughout the island; but they were not suitable for an altered state of agriculture, when the heavy lands were laid down for grazing, and the downs became corn-lands. Even when the swing-plough was invented as an improvement on the old wheel and gallows plough, the weight of draught was little less than before. It was the Messrs. Ransome of Ipswich who furnished the modern English plough with two low wheels, and with mould-boards adapted to different soils. Messrs. Howard and Mr. Busby afterwards paid particular attention to the curvatures of the mould-board; for this is indeed the essential acting part of a plough; raising, turning-out, and throwing over every furrow-slice of earth in true parallelism with other slices. Foreign agriculturists have often expressed surprise at the length of the mould-boards in modern English ploughs; since it is seen that short boards are better able to pulverise the soil while they turn it over. It has been found, however, by experience, that clay lands require longer mould-boards than those which are drier and lighter; and hence a plough suitable in England might not be so advantageous in Scotland, or on the continent. Among the ploughs exhibited at Hyde Park, eighteen were put to trial at Mr. Pusey's estate in Wiltshire, by Mr. Miles, Mr. Shelley, and Mr. Owthwaite; while eleven others were tried at Mr. Mechi's farm in Essex, by Baron Mertens D'Osten, Colonel Challoner, and Mr. Johnson. Of the former group, nine were two-wheel, three one-wheel, and six swing-ploughs. Some were found best at a seven-inch furrow; some broke the land too much in a furrow of that depth. All the swing-ploughs were clearly ascertained to be inferior to those with two wheels. It was further found that a particular curvature of mould-board suitable for a five-inch furrow worked unsatisfactorily in one of seven inches—showing, as many an old farmer would be astonished to hear, that there are mathematics even in farming. The Royal Agricultural Society had in recent years recommended the use of ploughs for two distinct purposes—the ordinary ploughing, and a deeper ploughing once in four years, when the root-crop recurs, to give the land a more thorough stirring. A common plough is fitted for this extra work; but Mr. Busby and other makers have constructed powerful ploughs, to be worked at leisure in winter with four or six horses.

Mr. Fisher Hobbs, in reporting on the ploughs exhibited at Carlisle Agricultural Show in 1855, said that enough had been indicated at the trials to show that improvements have been introduced in recent years, in nearly all parts of the English plough. Eleven ploughs were tried on a strong loamy soil, with a considerable quantity of herbage upon it. The Cumberland swing-ploughs were found decidedly inferior in power and efficiency to ploughs with iron wheels, made by Ransome, Howard, and other celebrated manufacturers; these latter, averaging about 90*s.* in price, were pronounced to be among the best ever produced. A machine for deep ploughing, by Messrs. Ransome, cut a furrow twelve inches deep, as clean and as well laid as any produced at shallower depths. Some persons have expressed an opinion that the plough has now reached the highest point of perfection; but Mr. Fisher Hobbs remarked with praiseworthy caution, "I still look forward to the time when its construction will be better adapted to the present operations on the soil, and for leaving the land in a fit state for drills or other machines required to complete its cultivation."

Harrows.—The old harrow was always made with square bars and square-set teeth; but as it was difficult to make such a harrow work always in different tracks, even though dragged from the corners, modern makers have constructed harrows which have the teeth set cross-wise, enabling the harrows themselves to be drawn straight. Mr. Coleman's expanding harrow is a very complete implement. The bars at every point of crossing are united by a loose pin, on which they work freely; the width of the harrow can thereby be increased or diminished; the tines, according to the state of the land, can be brought nearer together or spread wider apart; and there are small wheels, easily let down, by which the harrow can readily be moved from one field to another, without disturbing its general mechanism.

Rollers.—"Not many years ago," said the late Mr. Philip Pusey, one of the most enlightened encouragers of scientific agriculture, "the landlord was often asked by his tenant for some old tree to convert into a roller; the tree roller, when manufactured, had its framework loaded with rough materials to give it weight; but it soon wore and cracked, so as to become in a year a most ungainly instrument." Iron rollers of excellent construction have since been introduced. Their regularity of surface has, however one disadvantage, in passing over small clods so smoothly as merely to press and not to grind them. M. Claes, of Belgium, has invented a roller, intended for narrow round ridges, but also fitted to produce the action just adverted to; it consists of four rings or partial rollers, so adjusted on one axis as to have independent and irregular movements. Rollers for pulverising the soil have, however, been nearly superseded by

Clod Crushers.—This apparatus, invented by Crosskill, is used chiefly for breaking down turnip land which has been fed off by sheep in wet weather and afterwards baked by the sun; it is also a good presser for young wheat in March, when the soil has been swollen, and the roots thrown out by alternating frosts and thaws. The jagged iron teeth form the chief characteristic of this implement. Mr. Gibson has since invented one on a different principle, being formed of two rows of very narrow wheels, alternating one with another. Each of these kinds of clod-crushers has some advantages over the other. A third variety, of later introduction, is Patterson's 'Self-Cleaning Clod-Crusher;' it contains a series of eccentrics upon an axle, which, in revolving, rub and clean each other.

Scarifiers, Grubbers, and Cultivators.—The implements denoted by these several names are intended to save a great part of the time spent in ploughing on the old method. In an ordinary four-course system of arable culture, the land receives seven or eight ploughings in the four years; but if a scarifier be employed to pare the surface to a depth of two inches immediately after the wheat harvest, much of the four years' labour will be economised. The scarifier may be likened to many ploughs set abreast, so as to cut up and turn over a slice of soil five, six, or seven feet in width. Not only is the time spent in ploughing lessened, but less subsequent employment of the harrow and the roller is needed. Many forms of these time-saving implements have been invented. Coleman's scarifier, with six horses, is adapted for very hard ground. Biddle's, made by Messrs. Ransome, is suitable for going deeper into looser ground. Kilby's and Bentall's paring ploughs are midway in character between ordinary ploughs and scarifiers, and are useful for a very close surface of land. Cotgreave's plough is a cultivator, in which these processes are combined in rather a curious way; it first ploughs and turns a furrow five inches in depth; then it digs another 5-inch furrow, inverts the soil, and deposits it on the top of the first; and lastly, a sub-pulveriser loosens the soil to a further depth of 3 or 4 inches. Beauclerk's patent plough and subsoiler may be likened to a common plough with an Archimedian screw attached, which revolves in the bottom of the furrow, thus ploughing and subsoiling at the same time. Such farmers as have duly provided themselves with some or other of these various instruments, find that they may lessen their ploughings from seven or eight to two or three in the four years. In 1851 Mr. Pusey said :—"I will venture to add, what may appear theoretical, that if ever steam be employed successfully in cultivation, it will probably be less by ploughs or digging than with an implement like one of these cultivators; because they are able to work so much wider a space as they pass along in their course." Some of these implements have shares, some points, to dig into and turn up the soil. Several attempts have been made to introduce steam-cultivators. One, exhibited by Mr. Usher in 1855, consists of a steam-engine moving itself by the revolution of a large circular roller placed under it; and to it are attached numerous ordinary plough-shares reversed, revolving behind the engine. Another, brought forward about the same time by Mr. Fiskin, consists of two ordinary ploughs fixed to a carriage or framework of iron, and moved by an endless rope communicating with a steam-engine fixed in one corner of the field. Others have since been brought forward; but this department of the art is confessedly in its infancy.

Implements used in the Cultivation of Crops.

Drills.—The drill has almost driven the hand-sower from English farms. One half of the horse-power formerly expended in harrowing is saved by the adoption of some of the modern drills or sowing-machines; a saving of seed is also effected; and there is also an avoidance of the necessity for that previous harrowing into ridges at a particular angle, which was formerly deemed necessary as a preliminary to hand-sowing. The drill is, in fact, the key to a whole system of husbandry; for, in addition to the advantages just enumerated, the drill is applicable to the use of many artificial manures, distributing them beneath the ground by special coulters, and covering them with earth, that their excessive strength may not injure the seed, which is deposited last of all; while the use of the horse-hoe is almost wholly dependent on the previous use of the drill. The drills of recent invention exhibit much variety and ingenuity of construction. Some are for general purposes, capable of drilling with or without manure, wheat, beans, and turnips, at the different intervals suited to those seeds respectively, from seven inches up to two feet. Some are turnip drills, in which manure, generally ground bones, or superphosphate, is distributed as well as seed. Some, for use in unusually dry weather, pour down each manure-coulter the requisite amount of water mixed with powdered manure. Some, to economise manure, drop the seed and the manure only at those spots in the lines or rows where the plants are intended to stand without molestation from the hoe: each machine having a power of adjustment to different widths or distances. All the celebrated makers have contributed to the excellence of the modern drills. Messrs. Garrett have improved the wheeling or moving power of the general-purpose drill, to the ease of the horse and the driver; the turnip drill they have greatly improved; and they have constructed a hand-barrow drill for distributing grass-seed broadcast in a very effective manner. Messrs. Hornsby have constructed a drill for depositing manure-dust and turnip-seed on ridges, and reducing the ridge by concave rollers to a compact rounded form; they have also introduced india-rubber tubes for conducting the seed down to the channel made by the coulter, instead of using a series of tin cups; and they have also done much to enable the drill to deposit seed and manure on hill-sides, and to work equally well on ridges and on the flat. Messrs. Horsman have invented a 'self-adjusting steerage corn-drill,' adapted for being driven with great nicety, and for delivering the seed equally well going up or down hill. One of the drills lately invented is especially contrived for distributing equally well liquid manure or the thickest sewage. In short, the drill is now an implement to which all the makers devote very sedulous attention.

Top-Dressers or Manure-Distributors.—Although wheat is seldom sown with the manure drill, being usually provided with its requisite nitrogen by farm-yard dung or by sheep-folding, yet it generally requires a top-dressing of manure during its growth. This used to be applied by hand; but several machines, of which one is by Mr. Holmes, have been invented to perform this service more efficiently. It distributes three or four bushels per acre of guano or nitrate of soda, or a larger proportion of rape-cake or superphosphate, on wheat in the spring of the year. The machines are much more simple than drills.

Horse-Hoes.—The hoe not only clears away a host of young weeds, but, by loosening the crusted surface, admits the air, and stimulates the growth of the true crop. Formerly this used to be done by hand; the ridged root-crops were hoed by a horse, one row at a time; but the modern horse-hoes of Messrs. Garrett and other makers hoe at one time four rows of turnips, six of beans, or nine of wheat. The modern machine does the work at half the expense of the hand-hoe, and much more completely. A revolving horse-hoe is much used in some of the best Norfolk farms; by its revolving principle the plants and soil attached are thrown up together, but the soil by its greater weight reaches the ground before the plant, which, lying bare with its roots exposed on the surface, soon withers away.

Harvesting Instruments.

Reaping-Machines.—No other implements applied to agriculture have attracted so much attention within the last few years as reaping-machines; partly for the singular ingenuity displayed in their construction, and partly owing to the emulation between European and American inventors. At the opening of the present century it was thought that a successful reaping-machine had been constructed; and a reward was voted by Parliament to its inventor; but it was so intricate as speedily to fall into disuse. Another was invented many years afterwards, which cut off the heads of the corn, but left the straw standing—a fatal defect. When the Great Exhibition of 1851 was held, M'Cormick's American reaping-machine at once riveted attention; Mr. Hussey competed with him by means of another invention; and the different implement-makers, entering into manufacturing arrangements with these and other inventors, speedily introduced various novelties in the mechanism. The essential part of each machine is a horizontal saw or serrated knife, which by a rapid reciprocating motion cuts the straws very near the ground; while there are peculiar adjuncts for laying or depositing the straws with their ears of corn regularly after being cut.

This display of Hussey's and M'Cormick's machines in Hyde Park led to a curious revelation. The world then learned, almost for the first time, that England, or rather Scotland, had long possessed a reaping-machine of somewhat analogous character, although not in use. The facts brought to light were in brief as follows: In 1827 the Rev. Patrick Bell, son of a tenant farmer on Lord Panmure's estate in Scotland, became impressed with the disadvantages under which Scottish farmers lay through the scarcity of labour at a critical period of the year, and he constructed a rude machine intended to do much more in a given time than a sickle would perform. The machine acted on the principle of a number of shears placed side by side. He made the wooden model with his own hands, and then had the iron-work fashioned from it by a village blacksmith. He first tried his invention in cutting some oaten straw stuck up by himself on end in a layer of mould in his father's shed; and then observing certain deficiencies, he invented an attached piece of apparatus to deliver the corn in regular swathes; and another for collecting and pressing the corn against the cutter. The invention soon became known to the neighbourhood; others were made on the same model; and the Highland Society's premium was that year given to Mr. Bell; but, probably from defects in the construction, the machine did not work satisfactorily to the farmers, and they declined to use it. To an offer made by Lord Panmure, to defray the expenses of patenting the invention, Mr. Bell replied that he had no wish to make a profit out of any agricultural invention. For twenty-four years the subject was allowed to stagnate; insomuch that when men were told of the humble Scottish minister's reaping-machine at Inchmichael, they received the news with surprise. Intelligent implement makers, learning that Bell's invention had not been patented, examined it with a view to its capabilities; and it was speedily found that the substitution of a tooth-edged knife for a row of shears would be a vast improvement. Messrs. Crosskill bought the interesting old machine from Mr. Bell's brother; and the Americans found that "Crosskill's Bell" was a formidable competitor to their inventions.

Every year, since the Exhibition year, reaping-machines have been tried at the annual meetings of the Royal Agricultural Society. At the Carlisle meeting, for instance, in 1855, there was one of Bell's original construction improved by Crosskill; one of M'Cormick's improved by Lord Kinnaird; another of the same inventor, improved by Burgess and Key; one of Hussey's, improved by Messrs. Dray; and one of Forbush's, improved by Palmer. The prices ranged from 25*l.* to 42*l.* Trials were made of them near Carlisle, and again on Mr. Miles's estate at Leigh Court—in three fields exhibiting striking contrasts. The machines were worked from morning till night—each in cutting both wheat and barley, in light standing crops and in heavy and lodged crops, in clean stubble and in foul, and under circumstances as varied as an extensive farm could supply. The different instruments varied in capabilities. Crosskill's Bell's reaper excelled in the power of its corn-cutting, and the breadth of its stroke, nearly six feet; but was more cumbrous and heavy of draught than many of the others. Dray's Hussey's machine had the merit of compactness, simplicity of arrangement, and economy of price; but its working efficiency did not place it in the first rank. Burgess and Key's adaptation of M'Cormick's reaper was on that occasion found to be the best of all; it has a peculiar apparatus by which the corn, on being cut, falls on a series of rollers fitted with Archimedian screws, by which it is delivered in a continuous and well-formed swathe at the side of the machine, dispensing with the attendance of any person besides the driver. In the trials made in the years 1856 and 1857, the respective makers introduced several minor improvements into their machines; and scientific agriculturists look forward hopefully to the time when reaping-machines will be generally used in this country; but an opinion is at the same time expressed in many quarters, that "completeness is only to be effected by the combination in a single machine of those principles of construction in which different parties, under the present patent-law, claim individual right." When M'Cormick's machine first attracted notice, it was estimated that 15 acres of average wheat usually cost 6*l.* 15*s.* for reaping by the hand method, and only 2*l.* 8*s.* by the machine; but all such estimates require to be corrected by numerous subsidiary considerations.

Horse-rakes and Haymakers.—The ingenuity of modern makers has been bestowed on many implements and machines for cutting and gathering up the ripened crop. In many of these, the rotation of the wheels puts in motion other apparatus for lifting hay or other produce off the ground; and the price-lists of our chief implement-makers show how keenly any available improvements are sought after and adopted.

Waggons and Carts.—The last harvesting operation by which the produce is brought home to the barn, has received like attention with other departments of farm labour. The waggons and carts seen on modern English farms, for conveying produce, manure, &c. are strikingly different from those in use twenty years ago. A very profitable discovery has been made, that the Scotch and Northumbrian farmers, by using one-horse carts, effect a great saving over those south-country farmers who use three-horse waggons and three-horse dung carts. Hence the makers are applying all their skill to produce good workable one-horse carts for farmers. So much has been accomplished in this way, that in a trial at Grantham, five horses with five new carts were tried against ten horses with five old waggons, and clearly beat them in the amount of work performed. Some makers attend most to the form of the harvest-rail, that the corn may be carried more steadily; some endeavour to make the cart low, for ease of loading and ease of draught; some try to give horizontality to the shafts; some make their wheels by machinery; while others strive for excellence in a 'cart-of-all-work,' which shall be adapted to as many kinds of farm-service as possible. At the Great Exhibitions in London and Paris, foreigners were much struck with the superior neatness and compactness of English farm-carts over those made and used on the Continent.

Preparation for Market.

Moveable Steam-Engines.—Fixed steam engines have long been used for certain farm operations in Northumberland and East Lothian, chiefly for working threshing machines; but the Royal Agricultural Society, some years ago, pointed out reasons for thinking that moveable steam-engines would present superior advantage. One is, that if a farm be very large, it will be greater economy to wheel a locomotive steam-engine to different parts, than to employ horses and men in bringing all the corn in the straw to one point, and in again carrying out the dung to a distance of two or three miles. Another is, that if a farm be of small or moderate size, it will not support the expense of a fixed steam-engine; whereas a portable engine may be available for two or three farms, at a fair ratio of expense for each. A third is, that whereas threshing can only be performed under cover in barns by fixed engines, it is perfectly feasible in the open air by a locomotive engine—a plan, healthier and more expeditious for the labourer, and rendering probable a diminution in the number of farm-buildings requiring to be constructed by the landlord. The Royal Agricultural Society gave the first impetus to the construction of moveable steam-engines for farm purposes; and the annual prizes and exhibitions have been very influential in determining a constant course of improvement. At the Great Exhibition of 1851, there were engines of this kind exhibited, made by Hornsby, Tuxford, Clayton, Barrett, Hensman, Bullin, Roe, Ransome, Garrett, and other makers. Every one felt that the invention was still in its infancy; for the worst specimen exhibited consumed three times more coal than the best. Of thirteen specimens examined, the nominal horse-power varied from 4 to 9; the time of getting up steam, 28 to 83 minutes; the coal used in getting up steam, 25 lb. to 75 lb.; the coal burnt per horse-power per hour, 6·79 lb. to 25·80 lb. Mr. Locke, the eminent engineer, in reporting on these trials, said, "If I might be permitted to suggest a little advice to the makers of these engines, I would beg of them to attend more to the proportions of the various working parts and less to external ornament. There is a want of good proportion in several of the engines; and this to a mechanic or an economical farmer, is of more importance than a profusion of brass."

At the Carlisle Agricultural Meeting in 1855, a manifest improvement was observable in the moveable steam-engines. The maximum consumption of coal per horse-power per hour was 10 lb.; while the minimum (in Messrs. Tuxford's engine) was only 3·7 lb. It was, however, considered by some of the judges that this element of merit had been somewhat too exclusively attended to. "The conditions of competition laid down by the Society for portable engines have unfortunately led to the production of engines only intended for winning the Society's prizes, and known as 'racing engines,' requiring the nicest care; instead of those simple and effective engines which may be safely entrusted to the management of intelligent farm-servants;" and it was recommended in future "to submit the prize engines to subsequent trials, for a lengthened period, under the ordinary management of a farm establishment." At the Salisbury Agricultural Meeting in 1857, there were no fewer than twenty exhibitors of agricultural steam-engines; of which one firm, that of Messrs. Clayton & Shuttleworth, made at the rate of 500 engines per annum. In some of the best farms, at present, a steam-engine, under the charge of an intelligent farm-labourer, may be seen driving the barn machinery, cutting chaff or roots, crushing oats, grinding corn, pulping mangold-wurzel, splitting beans, sawing wood, pumping water, and lending its boiler for steaming potatoes or roots.

Threshing-Machines.—Threshing-machines worked by horses were considered, in their day, a vast improvement over the flail of earlier times; and so they unquestionably were. It occurred to Mr. Amos, the agricultural engineer, however, that a large amount of power was wasted in dragging dead weight; and he found on experimenting in 1849, much to the astonishment of farmers, that in a four-horse machine the strength of three horses was expended in moving the wood and iron work itself, while only one horse-power was available in threshing the corn. The makers immediately began to reform their methods of construction; and they gradually succeeded in bringing down the friction and dead weight to two and a-half, two, one and a-half, and one-horse power out of four. At that point, however, the higher class of farmers began to think more of steam-threshing than horse-threshing. In the one case, as in the other, the threshing arms or levers begin their work as soon as a central axis or shaft is set in motion; but there is much difference in the connecting machinery. Several threshing-machines were tested by the Exhibition Jury in 1851; they differed greatly in excellence; but on an average they required fifteen-horse power to thresh two and a-half cwt. of wheat sheaves per minute, or nine-horse power per minute for barley. It was found, however, that those which worked with least horse-power were not necessarily the best in the quality of work done, as denoted by the three tests of excellence—clean threshing, unbroken grain, and uninjured straw. Maltsters continued up to that year to distrust machine-threshed malting barley, on the ground that the grain was often too much bruised and injured for germinating. The makers had therefore every reason to try and improve these threshers. It was calculated that wheat is usually threshed for about 3*s.* 5*d.* per quarter, all expenses included; whereas steam threshing cost less than 1*s.*; and therefore if quality were good, the economy in quantity would be unquestionable. By the year 1855 the improvement in the machines was most decided. There were several exhibited in that year at Carlisle, of about eight-horse power, which threshed 130 sheaves of wheat in twelve to twenty minutes. The judges, in reporting on the trials, said, "These machines are now become of material importance, inasmuch as they enable the farmer in so short a time to prepare the corn for market. They have, in fact, almost entirely superseded the flail; and without their powerful aid the full supplies of corn could not this autumn have been furnished for consumption. The extraordinary demand for the threshing machine, and its daily use on the farms, are circumstances that prove its estimation by the agricultural community." A fixed steam-engine, working systematic barn-machinery, threshes corn more economically and effectively than portable machines; but the latter are of great importance in so far as they can be let out by their owners to different farmers, so as always to be employed according to the exigencies of the harvest. No kind of agricultural machine has met with more opposition from hand-labourers than threshing-machines; but the prejudice in favour of the old and inefficient way is dying out in this as in other directions. It has been recorded that "A small farmer was hanged at Salisbury in 1830 for firing barns containing machinery; whereas in the same town in 1857 the labourers cheered loudly on witnessing the success of the reaping machine."

Winnowing-Machines.—Instead of trusting the threshed corn to the wind, as in the old process, it is now winnowed by very ingenious and intricate machinery. Messrs. Hornsby were among the first to achieve success in the construction of such machines. Their winnowing apparatus is fitted with a spiked roller, working through a grating, and forming a sort of hopper; it separates the corn from the chaff in the rough pulsy state, as it comes from the threshing machine, without being previously riddled; and it can be adjusted to suit corn either in rough chaff or in any other state. The meshes of the grating are so varied, and placed in such relative positions, that the winnowing-machine will separate the whole produce of the threshing-machine into 'best corn,' 'good tailings,' 'tailings,' 'whites,' 'screenings,' and 'chaff,' at the rate of fifteen quarters an hour, and dressing over the second time at the rate of twenty quarters per hour. Not only has the flail been nearly superseded by the threshing machine, and horse-power by steam-power, but the threshing-machine itself, instead of being a mere box for beating out the corn in a rough way, as it was in 1847, has now been so perfected as to combine the threshing and winnowing machines in one, beating the grain from the ears, and then cleaning and separating it ready for market.

Machines for Preparing the Food of Stock.

Turnip-Cutters.—Formerly farming stock was fed with hay, or turned out to pick over straw, occasionally mixed with turnips; but scientific and practical men aided each other by degrees in discovering that this labour of the jaws wasted the muscle of the animals, and retarded their progress. Hence the invention of many ingenious machines for facilitating the preparation of food for live stock. One of these is the turnip-cutter, for mincing or cutting into small pieces one important variety of this food. Some farmers have asserted that lambs fed with machine-cut turnips are at the end of a winter worth 8*s.* per head more than other lambs which have wasted their muscle in masticating whole turnips; and assuming this to be true, it has been calculated that, allowing for wear and tear and labour in using the machine, the improvement is equivalent to a saving of 70*s.* per acre upon turnip crops. These estimates are frequently disputed in detail; but no one now disputes that the saving is a real one, be its amount what it may. All the varieties of this machine act by sharp-edged instruments, working horizontally or vertically according to the nature of the machine adopted. Some of them cut turnips for cattle-food, some for sheep, according to the size of pieces required.

Chaff-Cutters.—The cutting of straw into very small pieces, to supply the deficiency in natural chaff for cattle-food, was at first done by hand, with a sort of knife hinged at one end; then by a series of knives working round an axis; then by steam-power, by means of a strap connected with the fixed or moveable steam-engine on a farm. The process now costs only one-sixth or one-eighth of the charge formerly incurred. The machine is useful even to cut hay itself as a means of facilitating the masticatory process. In the trial of chaff-cutters at Carlisle, in 1855, one made by Cornes cut 1485 lbs. of chaff per hour, by steam-power; those that worked by the muscular power of one man each cut quantities varying from 90 to 210 lbs. per hour.

Crushers, Grinders, Bruisers, &c.—These machines, of modern introduction, act by the crushing movement of rollers rather than the grinding movement of mills, and are intended to facilitate the comminution of substances for cattle-food. One is a linseed crusher; another a corn crusher; a third an oil-cake bruiser; a fourth a fine-meal mill; a fifth a gorse bruiser. It is evident, from a mere inspection of this list, that there is much scope for ingenuity in the arrangement of working parts for such machines. Some of the fine-meal mills, made principally to crush barley, beans, and oats, admit of adjustment that will "enable them to grind anything from linseed up to flint-stones." Messrs. Hornsby, Garrett, Crosskill, and other manufacturers, now make steam-worked oil-cake breakers that will break 3000 lbs. of cake per hour for sheep, or 4000 lbs. for cattle.

Pulping-Machines.—Farmers are not agreed concerning the amount of advantage derivable from the reduction of root-food to a softened state. In reference to potatoes, it has been found worth while to steam potatoes for pig food; and even diseased potatoes, if not very far decayed, by being thus treated, may be rendered good victuals to be stored up for months. The pulping of turnips enables the root to be incorporated with other nutritious articles of food; but on the other hand, there is a tendency in highly reduced pulp to suffer a separation of the liquid from the solid portion, and then much of the saccharine qualities is lost in the liquid. The turnip pulping machines, which are both hand-worked and steam-worked, are on this account less decidedly successful than most modern agricultural implements.

Draining.

Tile-Machines.—There is much land that does not require more draining than the farmer can easily effect in the course of his yearly operations; but where a landlord systematically drains his poor land to increase the rental obtainable for it, his operations require to be conducted on a considerable scale; and then it becomes an important matter with him how to procure his draining tiles. Can he make them on his own estate, with clay dug close at hand? To answer this question has been a matter to which a large amount of ingenuity has been applied. Until about the year 1840, draining tiles were made by hand, cumbrous arches with flat soles, costing from 30s. to 50s. per thousand; but so active then became the exertions of machine makers, that at the York Agricultural meeting in 1848, there were no fewer than thirty-four different tile-machines sent in for competition. So rapid was the improvement, that tiles enough to drain an acre of land could be made for about sixty or seventy shillings. Most of these machines produce the tiles by forcing soft clay through an aperture shaped like the tile in section, on the same principle that maccaroni is formed; the action is horizontal in some machines, vertical in others. It has been calculated that between the years 1841, when drain-tile machines were first exhibited at the Shrewsbury Agricultural Meeting, and 1857, no less than 2,000,000 acres were drained in the United Kingdom; by this means many hundred thousand acres of land, formerly in waste, or only fit for poor pasture, and many hundred thousand acres of retentive clays which could only bear corn in favourable dry seasons, have been brought into a regular course of arable cultivation.

Draining Ploughs.—A most ingenious machine has been invented—not for making draining tiles, but for laying them down when made. Under ordinary circumstances a trench is dug to the proper depth by means of a narrow spade, sometimes concave, sometimes triangular lance-headed; but in a machine invented by Mr. Fowler, there is a furrow ploughed, and a string of pipes laid in it almost without any visibility on the surface. When this machine was tested by the Exhibition Jury in 1851, it excited general wonder and admiration. "The spectators," said Mr. Pusey, on whose estate the machine was tried, "are surprised to see two horses at work by the side of a field, on a capstan which, by an invisible wire rope, draws towards itself a low framework, leaving but the trace of a narrow slit on the surface. If you pass, however, to the other side of the field, which the framework has quitted, you perceive that it has been dragging after it a string of pipes, which—still following the plough's snout, that burrows all the while four feet below ground—twists itself like a gigantic red worm into the earth; so that in a few minutes, when the framework has reached the capstan, the string is withdrawn from the necklace, and you are assured that a drain has thus been invisibly formed under your feet." The machine is worked by two horses; a capstan, firmly and easily fixed into the ground, affords a firm traction to the plough by means of a wire rope and pulley. The chief defect in the earlier specimens was an inequality in the level of the channel excavated by the plough, because the upper and lower parts being fixed at an unvarying distance apart, any unevenness of the surface was faithfully copied by an undulating drain below. This defect was partially remedied afterwards; but the difficulty of ensuring horizontality in the drain has continued to be an obstacle to the use of this machine. The cost being considerable, none but a large landowner would find profit in buying such a draining plough; but the machine can easily be let out for a month, or other definite period.

The aggregate result of all these various improvements in the construction and application of agricultural implements has been immense. Mr. Pusey, in reporting on this subject, as Chairman of the Exhibition Jury, in 1851, made the following estimate: That by using lighter ploughs, cultivators that lessen the necessity for ploughing, drills that economise both seed and moving-power, horse-hoes instead of hand-hoes, varied manures instead of manures of a few kinds, reaping machines instead of sickles, well-constructed carts instead of clumsy waggons, fixed and portable steam-engines, steam-thrashing and winnowing machines, turnip and chaff cutters, drain-tile machines and draining-ploughs—*there had been effected in twelve years a saving of one-half the former outlay in cultivating a definite amount of crop.* It had been rendered further demonstrable that machinery had given comparative *certainty* to agriculture, by enabling many of the operations, in doubtful or unfavourable weather, to be done with quickness. which could hardly have been done at all by the hand method.

Mr. Evelyn Denison (afterwards Speaker of the House of Commons) prepared a Report on the Agricultural Implements displayed at the Paris Exhibition De l'Industrie, in 1855, in which he endeavoured to estimate the material saving accruing from the use of machinery in agriculture. Mr. Sidney, at the close of 1857, gave a few figures intended to bring down the estimate to that year. In this last-named estimate it was supposed that within six years—that is, since Mr. Pusey prepared the Great Exhibition report—the landowners of the United Kingdom had expended ten millions sterling in draining two million acres of land, on principles and with tools not known until 1845. Then, besides all the saving on the items already enumerated, there is that precious, though not easily-calculated advantage resulting from the economy of *time*, by employing machinery at full force during short intervals of fine weather.

(*Report of the Great Exhibition*, 1851. *Report of the Paris Exposition*, 1855. *Journal of the Royal Agricultural Society of England*, 1845-1857. *Journal of the Society of Arts*, *No.* 264; *paper by Mr. Sidney*.)

AGRICULTURAL STATISTICS can scarcely be said to exist as yet in England. Notwithstanding the acknowledged importance of exact information as to the amount of our agricultural production and consumption, especially to farmers, and the interest that is taken in the subject as shown by the attention to the Mark Lane reports, which are little better than ingenious guesses, no steps have yet been taken to insure a correct estimate of the expected amount of the incoming crops, and the state of live stock. Such estimates as are made are derived from individual instances, than which nothing can be more fallacious. The great differences in cost, cultivation, and even of climate in England, make the application of the doctrine of *averages* almost more indispensable in agriculture than in any other trade. It is by the accumulation of individual parts that we arrive at something like a *law*. A law prevails in agriculture as in everything else, and the more any subject has the appearance of chance, the more necessary it is that the experiences should be registered, in order to arrive at the law expressed by an average. The inconvenience and loss occasioned by the absence of statistical returns has been often felt. After the harvest of 1846, the average price of corn for six weeks, from the middle of August to the end of September, was 48*s.* 2*d.*, the lowest price being 45*s.* 1*d.* In October, the price improved; but in November it again fell to 50*s.* But as soon as the new year had begun, symptoms of scarcity, manifested themselves, and the wheat of that same harvest, notwithstanding the importation of four millions and a half of quarters, reached the price of 102*s.* 5*d.* per quarter. In this case, a knowledge of the produce of the harvest would have saved the farmer from the sacrifice of his property at the beginning; it would have saved the country from a great loss in the price of the foreign corn imported, occasioned by a sudden rush into the market for large supplies; it would have probably saved considerable waste of food during the period when it was improperly cheap; it would have saved inconvenience to the foreigners in whose markets our purchases inevitably increased the price of wheat; and the gains of the merely speculating corn-dealers would have been saved to the community.

The desirableness of some knowledge on so important a subject has led many individuals to form, from the best available sources, general estimates, but the discrepancies show the unreliability of such estimates for any practical purposes. Some endeavoured to arrive at it by taking the acreage of the kingdom, the proportion supposed to be cultivated, and the probable amount of produce per acre. Gregory King, who wrote in 1685, was among the earliest. He estimated England and Wales to contain 39,000,000 acres, of which he supposed half to be uncultivated. Davenant, Grew, Templeman, Sir William Petty, Arthur Young, Dr. Beeke, Mr. M'Culloch, Mr. Porter, and others, formed estimates varying from 31,648,000 acres, to 46,916,000 acres, which was the estimate of Arthur Young, and was adopted by Mr. Pitt in his calculations for the probable amount of the Income Tax. In the census of 1851, the area is stated at 37,324,915 acres, which was very near the estimate of Dr. Beeke, who gave it as 38,498,572. Others, again, have endeavoured to ascertain the consumption by multiplying that of each individual by the number of the population, but here they differ materially, varying from 6 bushels to 8 bushels for each individual, an unsatisfactory difference of one third. We will now enumerate what measures have been taken in providing statistics by the government.

What are called the *corn averages*, are entries or tables originally intended to regulate the duty on corn; but if modified and improved, they might be made an auxiliary to agricultural statistics. For a century previous to the year 1851, such returns were collected from the principal seaports of twelve maritime counties—entirely in relation to the imposition of duty on foreign corn; the collector of the returns was appointed by the magistrates of the town or borough in which the return was made, but his salary was paid by the government. In 1821 a change was made. The averages were ordered to be collected from 120 large market-towns in England and Wales. Every corn-merchant, miller, baker, and maltster, was ordered to make weekly returns to the inspector. The inspector provided a place for the reception of these returns; he posted up in some convenient locality the gross weekly returns, with the average price of each description of grain sold in the preceding seven days. These averages were then forwarded to the Comptroller of Corn Returns, in London, who added up all the gross amounts from all the inspectors, and struck a six weeks' average for the whole kingdom—which average regulated the duties on the admission of foreign corn for home consumption. When the 'sliding-scale' came into operation, there were several instances of the averages being tampered with, in London and some of the outports, by false returns; this was done by fraudulent persons, with a view of lowering the rate of duties by fictitious sales of large quantities of corn; thus swelling the quantity returned, raising the prices, and lowering the duty. In 1842 a motive of economy, whether wise or not, led to the appointment of excisemen, without any increase of salary, in place of inspectors, as the latter might die off, for taking the corn averages; and the returns are believed to have suffered in accuracy from this change. When the corn laws were repealed, further changes were made; the corn averages ceased to be as valuable as before in respect to fiscal regulations; but they remained important in connexion with the commutation of tithes; and it is now considered that they might render useful aid to the agricultural statists. The list of towns whence the returns are made has been largely increased; in all the towns thus added, excisemen have been appointed instead of inspectors.

These returns, it is evident, showed nothing beyond the average prices. In 1832 the attention of the government was directed to the attainment of more satisfactory results. In the previous year, a statistical inquiry had been made by a committee of the magistracy of Norfolk, respecting the acreage and crops of that county. The committee addressed circulars to 680 parishes; but 254 of these declined to answer the questions submitted to them, and the committee had no other resource than to infer from the 426 affirmatives to the 254 negatives. Still, though imperfect, the result was useful as a beginning; and in 1832, when the Statistical Department of the Board of Trade was established, Lord Auckland saw the importance and necessity of obtaining correct agricultural statistics. Nothing was effected, however, until 1836, when the Board of Trade resolved to make a small experiment of its own. Circulars were sent to the clergymen of 126 parishes in Bedfordshire, enclosing schedules of the returns required, and asking for co-operation. This experiment was a most signal failure; for out of 126 parishes applied to, only 27 returned any answer. It was a time when the clergy and the high Tory party distrusted the suspected radicalism of most new Government projects, and it was on that account an unfortunate period in which to make the attempt. Eight years passed over; when, in 1844, Mr. Gladstone, at that time President of the Board of Trade, stated in the House of Commons that the subject was under his consideration. The Board of Trade, the Home Office, and the Poor Law Board, next had a long correspondence in reference to the question, whether the last named of these three might undertake the management of a system of national agricultural statistics; and it appears to have been decided that, as constituted at the time, the Poor Law Board could not adequately fulfil this duty. In 1845 the Board of Trade resolved to make another attempt, or rather three small attempts in the three kingdoms—North Hants in England, Mid-Lothian in Scotland, and Bailieborough Union in Ireland. The Irish inquiry was made by a private individual, and was satisfactory; the Scotch inquiry was managed by the schoolmasters of the respective parishes, and was equally successful; but the English inquiry was an utter and disheartening failure. The Board of Trade, in this last-mentioned case, addressed communications to the Board of Guardians of the different Unions; while the Poor Law Commissioners backed the application, by requesting the Board to employ their own paid officers to induce the occupiers of land to fill up the schedules that were sent to them. The result was almost *nil;* scarcely any returns were obtained; and a strong impression was left that nothing less than compulsory powers would be available for obtaining the desired statistics.

The next attempt was made in 1847, when Mr. Milner Gibson, Vice-President of the Board of Trade, brought into Parliament a 'Bill to make Provision for the Collection of Agricultural Statistics in England and Wales.' By the provisions of that Bill, the duty of obtaining the statistical information was to devolve upon the Registrar-General of Births, Deaths, and Marriages; the superintendent registrars throughout the kingdom were to be charged with the appointment of 'agricultural enumerators' in their respective districts; the enumerators were to prepare lists of all the occupiers of land exceeding three acres, to send specified blank forms to those occupiers, and to collect those blank forms after an interval of fourteen days filled up with the several entries of particulars. This being done, the enumerators were to classify the returns, and construct general tables from them. These tables were to be transmitted to the superintendent registrars, by them to the Registrar-General, and by him to the Board of Trade. These returns and tables were to apply to the month of June in each year. The bill was read a first time; but as the public had not yet learned to feel much interest in the subject, and as various party questions were then on the *tapis*, the bill shared the fate of many others, and fell to the ground.

In 1854, an attempt was made to obtain complete statistical details through the machinery of the Poor Law Board. The selection was unfortunate, for the impression was instantly received that the returns would lead to additional assessment, and no explanation availed to remove that belief. In addition it was generally feared that such returns would be used against the farmers by their landlords in order to raise their rents, they, in very few cases, holding their farms upon lease. The West Riding of Yorkshire was the only division from which a complete return was procured. In all the other counties the returns were so incomplete as to be useless. Many Unions refused altogether, alleging that their officers had sufficient other duties to perform, and in some Unions up to a proportion of one half, where the guardians had consented, many parishes made no returns. In 1855, a Committee of the House of Lords was appointed on the subject, before which a number of witnesses were examined, and among them most of the Poor Law Inspectors. Notwithstanding their ill-success, and the many admissions they were compelled to make of the continued opposition that would be offered to the investigation of a farmer's affairs by Poor Law officials, the most of them represented that all that was required was a compulsory act; and accordingly the Lords' Committee embodied a series of resolutions in their report, recommending the government to introduce a bill into parliament for two returns a year, in July and November, to be carried out by the same machinery. The government however have not yet adopted the recommendation.

Under these disadvantages we will endeavour to give a few of such statistics relating to agriculture as rest upon sure bases. It is quite certain that a rapidly increasing population must have been fed, and that the means of feeding them can only arise from land not previously cultivated, from importation, or from improved cultivation. The following figures will give some notion of what has been effected in each division; unfortunately however, though the inclosures and population only apply to England and Wales, there is no separating the application of the imported wheat from that consumed in Scotland. The amount is no doubt very small, for wheaten bread was not generally used in that part of the kingdom in the early periods recorded; and from the vast improvement in cultivation during the latter portions of them, there is probably more than sufficient corn produced in Scotland to supply the population.

	Acres inclosed.	Qrs. imp.	Increase of Pop.
1800 to 1810	1,657,980	6,009,458	2,173,589
1810 to 1820	1,400,930	4,585,780	945,588
1820 to 1830	340,380	5,349,927	1,110,793
1830 to 1840	236,070	9,076,379	2,032,525
1840 to 1850	369,127	23,298,353	2,048,573

The increase of population is taken from between each of the decennial censuses commencing with 1801. The inclosures of course must necessarily decrease, and the best lands will have probably been among the earliest enclosed. Since 1846 the inclosures of commons have been conducted by commissioners, and are passed in acts in groups, in which the acreage is only occasionally stated. The amount on the whole since 1850 does not average more than a few thousand annually, while the population has increased in about the same proportion as in the previous decennaries. The result is that somewhat above four million of acres have been acquired for the support of upwards of eight millions and a-half of additional mouths. In 1851 there was imported 3,833,636 qrs. of foreign wheat, and 5,363,478 cwt. of wheat flour; in 1852, 3,068,892 qrs. of wheat and 3,889,583 cwt. of flour; in 1853, 4,949,314 qrs. of wheat, and 4,646,400 cwt. of flour; in 1854, 3,431,227 qrs. of wheat, and 3,646,505 cwt. of flour; in 1855, 2,667,702 qrs. of wheat, and 1,904,224 cwt. of flour; and in 1856, 4,072,833 qrs. of wheat, and 3,970,100 cwt. of flour. During the whole of this period the price of wheat has on the whole decreased. During the long war with France, from 1800 to 1815 inclusive, the average price per quarter was 84*s.* 9*d.*; from 1816 to 1820, it was 78*s.* 4*d.*; from 1821 to 1830, it was 58*s.* 3*d.*; from 1831 to 1840, it was 57*s.*; from 1841 to 1850, it was 56*s.*; in 1851, it was 38*s.* 6*d.*; in 1852, 40*s.* 5*d.*; in 1853, 52*s.* 11*d.*; in 1854, 73*s.*; in 1855, 74*s.* 9*d.*; in 1856, 69*s.*; and in 1857, the highest point reached was 63*s.* in July, and the lowest in December 45*s.* 3*d.*

All the statistical returns obtained by Government have a fiscal basis. The only real agricultural statistics we possess are those for hops, of which we know every cultivated acre and every pound of produce; and barley, of every bushel of as much as is made into malt. These we owe to the duty; but when, as in the case of live stock, the duty is discontinued, no account is taken by it even of importations, though the Board of Trade in their monthly returns give the number imported as obtained from other sources. The following is the return so given for the month ending November, 30th, 1857, and for the eleven months of 1857, ending the same date.

		Month.	11 months.
Oxen and bulls, and cows	number	9892	61,045
Calves	,,	2738	23,846
Sheep and lambs	,,	25,270	159,426
Swine and hogs	,,	1459	10,194
Bark	cwts.	28,686	342,579
Wheat	qrs.	456,804	2,988,933
Barley	,,	100,597	1,593,947
Oats	,,	197,296	1,657,053
Peas	,,	14,831	153,302
Beans	,,	36,368	260,881
Indian corn or maize	,,	152,770	1,014,353
Wheatmeal or flour	cwts.	267,160	1,702,358
Indian corn meal	,,	58	1082
Hemp	,,	108,779	702,783
Guano	tons.	43,289	179,455
Oilseed cakes	,,	10,283	85,380
Potatoes	cwts.	215,386	633,597
Hops	,,	1857	10,960
Bacon and hams	,,	5331	362,642
Beef, salt	,,	5561	120,887
Pork, salt	,,	4433	63,360
Eggs	number.	6,645,000	119,508,200
Butter	cwts.	31,189	413,389
Cheese	,,	33,882	346,268
Lard	,,	54	171.082
Clover seed	,,	8823	148,602
Flax seed and linseed	qrs.	164,734	823,358
Rape seed	,,	21,363	177,820
Timber, of various sorts, from British possessions and Foreign	loads.	282,184	2,180,341
Wool, from British possessions and Foreign	lbs.	11,680,071	110,995,577

These returns apply, however, to the whole of the United Kingdom.

The remainder of the estimates for England rest only upon probabilities. Thus in the Journal of the Royal Society of Agriculture for 1856, the number of sheep in England and Wales is estimated at 27 milliens, worth upon an average 30s. per head. About 10 millions are annually slaughtered for food, producing 800 millions of pounds of mutton, which at 6d. per lb. amounts to £20,000,000; and calculating the weight of each fleece at 4½ lbs. 157,500,000 lbs. of wool is obtained, worth at 1s. 3d. per lb. nearly £10,000,000. The number of cattle has been estimated at 5,620,000, and that of swine at about 5,000,000. The number of horses is given by Mr. M'Culloch in 1847, and they have probably not greatly increased since, as 1,500,000, the value of which he estimates at from £18,000,000 to £22,500,000. Such statements bear upon their faces evident marks of uncertainty, while the trouble any individual must have taken to procure materials even for a guess, shows the call there has been for this species of information.

In Scotland, where leases are, and have long been, almost universal, and where a less objectionable machinery was employed, statistical returns were much more easily obtained. Tenants there had indeed been long accustomed to the term, which some have asserted had no little influence in affrighting the farmers of England. In 1800, Sir John Sinclair had, with the assistance of the parochial ministers and others, produced a 'Statistical Account of Scotland,' giving in detail the state of every parish. This had been re-produced between 1834 and 1845, in so complete though bulky a form, and the agricultural improvements had been so great, as to justify the committee of ministers who had carried it through, in saying "They now present not merely a new statistical account, but in a great measure the statistical account of a new country." In 1847 the members of the Highland and Agricultural Society of Scotland, by whom agricultural improvement has been greatly promoted, felt the need of statistics, and by means of their secretary, Mr. Maxwell Hall, set about obtaining them. They memorialised Sir George Grey on the subject, and were desired to communicate a scheme, which was done, but without result. In 1852 they again memorialised the Home Department, offering their assistance if any project were legalised, but again without anything being effected. In 1853 the Government allowed the sum of £5000 to make the experiment, and Mr. Maxwell Hall determined to endeavour to obtain the returns though without any legal support. Complete returns were obtained for three counties, Haddington, Roxburgh, and Sutherland. In 1854 he travelled through a great part of Scotland requesting the assistance of farmers; he succeeded in removing their objections, and convincing them of the advantages; and by means of local branches of the parent institution succeeded in procuring complete returns for the kingdom. These have been continued annually, and though there have been a few omissions, are the most complete in their details of any yet known. Though the absence of similar returns of England deprives them of much of their value, they are still, conjoined with those of Ireland, of great importance. We give an abstract of the returns for 1856 and 1857. We may premise that the returns are from holders paying a yearly rent of 10*l.* and upwards (exclusive of tenants of woods, villas, feuars, householders and the like) in all the counties of Scotland except Argyle, Inverness, Ross and Cromarty, Sutherland, and that part of Bute which lies in Arran, in both years, and in Caithness, Sutherland, and Orkney, in 1856, where the returns are only from holders paying a rent of 20*l.* and upwards. Woods, sheep-walks, houses, roads, and waste, are omitted in the calculation.

In 1856 the number of occupants was 42,919; in 1857 there were 43,432. The number of acres under rotation of crop was 3,545,191 in 1856; of which, of wheat there were 263,328, of barley 165,738, of oats 918,644, of rye 4020, of bere 15,368, of beans 40,470, of peas 4817, of vetches 18,231, of turnips 460,131, of potatoes 149,351, of mangold 3531, of carrots 1532, of cabbages 1485, of rape 1407, of flax 2723, of turnip seed 1759, other crops 795, bare fallow 14,464, and grass and hay in rotation 1,475,775, which leaves 1602 of the stated total unaccounted for. The produce was 7,270,952 bushels of wheat, 5,581,970 of barley, 31,966,381 of oats, 6,540,267 tons of turnips, and 413,800 tons of potatoes. In 1857 the number of acres under crop was 3,556,572, of which there were of wheat 223,152, of barley 198,387, of oats 938,613, of rye 5989, of bere 21,607, of beans 39,186, of peas 3687, of vetches 18,418, of turnips 476,691, of potatoes 139,819, of mangold 2803, of carrots 1401, of cabbages 1704, of rape 2032, of flax 1534, of turnip seed 2576, of other crops 577, of bare fallow 18,582, and of grass and hay in rotation 1,459,805, an excess of 989 acres over the stated total. The produce was 6,154,986 bushels of wheat, 6,494,534 of barley, 32,750,763 of oats, 6,690,109 tons of turnips, and 430,468 tons of potatoes. In 1856 the total number of horses was 179,853, of milch cows 209,960, of other cattle 473,384, of calves 197,709, of sheep and lambs 5,816,560, of swine 128,924. In 1857 the numbers were, of horses 185,409, of milch cows 303,912, of calves 195,198, of sheep and lambs 5,683,168, and of swine 140,354. In this account the horses, cows, and swine kept in towns are not included: and it is estimated that above 300,000 head of stock, and upwards of 200,000 acres of tillage are held by occupants not in these returns. Fife and Haddington show the greatest proportional acreage in wheat and in white crops generally, and Aberdeen and Argyle the greatest in turnips; those counties also possessing the greatest number of live stock.

In Ireland, where the interest felt might have been supposed to be less, statistical returns have been obtained in an excellent form, and with no opposition. The task of gathering the returns was confided to the constabulary in 1852, and they have been continued annually since. We append the return of 1857:—In that year the returns show that there were 5,860,089 acres under crop, being an increase of 106,542 acres over the quantity in 1856. Of these 562,581 acres were in wheat, 1,978,878 in oats, 246,257 in barley, beans, peas, &c., showing a small increase of cereal crops generally, but a decrease on oats of 58,559 acres. On green crops there was a general increase of 45,637 acres, potatoes occupying 1,146,920 acres, an increase of 42,216 acres, and flax had decreased from 106,311 acres in 1856 to 98,074 acres in 1857; and turnips had decreased 4,487 acres. Meadow and clover had increased from 1,302.787 acres to 1,369,421 acres.

The produce of the 5,753,681 acres in cultivation in 1856, had been 2,738,163 barrels of wheat of 20 stone each; 14,778,045 barrels of oats of 14 stone each; 1,367,453 barrels of barley of 16 stone each; 50,709 barrels of beer of 16 stone; 72,165 barrels of rye of 20 stone; 431,561 bushels of beans and peas; 35,268,345 barrels of potatoes of 20 stone each; 4,581,172 tons of turnips; 287,838 tons of mangel wurzel; 332,650 tons of cabbages; 3,006,553 stones (14 lbs.) of flax; and 2,492,732 tons of hay. The total number of holders of land was 592,489; of whom 36,474 held not more than one acre; 82,035 not more than five acres; 179,931 not more than fifteen acres; 138,424 not more than thirty; 71,156 not more than fifty; 53,279 not more than one hundred; 21,292 not more than two hundred; 8243 not more than five hundred; and only 1655 held upwards of five hundred acres.

Live stock, except sheep, had increased remarkably. The number of horses was 600,693, an increase of 27,285; the number of cattle 3,618,544, an increase of 30,686; the number of sheep 3,448,676, a decrease of 245,618. Pigs numbered 1,252,152, an increase of 333,627.

Road contractors in Ulster are required to keep the roadsides and fences free from weeds, and surveyors in the other provinces are recommended to obtain authority from grand juries, &c., to enforce in them similar regulations.

Most foreign countries have found the necessity of having statistical returns of their agricultural produce. Austria, Prussia, France, Denmark, Hungary, Belgium, and the United States of America, have all such returns more or less perfect, among which those of Belgium take a high rank, and are nearly equal to those of Scotland. Such statistics for the whole of a kingdom are highly valuable for the regulation of the inhabitants of that kingdom; but if we possessed them for the whole of the civilised world, what are called the chances of agriculture would probably be reduced to a certainty, and the price of food would remain with little or no variation.

AGRODROMA. [Alaudinæ, *S.* 2.]

AGROSTEMMA (from ἀγρός, a field, and στέμμα, a crown), a genus of plants belonging to the Silenious division of the order *Caryophyllaceæ*. It has several species, the best known of which is the Corn-Cockle, which is now referred to the genus *Lychnis*, or *Githago*.

AHUN. [Creuse.]

AIGUESMORTES. [Gard.]

AIGUILLON. [Lot-et-Garonne.]

AIKIN, ARTHUR, the eldest son of John Aikin, M.D., was born in 1784. Arthur Aikin began his literary career, we believe, as editor of 'The Annual Review;' upon the title-page of the first six volumes of which—1803-1808—his name appears as editor. His earliest scientific work was 'The Manual of Mineralogy,' of which the first edition was published in 1814. Besides these he was the author of a 'Tour in North Wales,' a 'Dictionary of Chemistry and Mineralogy,' and a 'Dictionary of Arts and Manufactures;' and also of numerous papers in various scientific journals. For a long series of years Mr. Aikin was the resident secretary of the Society of Arts, and a frequent contributor to its 'Transactions.' He was also one of the oldest fellows of the Linnæan and Geological societies. Mr. Aikin was a man of quiet retiring habits, and outlived his scientific reputation; but was well known in scientific circles as one of the most regular frequenters of the meetings of the learned societies in the metropolis, and was generally esteemed. He died at his house in Bloomsbury, London, April 15, 1854, in his 81st year.

AIRA, a genus of Grasses belonging to the tribe *Sesleriеæ*, and distinguished by possessing a lax panicle, two-flowered glumes, the outer pale terete on the back, and a dorsal awn. There are several species, but that which is best known is *A. cæspitosa*, the Tufted Hair-Grass. It has long and flat leaves, with a fibrous perennial root. It flowers in the beginning of August, and reaches a height of four feet. It grows naturally on marshy damp soils, in the form of large tufts. It is a wiry harsh grass, and is rejected by domestic animals. It may, however, be advantageously sown as a cover for game, and also by the side of ponds and marshes for snipe and wild fowl. (Lawson, *Acrostographia*.)

AIRE, RIVER. [Yorkshire.]

AITONIA (after Mr. W. Aiton, for many years head-gardener at Kew) a genus of plants belonging to the order *Meliaceæ*. The *A. Capensis* is a native of the Cape of Good Hope, and is cultivated in our greenhouses.

AKHALZIKH, a town in Russian Armenia, situated near the watershed between the Black Sea and the Caspian, on a feeder of the Kur, which flows towards the south-east from the Perengah Dagh, in 41° 40′ N. lat., 43° 10′ E. long. Population about 15,000, who are chiefly Armenians. It was formerly the chief town of a pashalic in Turkish Georgia; since the cession of which province to Russia, it is the capital of the province of Akhalzikh. [Georgia.] The town is fortified, and of considerable extent. The most remarkable building after the citadel is the mosque of Ahmed, which is built on the model of that of Santa Sophia at Constantinople. Connected with the mosque is a college, and a library rich in Oriental literature; but it is said that the best works it contained have been carried away to the royal library of St. Petersburg. The Armenians have several large churches, and there is also a synagogue. The chief trade is in silk and honey; there is also some transit trade, as the town lies on the road between the port of Batoum and Tiflis, being 80 miles E. from the former and 105 miles W. from the latter.

ALAGOAS, a province of Brazil, which, up to about 1840, was a district, or comarca, of the province of Pernambuco; but, on account of its increasing population and wealth, was formed into a separate province, which is under the administration of its own governor. It is situated between 9° and 10° S. lat., 36° and 38° 30′ W. long. It borders on the south of the province of Seregipe del Rey, from which it is separated by the Rio de San Francisco, along the northern banks of which it extends to the great cataract, called Cachoeira de Paulo Affonso. On the west and north it is surrounded by the province of Pernambuco, from which it is separated for a considerable space by the Rio Unua. The Atlantic washes its eastern side. In length, from east to west, it extends about 150 miles; its average width probably does not exceed 60 miles. The area is about 9000 square miles.

Two-thirds of this surface are covered with mountains. They form the southern declivity of the elevated and hilly table-land, which occupies nearly the whole of the country, and projects into the Atlantic between 3° and 9° S. lat. These mountains come close up to the river San Francisco as far east as the mouth of the Rio Sacare, and terminate in Alagoas, at a distance of about 20 miles, or little more, from the sea. This region is almost entirely covered with wood, and contains many high timber-trees, which afford a considerable article of exportation. The valleys and more gentle slopes of the mountains exhibit a considerable degree of fertility. Along the eastern base of the mountains extends an undulating or rather hilly tract, which occupies about half the country between the declivity and the sea. It is likewise wooded, and has a light soil, very fit for the culture of cotton, which is rapidly extending. The country along the sea-shore, and at a distance of about 10 miles or somewhat less from it, is low, level, and covered with a thick alluvium, which has been brought down by the numerous small rivers that rise on the eastern declivity of the mountain-region, and deposited along the edge of the undulating tract. This soil is of the best quality, and fit for the cultivation of every kind of intertropical productions. A considerable portion, however, of this tract is still covered with swamps, and the tide, which rises along the coast from 4 to 5 feet, enters the mouths of the rivers, and has changed the adjacent low countries into lagunes. The most considerable of these lagunes is the Lake of Manguaba, from which the river Alagoas runs to the sea in a southern direction. It is stated to be 30 miles long, and about 3 miles wide at an average, and consists of two lagunes united by a strait. The northern is called Lagoa do Norte, and the southern Lagoa do Sul. Its water is salt. Only canoes can navigate the river Alagoas, which carries its water to the sea. The rich plantations situated around the Lagoa do Sul carry their produce to the northern lake and the town of Alagoas, whence it is transported to the harbours of Taragua and Pajassara. Farther south is the Lagoa do Siquiba, which is 15 miles long from north to south, with an average width of 3 miles. A river of the same name runs southwards to the sea.

Though all the rivers which disembogue along this coast are small, and have bars at their mouths, with so little water on them that sea vessels of even the smallest size cannot enter them, the province has a few harbours sufficiently deep for vessels of moderate magnitude. The most northern are the harbours of Pajassara and Taragua, which are close together and separated by a low tongue of land. The port of Taragua is the better of the two. Merchandise disembarked at this port is transported by land three miles to the Lagoa do Norte, and there embarked on canoes for Alagoas and other towns. Cururippe, which is farther south, is a harbour of moderate size, formed by a reef extending to a distance of 300 yards from the shore, which breaks the fury of the sea. The harbour may be entered by two breaks in the reef, but the anchorage is not generally good. The river which falls here into the sea bears the same name, and is navigable for canoes for several miles, but has very little water on the bar at its mouth.

The only river which here deserves to be noticed is the

San Francisco, which enters Alagoas at its western extremity at the great cataract of Paulo Affonso, where it is said to descend 50 feet in perpendicular height. It then runs for nearly 50 miles to the Aldea do Caninde, forming several rapids and smaller cataracts, between rocky banks several hundred feet high, and extremely rugged. Many rocks occur in the bed of the river, and it is not navigable. At Caninde the width of the river increases to half a mile and more, and the navigation to its mouth is not interrupted. Its banks are of moderate height as far down as Penedo. Below Penedo the river enters the alluvial tract, in which it divides into several branches, forming a great number of islands, generally low and abounding with woods. They have a fertile though partly a sandy soil, where rice, maize, mandioc, sugar, and vegetables are raised in abundance. In the rainy season they are overflowed. The branches of the river unite again, and it disembogues by two mouths of different size. The northern is the larger, being nearly 2 miles wide, but has so little depth that smacks can enter it only at high-water, and must there wait for the full tide to go out. They can sail as far up as Peuedo, 25 miles from the mouth. Farther up the navigation is solely by ajojos, that is, two or more canoes moored together with cross-pieces of timber above. In ascending the river sails are always used, as the wind from eight o'clock till the following morning's dawn blows always from the east. The ajojos always descend the river with the current, which is rather rapid.

The climate is warm and humid. The heat in the rainy season is frequently oppressive, except along the coast, where it is moderated by sea-breezes. It is less hot in the dry season, and also more healthy. The wet season occurs from November to March, and then the rains are very abundant, but showers are not rare in the dry season also.

Tobacco was once the staple article of this province, and was especially sent to the western coast of Africa; but since the abolition of the slave-trade this branch of agriculture has continually been decreasing, and has been replaced by sugar and cotton, which at present constitute the staple articles, the first being raised in the alluvial and the second in the undulating tracts. As food are raised—mandioc, maize, rice, plantains, beans, and some roots, as yams, sweet potatoes, &c. The most common fruit-trees are oranges, pine-apples, jack-trees, cocoa-nuts, and palms. The mamona-tree is carefully cultivated in some districts on account of its oil, which affords an article of exportation. Alagoas has extensive forests of timber-trees, even in its lower districts, and affords the best timber in Brazil. It is exported to Bahia and Recife; and many small vessels are built in the province. Some of these timber-trees are very durable, especially those named Sucupira, Pao Roxo, Vinhatico, and Tatahy, but their wood affects the iron, and the bolts become loose in a few years, which is ascribed to the great quantity of tannin contained in the wood. The forests abound also in several kinds of wild fruit-trees, and there are also the trees which produce dragon's blood, mastic, ipecacuanha, copaiba, and caoutchouc. Other woods are used as dyes, among which Brazil-wood is the most prized. An inferior species of quinine, or Jesuit's Bark, is not rare.

The European domestic animals are far from being numerous, except asses and mules. The ounce exists at present only in the mountain-districts. The most numerous animals are deer and monkeys of different kinds, and also ant-eaters, armadilloes, and others. The tapir and peccary are rather rare. Alligators abound in the lakes and rivers; land-tortoises are numerous. The number and variety of birds are very great, especially of parrots. Honey and wax are obtained from wild bees. Several kinds of fish abound in the lakes and lagunes, and on the sea-coast, and they constitute one of the principal articles of food for the lower classes and the Indians. The river San Francisco is noted for the abundance of its fish. Several kinds of snakes are poisonous.

It does not appear that any kind of metal is found; none at least is worked.

The population was stated more than 20 years ago to amount to nearly 100,000; and it is supposed that at present it hardly falls short of 200,000, as cultivation has greatly increased in late years. But this number is very unequally distributed over the surface. More than 120,000 probably inhabit the low and hilly tracts, which may comprehend 3000 square miles, so that in these regions there are about 40 persons to a square mile. No part of Brazil, with the exception of the Reconcave of Bahia, is so populous as this portion of Alagoas. The number of negro slaves may amount to nearly one-fourth of the population. The greater portion of the mountain-region is still the haunt of some native tribes, who mainly depend on the produce of the chase for their subsistence. Several families of Acconans, Carapotes, and Cayriris, have been converted to Christianity, and live in the parish of Collegio, on the banks of the San Francisco, where a tract 3 miles wide and 6 miles long has been given to them for purposes of agriculture, but they cultivate only a little maize. Their women make earthenware.

Agriculture is the principal occupation of the inhabitants. Only a few persons are employed in the exercise of the most necessary arts of civilised life. Common cotton-cloth is made in the families, but most of the manufactured goods are imported. Boat-building is the most important branch of industry.

The province returns two senators and five representatives to the imperial parliament of Brazil.

In this province is one city, ALAGOAS, and seven towns, namely, *Porto de Pedras*, *Porto Calvo*, *Matsayo*, *Anadia*, *Atalaya*, *Poxim*, and *Penedo*. Besides these places, there is San Miguel, which is built about 18 miles from the sea, and is a populous place in a very fertile district. The village of Caninde, on the Rio de San Francisco, is the place where the navigation of the river terminates. Goods destined for the consumption of the country adjacent to the upper course of the river are here disembarked, and transported on the backs of mules to Vergem Redonda, which is about 20 miles distant, and built where the cataracts begin. There they are again embarked, and carried in boats to the places of consumption.

A railway has been projected from Pernambuco to the cataract of Paulo Affonso, which will pass through the best part of this province, and connect the country along the San Francisco with the important city and port of Pernambuco.

(Henderson's *History of Brazil;* Spix and Martius's *Roise in Brasilien.*)

ALAGOAS, the capital of the province of Alagoas, in Brazil, is situated in 9° 40′ S. lat. 35° 50′ W. long. It is built on the western margin of the Lake of Manguaba, by means of which and a road about 3 miles long, it sends the produce of the rich country surrounding the lake to the harbour of Taragua. This produce consists chiefly of sugar and tobacco. The town has a population of 12,000, and contains several convents and a grammar-school. The country about it abounds in fruits, especially orange-trees and jack-trees.

(Henderson's *History of Brazil.*)

ALANINE. [CHEMISTRY, *S.* 1.]

ALAUDA. [ALAUDINÆ, *S.* 2.]

ALAUDINÆ, a sub-family of birds belonging to the order *Passerinæ*, and the family *Conirostres*, is thus characterised by Mr. Swainson:—

Bill more lengthened than in any of the *Fringillidæ;* the tip entire or obsoletely notched. Tertial quills considerably lengthened, pointed, and generally as long as the quills. Claws very slightly curved; the claw of the outer toe always shorter than that of the inner toe; the hinder claw considerably lengthened, and either nearly straight or very slightly curved.

Alauda (Linn.)

Bill cylindrical; nostrils concealed. Wings very long; no spurious quill; the first, second, and third quills longest, and nearly equal; the rest considerably graduated; tips of the lesser quills emarginate. Tail forked. Head crested. (Sw.)

The Larks are characterised by their having the hind-claw, which is like the fore-claws, somewhat straight, and longer than in the pipits and the wag-tails. The bill is straight, and rather short and strong, the upper mandible being arched without any notch, and not longer than the under. The nostrils, situated at the base of the bill, are oblong, and protected by small plumes and bristles directed forwards. The feathers on the back part of the head can be raised up at the will of the bird into the form of a crest.

Various species of larks are found in all parts of the globe, and are everywhere distinguished by their vigilance and their singing. They are peculiarly birds of the fields, meadows, and other open places. The conformation of their feet, except in a few instances, such as the wood-lark, does not adapt them to perch upon trees. They accordingly always build on the ground, making in general a rather slight though neat nest, and laying about five eggs, usually of a grayish white, with specks of a brown colour. They frequently rear two broods of young during the summer.

They are almost all birds of passage; for even in Britain, where some remain during the winter, the greater number flock together and migrate, either southward or to the sea-coast. During these migrations immense numbers are caught in nets for the table, particularly on the continent, where small birds are more sought after for this purpose than in Britain.

Localities.—Europe and America.

Mr. Swainson considers this as the Fissirostral type.

Example:—*Alauda arvensis.* This is the *Alouette, Alouette Ordinaire*, and *Alouette des Champs* of the French; *Lodola, Lodola Canterina, Lodola di Passo*, and *Lodola di Montagna* of the Italians; *Feld Lerche* of the Germans; *Hedydd* and *Uchedydd* of the Ancient British; and *Skylark* (in Scotch *Laverock*) of the modern British.

The Skylark is too well known, from its inexpressibly beautiful song, chanted forth far up in the air when at liberty and in its natural state, to require any description.

Food.—Insects and their larvæ, with many sorts of seeds and grain.

Nest.—On the ground. Eggs four or five, greenish white, spotted with brown.

Localities.—All the parts of Europe; also in Asia and the northern parts of Africa, but not in the south of that vast continent (Temm.); the whole of Europe within the temperate zone, many parts of Asia, and the north of Africa. (Selby.)

Calendula. (Linn.)

Bill thick, much compressed; the culmen curved and convex; the commissure arched; the tip of the upper mandible wide above and inflexed. Wings long or moderate; the first quill very small and spurious; the second nearly equal to the third and fourth; lesser quills short, emarginate. Tail slightly forked. Lateral toes equal. Africa. The Dentirostral type—*C. magnirostris*, 'Ois. d'Afr.,' pl. 193. (Sw.)

Sub-genera:—*Myrafra*, Horsf.—Bill as in *Calendula.* Wings short, rounded; greater quills hardly longer than the secondaries and tertials; the first quills spurious, half the length of the second, which is shorter than the third; the third, fourth, fifth, and sixth equal, and longest. Tail short, even. Legs long.—*M. Javanica*, 'Linn. Tr.,' xiii. 159. (Sw.)

Braconyx, Sw. (*Brachonyx*).—Bill as in *Calendula*. Hinder claw very short. Wings and tarsi much lengthened. Africa. (Sw.)

Agrodroma. (Sw.)

Bill slender, considerably compressed; both mandibles of equal length; the tip of the upper one not reflected over the lower, and with a small notch, almost obsolete. Wings long; the first four quills nearly equal; the rest rapidly diminishing, and emarginate at their tips; tertials lengthened, pointed, as long as the quills. Tail moderate, even. Legs pale, long, slender. Tarsus longer than the middle toe. Lateral toes equal, but the outer claw shorter than the inner. Colour brown, lark-like. Distribution universal. The Insessorial or pre-eminent type—*Agrodroma rufescens*, 'Enl.,' 661, f.1. (Sw.)

Macronyx. (Sw.)

Bill slender, compressed, thrush-like, entire; nostrils large, naked, the aperture lateral. Wings short; the primaries not longer than the tertials, the first four of equal length; secondaries long, emarginate. Tail moderate, even. Feet enormous. Tarsus and hinder toes very long, and of equal length. Lateral toes unequal, the inner shortest. Africa. The Rasorial type—*M. flavicollis*, 'Ois. d'Afr.,' pl. 195; *M. flavigaster*, Sw., 'Birds of West Africa,' ('Naturalists' Library,' *Ornithology*, vol. vii., p. 215.)

Certhilauda. (Sw.)

Bill slender, lengthened, more or less curved; nostrils round, naked. Wings very long; the first quill spurious; the three next nearly equal. Tail moderate, even. Feet lengthened; the lateral toes equal; length of the hinder claw variable, although typically short and straight. Africa. The Tenuirostral type—*Certhilauda longirostra*, 'Ois. d'Afr.,' 192; *C. bifasciata*, Rüpp., 'Atlas,' plate 5; *C. nivosa*, Sw., 'Birds of West Africa' (vol. vii., p. 215.)

Such are Mr. Swainson's views as to the arrangement of this sub-genus. [FRINGILLIDÆ.] The genus *Anthus*, Bechst., is placed by Mr. Swainson at the end of his sub-family *Motacillinæ* (Wagtails), under his family *Sylviadæ* (Warblers).

Fossil Larks.

Dr. Buckland figures a lark (*Alauda*) among the land Mammifers and Birds of the third period of the Tertiary Series, in the first plate of the illustrations of his 'Bridgewater Treatise.' He had previously noticed the remains of the lark in Kirkdale Cave. ('Reliquiæ Diluvianæ,' pp. 15, 34, plate xi., ff. 24, 25.)

ALBRECHT, WILHELM, was born in Germany, in 1786. He was one of the most distinguished pupils of Thaer, in the agricultural school at Möghin, in Prussia; and he afterwards taught rural economy in Fellenberg's school at Hofwyl. In 1819 he was employed by the government of Nassau to edit a weekly publication devoted to agricultural subjects; and in the following year he was made director of an experimental agricultural school, established at Idstein. The experimental farm was transferred to Geisberg, near Wiesbaden, and it became at once distinguished as the source of agricultural improvements for the west of Germany. As it was found impossible constantly to employ all the pupils on the farm, Albrecht determined to open the school, during the six winter-months, for instruction in the theory of agriculture; while in April of each year the students went to the homes of their parents, or to some farming establishment, in order to familiarise themselves with the practical labours of an agriculturist. During the life of Albrecht the school was highly successful. "The best students for our institute," said he, "are young men from about eighteen to twenty-two, who, after distinguishing themselves at the primary schools, have followed agriculture for some years at home, or on some well-managed farm; they bring a well-disposed mind, not fatigued with study, nor distracted by too many pursuits." While managing these establishments, Albrecht, besides his weekly paper, edited the 'Annals of the Agricultural Society of Nassau;' to which society he was perpetual secretary. Albrecht died in 1848, at his house in Franconia, whither he had retired on resigning the direction of the establishment at Geisberg, a short time previously. (*Nouvelle Biographie Universelle*, 1852.)

ALBUCA (from *albus*, white), a genus of plants belonging to the natural order *Liliaceæ*. The species are mostly found at the Cape of Good Hope. They are cultivated in this country, and require the treatment of greenhouse bulbs.

ALBURNUM, ANIMAL AND VEGETABLE. [CHEMISTRY, *S.* 1.]

ALDEHYDAMMONIA. [CHEMISTRY, *S.* 2.]

ALDEHYDE. [CHEMISTRY, *S.* 1.]

ALDEHYDIC ACID. [CHEMISTRY, *S.* 1.]

ALHAGI (from the Arabic *Aghul* or *Algul*), a genus of plants belonging to the natural order *Leguminosæ*. The species are under-shrubs or herbs with simple leaves and minute stipules. The flowers are red, and disposed in racemes along the peduncles.

A. Maurorum is a native of the deserts of Egypt, Syria, Mesopotamia, and other countries of the East. This plant yields a species of manna, which is called Trungibin or Terengabin. It is chiefly gathered in the neighbourhood of Tabriz where the plant grows abundantly. The manna is a natural exudation from the leaves and branches of the plant, and is most abundant during hot weather. In Arabia it is supposed that the manna falls from heaven on the plant. It first appears in the form of a small drop as of honey, which goes on increasing in size till it is about as large as a coriander seed. The manna yielded by this plant does not appear to be imported into this country. It is principally made use of at the present day in Persia, and is known by the name of Persian Manna. It is employed as food for cattle. Two other species, *A. Camelorum* and *Nipaulensis*, are described by botanists, and cultivated in the greenhouses of this country. They also yield manna.

ALIASKA, a peninsula projecting from the N.W. coast of North America into the Pacific Ocean, and separating, together with the Aleutian Islands, the Kamtchatka Sea from the Pacific. The large lake of Iliamna or Shelikoff, and the isthmus which separates that lake from Cook's Inlet, may be considered as forming its natural N.E. boundary. A river, called Kortchak, or Bristol River, issues from the lake, and falls into Bristol Bay, or the Bay of Kanisko, which washes the N.W. side of the peninsula. From the lake of Iliamna the peninsula extends in a general direction from E.N.E. to W.S.W. between 59° and 54° 40′ N. lat., and between 153° and 163° 40′ W. long. It is more than 450 miles long. and opposite the mouth of the river Nahnek (157° W. long.) 110 miles wide, but its breadth decreases in proceeding farther west, where in some places it is hardly 20 miles wide. It terminates at the strait of Issanakh, which separates it from the island of Oonimak.

The two coast-lines differ greatly in aspect. The south-eastern shores rise with a steep ascent, are indented with numerous inlets and bays, and lined with numerous isles, islets, rocks, and reefs, partly under and partly above water, and in some places extending to a distance of ten, and nowhere less than five miles from the coast. Between these islands and the coast the sea is commonly very deep. The north-western coast, on the contrary, is everywhere low with a sandy beach, and has only a few open bays, but it is free from the islets and shoals, and offers in many places an anchorage of moderate depth. A chain of mountains extends through the peninsula from the strait of Issanakh to the isthmus of Iliamna along the south-eastern shores, but east of 155° W. long. its highest part is at a greater distance from the coast than to the west of that meridian. It contains several very elevated peaks towards its western extremity, and four at least are always covered with snow, but farther east it becomes considerably lower.

It is remarkable that in the western and more elevated portion of the chain, which consists mostly of volcanic rocks, and where some still active volcanoes exist, there occur four breaks in the range. These depressions intersect the mountains to such a depth, that their surface is not many feet above the sea-level; the soil in them consists of loose sand, and it appears likely that these depressions were once straits, and the most south-western part of the peninsula a series of islands separated from each other by narrow sounds, like the eastern islands of the Aleutian chain, but the straits have been filled up by sand in the process of time.

The low country along the Bay of Kanaïsko consists mostly of sand, covered in many places with swamps, and in others with mosses. Several plants grow on it, and bushes of dwarf willow and alder, but no trees. Along the southern coast, especially east of 158°, also occur some level plains at the innermost recesses of the bays; they do not much differ in plants from the district just noticed, except that their vegetation is much more vigorous, and the bushes attain a greater height. The best harbour on the north-western shore is in the Bay of Moller (56° N. lat., and 160° 40′ W. long.), between which and the Bay of Pavlovskaja the peninsula is narrowed to about 4 miles. On the south-eastern coast several harbours are met with. The most considerable from west to east are Morjevskaïa, Belkowskaïa, Pawlowskaïa, the Bay of Wrangell (156° W. long.), the best of them all, and the Bay of Katmaï.

The Russians, who have a few settlements almost entirely inhabited by natives on both coasts, have introduced agriculture, and though no kind of grain succeeds, the inhabitants of the few dispersed villages raise considerable quantities of potatoes and turnips, and keep fowls. They derive their principal subsistence from fishing, the sea abounding in cod, soles, turbots, and several kinds of mollusca. Whales are frequent along the northern coast, but rather rare on the southern. Morses in immense numbers visit the northern coast, and their teeth constitute the principal article of commerce, since the sea-otters, which formerly were very plentiful, have been nearly destroyed by the avidity of the inhabitants. Rein-deer, bears, and red foxes, are the only large animals which are found in great numbers, but towards the east are also wolves and a kind of mountain-sheep, perhaps also the musk-ox. Seals and sea-lions visit the deeper inlets, and afford to the inhabitants some additional articles of commerce.

The number of settlements made on this peninsula does not exceed ten. Those west of 155° W. long. are dependent on the establishment of Oonalashka, and those east of it on that of Kodiak. The largest of those settlements is the village of Katmaïskoi, on the Bay of Katmaï, which has 90 inhabitants.

(Lutke's *Voyage autour du Monde*; Krusenstern's *Voyage round the World*; Kotzebue's *Voyage of Discovery to the South Sea.*)

ALLAMANDA, a genus of plants belonging to the natural order *Apocynaceæ*. It was named after Frederick Allamand, a surgeon who travelled in Guiana, in 1769, and afterwards in Russia. He was a correspondent of Linnæus.

The species of this genus are shrubs yielding a milky juice, with verticillate leaves, and many-flowered peduncles of large yellow flowers. They are worthy of cultivation on account of the beauty of their flowers and foliage. They are all natives of South America, and when cultivated require a strong moist heat to make them flower freely.

An infusion of the leaves of *A. cathartica* is said to act as a powerful purgative, and an overdose to produce poisonous effects.

ALLAN, SIR WILLIAM, was born in Edinburgh in 1782. After receiving his early education at the High School, he was placed with a coach-painter; but displaying a strong attachment to art, he was entered as a pupil in the Trustees' Academy, where Wilkie was his fellow-student. When his term expired he proceeded to London, and became a student of the Royal Academy. In 1805 his first picture of a 'Gipsy Boy and Ass' appeared at the exhibition of that institution. Not succeeding in at once attracting public attention, Allan resolved to try his fortune abroad, and selected St. Petersburgh for the scene of his experiment; incited partly, it is said, by the expectation of finding novel and picturesque objects for the exercise of his pencil. He remained in Russia nearly ten years, making occasional journeys to distant parts of the country, to Turkey, Tartary, the shores of the Black Sea, &c., and everywhere industriously employing himself in gathering materials for his art.

On his return to Scotland in 1814, he made a public exhibition of his sketches and finished pictures of Russian, Tartarian, and Circassian scenes and costume. Among the pictures was a large one of 'Circassian Captives,' which at the suggestion of Sir Walter Scott was purchased by one hundred gentlemen, who subscribed ten guineas each; it fell to the lot of the Earl of Wemyss, in whose possession it now is. From this time Allan settled in his native city, sending regularly some of his works to the exhibition of the Royal Academy. For a while his pencil was chiefly employed on pictures suggested by the countries in which he had travelled; he then turned to the annals of his native land, and for several years was mostly engaged in illustrating the history or the romance of Scotland. To this period belong the 'Murder of Archbishop Sharpe,' 'Parting of Prince Charles Stuart and Flora Macdonald,' 'Knox admonishing Mary Queen of Scots,' 'Murder of the Regent Murray,' and others of his best works. In consequence of a disease in the eyes he was compelled for a year or two to cease from painting, and being advised to try a change of climate, he visited Italy, Asia Minor, and Greece. On resuming his pencil, his 'Slave Market at Constantinople,' and pictures of a like kind, showed that he had profited by his travels.

Meanwhile he had been gaining the distinctions awarded to success in his profession. In 1825 he was elected associate of the Royal Academy. In 1835 he became R.A. In 1838 he was chosen, on the death of Mr. Watson, to be president of the Scottish Academy. On the death of Wilkie in 1840 Allan was appointed to succeed him as her Majesty's Limner for Scotland; and in 1842 he received the honour of knighthood. Sir William Allan was best known by his Russian and Circassian *genre* pieces, and by his Scottish historical works. In all of them there is much skill and refinement, but in none any very evident marks of a high order of genius. But he was also a very successful painter of a special class of portraits, such, for instance, as his 'Scott in his Study Writing,' and its companion, 'Scott in his Study Reading;' and in his later years he essayed with success the more laborious task of depicting scenes of actual warfare. Of these the most important were two pictures of the 'Battle of Waterloo,' which met with the marked approval of the Duke of Wellington, and one of which his grace purchased; the 'Battle of Preston Pans;' 'Nelson Boarding the San Nicolas;' and the 'Battle of Bannockburn,' a large painting, on which he was engaged at the time of his death. One of his last considerable works, 'Peter the Great teaching his Subjects the Art of Ship-building,' was a commission from the Emperor of Russia.

Sir William Allan died on the 23rd of February, 1850. As a painter he was generally acknowledged by his countrymen to be at the head of Scottish art, by right of his talent as well as of his office.

ALLANTOINE. [CHEMISTRY, S. 2.]

ALLEN, JOSEPH W., a landscape painter of considerable reputation, was born at Lambeth, Surrey, in 1803. His father was a schoolmaster, and the son was designed to follow the same profession. Having completed his education at St. Paul's school, he for a time practised as an usher in Taunton, but he soon threw aside the pen and the ferula, and returned to London in the hope of maintaining himself by his pencil. While acquiring the technicalities of his art he was often reduced to great straits. At first he was constrained to paint signs and transparencies for blind-makers; and when he was more advanced he had for a long period to manufacture paintings for picture-dealers. Under the necessity of producing many showy pictures at low prices, he soon acquired considerable mechanical dexterity, and he was led not unnaturally to turn his attention to scene-painting for theatres—then a very popular branch of art. After working for a while as assistant to Stanfield and others, he obtained the situation of principal scene-painter at the Olympic Theatre, when that establishment first came under the management of Madame Vestris; and his clear style and vigorous pencil did much to secure the success of the brilliant spectacles which formed the distinguishing feature of the management. Allen's early oil-paintings were generally of small size, and represent quiet, homely, pastoral scenery, which was rendered with great delicacy, and a nice appreciation of the freshness of natural colour. But though they found purchasers among well-known patrons of art, his reputation extended slowly, and he attributed his tardy progress to the placing of his pictures at the annual exhibition of the Royal Academy. He joined himself therefore to the newly-founded Society of British Artists, and became one of its most ardent supporters. All his most important works were thenceforward exhibited in the first instance on its walls; and he eventually became its secretary.

Allen did not attain the position his early pictures promised. His inclination and his *forte* lay towards pastoral scenery. He loved and he could well depict those fresh, open, country scenes, so characteristic of our 'home counties,' which Milton describes as affording constant delight to the city dweller. For these Allen had all a Londoner's relish, and while he painted them with continual reference to the reality, his pictures commanded the sympathy of all who enjoy this style of art. But when he had obtained skill in producing those "brilliant effects," which are so attractive in conjunction with gas light and theatrical 'properties,' he began to employ them in his pictures, and though he succeeded by such means in sparing himself much thought and labour, while he rendered his pictures more attractive in the exhibition-room, it was at the expense of those higher qualities of truth and propriety which are essential to lasting fame. And the evil was fostered and strengthened by another influence under which he fell, when he appeared to be about to escape from that of the theatre. From the first establishment of the Art-Union his landscapes won the favour of the prize-holders. Seldom possessing any knowledge of art, their taste is commonly caught by glare and glitter; and Allen permitted himself to be driven by the pressure of his circumstances to paint more and more with a special regard to them. His earlier pictures have many admirable qualities, and his latest display great technical and manipulative skill; but his life was not one of artistic progress, and his is not a name that can permanently take a high place among the artists of England.

Allen died August 26, 1852, of disease of the heart, at the early age of 49; leaving a widow and eight children, for whom unhappily he had not been able to secure a sufficient provision.

ALLONBY. [CUMBERLAND.]

ALLOTOIN, ALLANTOIC ACID. [CHEMISTRY, *S.* 1.]

ALLOXAN, ALLOXANIC ACID, ALLOXANTIN. [CHEMISTRY, *S.* 1.]

ALLYLE. [CHEMISTRY, *S.* 2.]

ALMADINE. [GARNET.]

ALPINIA, a genus of plants belonging to the natural order *Zingiberaceæ*. The species have thick tuberous horizontal roots. The stems are numerous and perennial, with lanceolate leaves, having a slit ligulate sheath. The flowers are in panicles, or loose racemes or spikes. The tube of the corolla is short, the inner limb 1-lipped. The filament of the stamens linear. The fruit is capsular and 3-celled, with winged seeds.

A. Galanga is a native of Sumatra, and is cultivated in the Indian Archipelago. Its roots are pungent, acrid, and aromatic, and are often substituted for ginger. They are sold by druggists under the name of *Galanga major*. A plant related to, if not identical with, the *A. exaltata* of Linnæus, is called *Corowatti* in British Guyana, and is described by Dr. Hancock as a bitter pungent plant, and when taken acting as a diaphoretic and diuretic, and in large doses as emetic. [GALANGA.]

ALTKIRCH. [CHER.]

ALUMINA. [CHEMISTRY, *S.* 1.]

ALUMINIUM. [CHEMISTRY, *S.* 2.]

AMADIYAH, a town and district in Kurdistan. The town is situated upon a lofty isolated rock in 36° 47′ N. lat. 43° 21′ E. long. in a plain which is screened on the north and south by mountain-ranges and drained by the Ghara River, which flows eastward into the Great Zab. The southern range called Ghara is high, well-wooded, and in parts precipitous and very difficult of access. It separates the Amadiyah district from the country of the Missouri Kurds. The northern range, which is also well wooded but does not seem to be so high as the southern one, separates the plain of Amadiyah from the extensive valley of Berwari.

The plain of Amadiyah is cut up into innumerable ravines by the torrents which rush down the mountains into the Ghara River, by which they are carried to the Zab. It is well wooded with the gall-bearing oak and with fruit and forest trees. It contains many villages, which were formerly inhabited by Chaldean or Nestorian Christians and were very flourishing, but many of them have been deserted by the inhabitants in order to escape the violence of the Kurds and the tyranny of their Turkish governors; most of those who remain have joined the Roman Catholic Church. Around the town and the villages are well-cultivated gardens and orchards. Tobacco, rice, grain, water-melons, fruit, and gall-nuts are among the products, but Kurdish robberies and Turkish oppression afford little encouragement to cultivate the land.

The town is described by Dr. Layard as a heap of ruins; porches, bazaars, baths, and habitations were laid open to their inmost recesses; every part seemed crumbling to ruin, filthy, and nearly deserted; for the population at the time of his visit, in August, had retired to their summer habitations in the mountain valleys. The fort or castle, which is surrounded by walls flanked with towers, is considered of great importance as a key to Kurdistan and is defended by a small garrison. Amadiyah was formerly a place of considerable importance and strength, and contained a very large and flourishing population. It was governed by hereditary pashas, who traced their descent from the Abbasside Caliphs, and were on this account always regarded with religious respect by the Kurds. The ladies of their family enjoyed the title of Khan. Ismail Pasha, the last of these hereditary chiefs defended himself long against the Turks in his inaccessible castle, but at last a mine was sprung under a part of the walls, which the Kurds thought safe from attack, and the place was taken by assault. Amadiyah (which is said to mean 'Town of the Medes') is frequently mentioned by early Arab geographers and historians, and its foundation most probably dates from a very early epoch. Some have asserted that it was called Ecbatana. To a defaced bas-relief on the rock near the northern gate, Dr. Layard assigns the date of the Arsacian kings. Amadiyah is proverbially unhealthy. Fever and agues are very prevalent in summer, at which season the population remove to the neighbouring mountains, in the valleys of which they live in tents and ozailis, or sheds made with boughs. The population has greatly diminished since the place became subject to the Turks.

(Dr. Layard's ***Nineveh and its Remains;*** Colonel Chesney's ***Expedition to the Euphrates and Tigris.***)

AMALFI. The story of the discovery of a copy of the Pandects at the siege of this place, A.D. 1137, is now considered entirely without foundation. (Savigny's 'Geschichte des Römischen Rechts im Mittelalter,' Heidelberg, 1815-31, 6 vols. 8vo.)

AMAND, ST. [CHER.]

AMBLESIDE. [WESTMORELAND.]

AMELANCHIER (the Savoy name of the Medlar), a genus of plants belonging to the sub-order *Pomeæ* (*Pomaceæ*, Lindley), of the order *Rosaceæ*. It has a 5-cleft calyx with lanceolate petals, and an ovary of 10 cells, with a solitary ovule in each. The mature fruit is 3-5-celled, with one seed in each cell. The species are small trees, with simple serrated deciduous leaves, and racemes of white flowers.

A. vulgaris, the common species, is a native of rugged places throughout Europe. It is the ***Aronia rotundifolia*** of Persoon.

A. Botryapium, the Grape-pear or Canadian Medlar, is a very common plant in Canada; it is also a native of Newfoundland, Virginia, and the higher parts of Columbia. It is a shrub 6 or 8 feet in height, with a purple fruit.

A. ovalis is also a shrub 6 or 8 feet high, and is a native of North America, throughout Canada from Lake Huron to the Saskatchewan and Mackenzie rivers, and as far as the Rocky Mountains. Sir John Richardson says that it abounds on the sandy plains of the Saskatchewan. Its wood is prized for making arrows and pipe-stems, and is thence termed by the Canadian voyageurs 'Bois de Flèche.' Its berries, about the size of a pea, are the finest fruit in the country, and are used by the Crees both in a fresh and dried state. They make a pleasant addition to pemmican, and excellent puddings very little inferior to plum-pudding.

Another North American species is known by the name of *A. sanguinea*. Its fruit is of a blood-red colour.

AMENDMENT. The powers of Amendment possessed by the Superior Courts of Law have been greatly extended by the Common Law Procedure Acts of 1852 and 1854; both of which expressly require that all amendments shall be made which are necessary for the determination in the ensuing suit of the question in controversy between the parties.

AMERICA. In the article AMERICA, in the 'Penny Cyclopædia,' the narrative of discoveries terminates with the voyage of Captain Ross (afterwards Sir John Ross), in search of a North-West Passage. He left England in 1829, and did not return till 1833. He was forced to pass four successive winters in the dreary regions of Boothia Felix, and emerged with his crew from the icy seas when the hope of return had almost been universally abandoned at home. In this expedition, which was entirely a private one, and had been fitted out through the munificence of Sir Felix Booth, a London distiller, some additions were made to our stock of geographical knowledge by the exploration of Prince Regent's Inlet, the Gulf of Boothia, and the country to the west of these seas, which was found to be continuous from Barrow's Strait to the American continent; thus proving the impossibility of a passage to the westward in that direction. The position of the magnetic north pole was likewise one of the discoveries made. Commander Back (now Sir George Back) was sent out in 1833 on a land journey in search of the preceding expedition; and he traced the Back River, named after him. Having returned in 1835, he was again appointed the commander of an expedition in 1836, which was destined to proceed to Wager River and Repulse Bay. This was a most disastrous voyage, the expedition having to pass the winter in the ships tossed about in the ice. No geographical results were gained. During the years 1836 to 1839, Dease and Simpson, two officers of the Hudson's Bay Company, surveyed a considerable line of the northern shores of the American continent, leaving only the southern part of Boothia Gulf, of the entire coast line, unexplored. This latter portion was surveyed by Dr. Rae in 1848. In 1845 one further attempt was undertaken to solve the 300 years' problem of the North-West Passage, when the expedition under Sir John Franklin was despatched to Lancaster Sound. The expeditions which have been sent out in search of Sir John Franklin and his associates, and the discoveries which have been made in the Arctic Regions, are described in the articles NORTH-WEST PASSAGE, *S.* 2, and POLAR COUNTRIES AND SEAS, *S.* 2.

The progress of discovery and settlement in the territories of the United States has proceeded without interruption, and new States and Territories have been established since the article AMERICA was written, which are described under their respective names in the two Supplements. Among the discoveries which have enabled the government of the United States to extend its territories from the eastern to the western side of the continent the most important are those made by Lieutenant Fremont in his exploring expeditions of 1842, 1843, and 1845. The tides of emigration have since swept from the east to the west through the passes of the Rocky Mountains, large acquisitions of territory have been obtained from Mexico, and the important State of California, and town of San Francisco with its capacious harbour, established on the shores of the Pacific Ocean. The discovery of gold in California has led to many important explorations, the Salt Lake City has been founded by the Mormons, and the territory of Utah added to the United States, on the western side of the Rocky Mountains. On the eastern side railroads have been formed in various directions to the extent of more than 20,000 miles; and several important expeditions have been despatched, by order of Congress, to discover the best route for a railway from the Mississippi to the Pacific between the parallels of 32° and 49°. These expeditions, organised by the Secretary of War under various leaders, have contributed very largely to American geography, observations having been made from the Mississippi to the Pacific, between the parallels of 49° and 47°, 41° and 43°, and near those of 38°, 35°, and 32°, touching upon the Pacific Ocean at Puget Sound, San Francisco, San Pedro, and San Diego. On the results of these labours the Secretary of War has reported, that "the route of the 32nd parallel is, of those surveyed, the most practicable and economical route for a railroad from the Mississippi River to the Pacific Ocean."

In British North America, an extensive region, including at least 112,000 square miles, remains almost completely unexplored. This region extends from the head-waters of the Assimboine River to the foot of the Rocky Mountains, and from the northern branch of the Sascatchewan to the parallel of 49°, which forms the boundary between the British possessions and the United States. The exploration of this portion of British America has been undertaken by Mr. Palliser, a traveller who has spent a considerable time in the neighbouring districts of the Upper Missouri. For the purposes of this expedition the Lords of the Treasury, on the recommendation of the Secretary for the Colonies, have obtained a grant from Parliament of 5000*l.*, and Lieutenant Blakiston of the Royal Artillery, Mr. Bourgeau a botanist, and Dr. Hector a medical gentleman, have been associated with Mr. Palliser. The chief objects of exploration are stated to be, 1, the exploration of the water-parting between the basins of the Missouri and Saskatchewan, and the course of the south branch of the Saskatchewan and its tributaries; 2, the exploration of the Rocky Mountains, for the purpose of ascertaining the most southerly pass across to the Pacific, within the British territory; and 3, to report on the natural features and general capabilities of the country, and to construct a map of the routes. The expedition sailed on the 9th of May, 1857, and having arrived safely at New York, proceeded to Fort William on Lake Superior, and thence to Lake Winnipeg as the starting point of exploration.

The great project of communication by a ship-canal between the Atlantic and Pacific has led to the investigation of routes across the narrow Isthmus of Panama by different exploring parties, but no route has yet been discovered which will admit of a ship-canal being formed without locks or tunnels.

In South America, not long after the important journeys of Spix and Martius, three European travellers crossed the whole breadth of this continent, from the Pacific to the Atlantic, descending the Amazonas, which was first explored by the intrepid Orellana three centuries ago; namely, Lieut. Mawe, R.N., in 1828; Dr. Pöppig, in 1831; and Lieut. Smith, R.N., in 1834. Of these travellers Pöppig added most to our geographical knowledge. He went first to Chili, where he spent two years chiefly in exploring the Andes; he then sailed to Lima, whence he ascended the high table-land of Pasco, and descended thence by the eastern declivity of the Andes to the valley of the Huanuc or Huallaga, where he remained nearly two years, during which he collected a great deal of information respecting the climate, productions, and geography of that country. From the Huallaga he passed down the river Marañon, and thence returned to Europe, after five years (1827 to 1832) of wandering in the wilds of the New World, laden with 17,000 specimens of dried plants, some hundred stuffed animals, many plants before unknown, 3000 descriptions of plants, and many sketches. His work is a most valuable addition to our knowledge of South America.

Nearly simultaneously, namely from 1826 to 1833, another extensive journey was accomplished by Alcide d'Orbigny, who travelled through the Banda Oriental, Patagonia, La Plata, Chili, Peru, and Bolivia, and published a very full account with many illustrations.

More important still are the results of the great Surveying Expeditions of the Adventure and Beagle, 1825 to 1836, commanded by captains King, Stokes, and Fitzroy. The coast-surveys of this expedition were very extensive: in addition to which it brought home a greater mass of accurate geographical information than any expedition since the voyages of Cook and Flinders. Very valuable collections in all departments of natural history were made by Charles Darwin, the naturalist of the expedition.

During the years 1835 to 1844 Sir Robert Schomburgk explored British Guyana and the country to the west as far as the Orinoco and Cassiquiari. In reaching the Upper Orinoco he was enabled to connect his observations with those of Humboldt; and thus was completed a connected series of fixed points, astronomically determined, along a line extending from the Atlantic to the Pacific. One of the most interesting of his discoveries is that of the water-lily named *Victoria Regia*, the most beautiful specimen of the flora of the western hemisphere, which has so successfully been brought to Europe, and has been an object of admiration during several years.

In the same region, and extending over the whole of Venezuela, Colonel Codazzi, by order of the government of that country, has made a complete survey, which is embodied in a valuable work and atlas, executed at Paris.

Prince Adalbert of Prussia has explored the Xingu and some other rivers and regions in the lower basin of the Amazonas, not before visited by any European.

In the more southern portion of the continent some interesting observations were made by Mr. Pentland in the elevated regions of the Titicaca Lake in 1827 and 1838. According to these observations the heights of the Sorata and Illimani, situated to the east of the lake, were long given out to be greater than that of Chimborazo, and the highest peaks of South America, but it has since been found by the trigonometrical surveys of M. Pissis, a French engineer, that the alleged elevation of Illimani was about 3000 feet too high; and Mr. Pentland himself, on recalculating his observations, admitted this error, and found that the elevation of Sorata had even been assumed by him 4000 feet too high.

W. Bollaert and G. Smith, who since 1826 had been residing for a considerable time in the province of Tarapaca, Peru, have made us acquainted with a very remarkable region of South America, a full account of which was published in 1851 by Mr. Bollaert. In it the silver mines of the region along the coast, the Desert of Atacama with its deposits of nitrate of soda, salt, and other saline substances, and the Andes, have been well described. Mount Lirima, the highest peak of that portion of the Andes, is estimated at 24,000 to 25,000 feet, which, if correct, would place it above all other American mountains.

The provinces of La Plata have been well described by Sir Woodbine Parish, in a work published in 1839, of which a second edition, much enlarged, appeared early in 1852; and the French traveller Castelnau, accompanied by the English naturalist Weddell, has since explored the little-known regions between the upper course of the Plata and the Peru-Bolivian table-land.

Respecting the surveys of the American coast, Sir Francis Beaufort, in a return to the House of Commons, thus stated their progress in 1848:—"From the equator to Cape Horn, and from thence round to the river Plata, on the eastern side of America, all that is immediately wanted has been already achieved by the splendid survey of Captain Fitzroy.

"Some parts of the great empire of Brazil we owe to the labours of Baron de Roussin and of other French officers; but there is much yet to be done on that coast between the Plata and the Amazon rivers, and again along Guyana and Venezuela up to the mouth of the Orinoco.

"The shores of the mainland between Trinidad Island and the Gulf of Mexico have been charted and published by the Admiralty; but many of the West India Islands are still wanting to complete a wholesome knowledge of those seas.

"The United States are carrying on an elaborate survey of their own coasts, and to the northward of them; a part of the Bay of Fundy has been done by ourselves, as well as all the shores of Nova Scotia, Canada, and Newfoundland; and when these surveys are finished, we shall only want to complete the eastern coast of America, those of Labrador, and of Hudson's Bay, which, being in our possession, ought to appear on our charts with some degree of truth."

Since 1848, Captain Kellett, in H.M.S. Herald, has continued the survey of the western coasts from the equator northward, along Central America, Mexico, part of California, and other regions, and has thus completed the entire western coast-line of America. The Americans advance steadily with the surveys of their coasts.

Since the publication of the article America many political changes have taken place in the governments of North and South America. The present names of the various states, with the area, population, and capital town of each, are stated in the following table—of which however some of the figures are only approximations.

North and South America.

Governments.	Area in sq. miles.	Population.	Capitals.
Danish America (Greenland)	380,000	9,400	Lichtenfels.
French Possessions (St. Pierre, &c.)	118	200	St. Pierre.
Russian America	394,000	66,000	N. Archangel.
British North America	1,800,000	180,000	York Factory.
Canada West	147,832	999,847	Toronto.
Canada East	201,989	890,261	Quebec.
New Brunswick	27,700	200,000	Frederickton.
Nova Scotia, &c.	18,746	300,000	Halifax.
Prince Edward's Island	2134	62,348	Charlotte Town.
Newfoundland	57,000	120,000	St. John's.
Vancouver Isl. & Br. Oregon	213,500	7500	Fort Langley.
United States of North America	3,306,834	23,191,876	Washington.
United States of Mexico	1,038,865	7,200,000	Mexico.
San Salvador	14,000	450,000	Cojutepeque.
Nicaragua	49,000	430,000	Granada.
Honduras	72,000	380,000	Comagagua.
Guatemala	28,000	1,100,000	N. Guatemala.
Costa Rica	17,000	200,000	San José.
Mosquitia	23,000	6000	Blewfields.
British Honduras	62,740	11,066	Balize.
Venezuela	416,600	1,356,000	Caraccas.
New Granada	380,000	2,200,000	Santa Fé.
Ecuador	325,000	665,000	Quito.
Bolivia	374,480	1,000,000	Chuquisaca.
Peru	580,000	2,400,000	Lima.
Chili	170,000	1,200,000	Santiago.
Argentine Confederation	927,000	800,000	Parana.
Buenos Ayres	200,000	250,000	Buenos Ayres.
Uruguay	120,000	250,000	Montevideo.
Paraguay	74,000	260,000	Asuncion.
Brazil	2,300,000	7,560,000	Rio de Janeiro
British Guiana	76,000	120,695	George Town.
Dutch Guiana	38,500	64,270	Paramaribo.
French Guiana	21,500	30,000	Cayenne.
Patagonia	380,000	120,000	
Total	14,237,068	54,080,463	

AMHERST, WILLIAM PITT, LORD and 1st EARL, nephew and successor of the first Lord Amherst [Amherst, Jeffery, Baron], was born in 1773. He was sent as ambassador to China early in the present century, but was wrecked on his return in the Eastern seas, and with difficulty reached Java in an open boat. He succeeded the Marquis of Hastings as governor-general of India in 1823. He signalised his administration by the first Birmese war, which was brought to a successful issue by the arms of Lord Combermere, and resulted in the annexation of Assam, Aracan, Tenasserim, and other provinces of the Birman Empire to the British dominions. He was created an earl in 1826, and resigned his post in India in 1827, when he was succeeded by Lord William Bentinck. He spent the latter years of his life in retirement, and died in March 1857, in his eighty-fifth year.

AMIDES and AMIDOGEN. [Chemistry, *S.* 1.]

AMMANIA (in honour of John Amman, a distinguished botanist), a genus of plants belonging to the natural order *Lythraceæ*. The species are aquatic plants, with smooth opposite entire leaves, 4-cornered stems, and small pink or red flowers. They are natives of both the New and Old Worlds, and very generally distributed. One species, *A. vesicatoria*, has a strong peculiar smell, and the leaves are very acrid. They are used by the native doctors of India for the purpose of raising blisters, which they do in the course of half an hour.

AMMELIDE. [Chemistry, *S.* 1.]

AMMELINE. [Chemistry, *S.* 1.]

AMYGDALIN. [Chemistry, *S.* 1.]

AMYLE. [Chemistry, *S.* 2.]

AMYOT, THOMAS, was born at Norwich about 1775 and settled in that city as a solicitor. In 1802 he was appointed law-agent for Mr. Windham in a contested election, and this led, on Windham's becoming Secretary-at War in 1806 in the Grenville administration, to his being appointed his private secretary. His tenure of this office was something less than a twelvemonth, but during it he had obtained also one of the ordinary clerkships in the Colonia Office; and in 1807 he was appointed Registrar of Record in Upper Canada, an office executed by deputy. In 1810 Mr. Windham died; and in 1812 Mr. Amyot published the speeches in parliament of his late patron, with a shor sketch of his life. Mr. Amyot's leisure was now devoted t the study of the antiquities and history of his country, al his other works being contributions to the 'Archæologia his principal papers being on the Bayeux Tapestry, and o the asserted existence of Richard II. in Scotland. In 182 he was appointed treasurer of the Society of Antiquaries, a office which he filled very effectively till within a short tim of his death, which took place in London, September 2 1850.

ANÆSTHETICS. [MATERIA MEDICA, *S.* 2.]

ANAPA, a sea-port town and fortress of Russian Circassia, situated on the eastern shore of the Black Sea, in 44° 55′ N. lat., 37° 16′ E. long., 20 miles N. from the harbour of Sudjuk-Kalé, and about 30 miles S.S.E. from the mouth of the Kuban: population, exclusive of the garrison, about 3000. It was founded by the Turks in 1784, to protect their Tartar subjects on the left bank of the Kuban, as also to keep up their relations with the Caucasian tribes. The products of Circassia soon began to circulate through Anapa, as they did formerly through Taman, which was then recently occupied by the Russians. There is no harbour, but only a roadstead at Anapa. The imports are cotton and woollen cloths, steel ware, nails, glass, salt, &c.; the exports are ox, buffalo, and cow hides; hare skins, furs; tallow, wax, &c.

The fortress of Anapa is built on a projecting crag, the most north-western extremity of the Caucasian Mountains. The surface is smooth and slopes down in an extended plain on the north and east towards the Kuban. The walls towards the sea are 425 yards long, and the entire circumference exceeds 2 miles. To the south-west the walls are built upon a calcareous rock, which rises 65 yards perpendicularly above the sea. Towards the roadstead, which is on the northern side of the town, the white cliffs that line the shore subside. Some bastions and a ditch defend the fortress on the side of the plain. During the Turkish possession of the place, about one-third of the space inclosed by the fortifications was occupied by 200 shops, several coffee-houses, and cabins built of wood, hurdles, and mud. It was ill-built, irregularly laid out, and had a very turbulent population; but it is said to have improved in every respect under the Russians.

A body of 8000 Russian troops made an unsuccessful attempt to take Anapa in 1790; in the next year it was taken by assault by General Goudovitch, though defended by 10,000 Turks and 15,000 mountaineers. It was soon after restored to Turkey, but the Russians seized it again in 1807 and in 1809. It was again restored to Turkey by the treaty of Bukharest. The Russians finally took Anapa, June 23, 1828, after an obstinate defence, and held it till the Russian War of 1854-5, when they were obliged to evacuate it; but they have since reoccupied it.

ANAMERTA. [MATERIA MEDICA, *S.* 2.]

ANAS, the Duck, a genus of birds under which Linnæus included a great number of species now separated into several genera by recent naturalists. [DUCKS.]

ANASTATICA, a genus of plants belonging to the natural order *Cruciferæ*. One species, *A. hierochuntina*, is the rose of Jericho. [JERICHO, ROSE OF.]

ANATHERUM, a genus of Grasses, belonging to the group of which species yield fragrant volatile oils. *A. muricatum* is the *Vetian* of the French, and the *Khus* of the Hindoos. Its fragrant roots are employed in making tatties, covers for palanquins, &c. It is administered medicinally, and has stimulating and diaphoretic qualities. *A. nardus* is also, on account of the volatile oil it contains, called Ginger-Grass, or Koobel.

ANCON-SIN-SALIDA, a deep and extensive inlet on the western coast of South America, situated between 50° 30′ and 52° 30′ S. lat., 72° 30′ and 73° 40′ W. long., is remarkable as bounding the southern extremity of the Andes. The Ancon opens into Smyth Sound, which separates the Adelaide Archipelago from the continent of America. It penetrates by a very winding channel (40 miles long, and from 1 to 4 miles wide) through the mountains from Smyth Sound, and expands at its eastern extremity into a large sheet of water, called Kirke Water, which is 20 miles long and 10 miles wide. From the channel several arms branch off north and south. The most western, which is called the Canal of the Mountains, runs northward for about 30 miles. It is screened by steep ranges of mountains, broken here and there by deep ravines, which are filled with frozen snow, and surrounded by extensive glaciers, whence avalanches frequently descend. The mountain range which incloses this arm on the west is considered to be the southern extremity of the Andes. From Kirke Water two deep inlets branch off. One of these, called Last Hope's Inlet, extends first northward and then north-westward, with a total length of about 30 miles, and a width of 2 to 4 miles, and terminates not far from the northern extremity of the Canal of the Mountains, from which it is separated by a high snow-capped ridge. The other, called Obstruction Sound, runs southward for above 70 miles, and is from 3 to 6 miles wide. The western shores, both of Obstruction Sound and of Last Hope's Inlet, are lined with high mountains, in some places covered with perpetual snow, but the greater part of their eastern shores, as well as the eastern shore of Kirke Water, consists of level ground, which extends some distance inland, where only a few low hills and some rising ground appear. It is therefore evident that the Ancon-sin-Salida cuts through the whole range of the mountains, and terminates in the eastern plains of Patagonia. (*Surveying Voyages of the Adventure and Beagle.*)

ANCO'NA, a delegation or province in the States of the Church, is bounded N. and W. by the province of Urbino, E. by the Adriatic, and S. by the province of Macerata. Its greatest length is about 38 miles, and the breadth is about 16 miles. The area is 408 square miles, and the population in 1843 numbered 166,114. The surface is traversed by numerous offshoots of the Apennines, which are separated by fertile valleys. Of the rivers which are small, the principal are—the Misa, the lower part of which is in the province of Urbino-e-Pesaro, and enters the sea at Sinigaglia; the Esino, which has its source in the province of Macerata; and the Musone, which forms the boundary between this province and that of Macerata. Of the whole area of the province (260,804 acres), 103,016 acres are under cultivation; 85,780 acres are covered with plantations and copses, and the rest consist of olive-grounds, meadows, natural pasture, forest land, &c., so that the amount of absolutely barren land is only 250 acres. The chief agricultural products are wheat, maize, hemp, hay, tobacco, wine, oil, and beans. Some silk is also produced. Sheep and hogs are reared in great numbers. There are also many horned cattle.

The province comprises the northern part of ancient Picenum, with a small portion of Umbria; these two provinces were separated by the Æsis, now the Esino, which river also formed the boundary between the Galli Senones and Picenum, and was therefore the northern limit of Italy on the side of the Adriatic until this was afterwards extended to the Rubicon. The province contains only a part of the old Marches of Ancona, which formerly extended from the duchy of Urbino on the north, to the Marches of Fermo on the south. The capital is ANCONA. The other towns which require notice here are Iesi and Osimo.

Iesi, 15 miles W. by S. from Ancona, near the left bank of the Esino, and about 10 miles from its mouth, occupies the site of the ancient Umbrian town Æsis or Æsium, which became a Roman colony, and was famous for its cheese. It gives title to a bishop, and is a walled town of considerable size, with a cathedral, five parish churches, and several convents. Silk and woollen hosiery are manufactured. The population is about 6000.

Osimo, the ancient *Auximum*, and a bishop's see, is situated on a high hill in the midst of a beautiful and fertile country, 8 miles S. from Ancona, on the road to Loreto, in 43° 29′ 36″ N. lat., 13° 27′ 30″ E. long.: population about 7000. It is a healthy and well built place, with a cathedral dedicated to St. Tecla; a town-house containing a museum of ancient statues and inscriptions found in the neighbourhood; a handsome episcopal palace; and several churches which contain some good paintings. Auximum, from the strength of its position, was a place of importance in ancient times. The Roman censors had walls built round it B.C. 174, and it became a Roman colony B.C. 157. In the great civil war the partisans of Pompeius seized the town B.C. 49, but the inhabitants opened the gates to Cæsar. Under the empire Auximum became the capital of Picenum, of which it was always one of the strongholds. Belisarius took it from the Goths after a long siege, during which he narrowly escaped death. Under the Byzantine empire, Auximum was one of the cities of the Pentapolis in the Exarchate of Ravenna.

ANCUD, THE GULF OF, extends between the mainland of South America and the island of Chiloe, from 41° 30′ to 43° 30′ S. lat., and from 72° 40′ to 73° 50′ W. long. It communicates with the Pacific on the north of the island by the Narrows of Chacao, which are of considerable depth, but at some places hardly a mile wide. On the south of the island of Chiloe it is connected with the Pacific by the wide opening which occurs between the Chonos Archipelago and the island, which is nearly 20 miles across. This gulf is nearly 150 miles long (including its expansion towards the north, which is called Reloncavi Sound), and at an average 60 miles wide. Its shores are everywhere high, and formed by rocks.

In the middle of the gulf, between 42° 10′ and 42° 50′ are a great number of high rocky islands and islets. The southern part of the Bay of Ancud is in some maps named the Gulf of Corcovado. (*Surveying Voyages of the Adventure and Beagle.*)

ANGLESEY, HENRY WILLIAM PAGET, MARQUIS OF, eldest son of Henry, first Earl of Uxbridge, was born May 17, 1768. He was educated at Westminster school, and Christchurch, Oxford; and entered Parliament as member for the Caernarvon boroughs in 1790. His predilection was however for a military life, and it found free scope at the outbreak of the revolutionary war in 1793, when he eagerly set about raising from his father's tenantry a regiment called at first the Staffordshire Volunteers, but which was admitted into the establishment as the 80th foot. Of this regiment he was appointed lieutenant-colonel on its having made up its complement of 1000 men. At the same time he received corresponding preferment in the army, his lieutenant-colonel's commission bearing date September 12, 1793. In 1794 he joined the army of the Duke of York in Flanders, and greatly distinguished himself during the remainder of that campaign.

On his return to England, Lord Paget was transferred to the command of a cavalry regiment, and commenced the career which at no distant day caused him to be regarded as the first cavalry officer in the service. As commander of the cavalry he accompanied the Duke of York into Holland in 1799. This short and disastrous campaign afforded few opportunities of acquiring distinction, but in the general attack Lord Paget succeeded in defeating a much superior body of the enemy's cavalry; and in the retreat, where he occupied the rear, he gained a signal triumph over a much larger force under General Simon. From this time he remained at home diligently occupied in training the regiment of which he was colonel, and in carrying out the system of cavalry evolutions which he had introduced, until near the end of 1808, when, having previously been made major-general, he was sent into Spain with two brigades of cavalry to join the army of Sir John Moore. In forming this junction General Paget was perfectly successful, and on the road he succeeded in cutting off a party of French posted at Rueda—this being the first encounter between the English and French in Spain. On joining Sir John Moore the cavalry under Lord Paget was pushed forward, and on the same day, December 20, came up with a superior body of French cavalry, and defeated it, taking above 150 prisoners, including two lieutenant-colonels. These victories gave the English cavalry an amount of confidence in themselves and their commander, which in the subsequent retreat was of the utmost value. During the retreat Lord Paget with his cavalry formed the rear-guard. After the infantry and heavy artillery had quitted Benevente he received intelligence that the enemy had arrived, and that their cavalry were crossing the Esla. Lord Paget hastened to the ford, and directed the 10th Hussars under General Stewart to charge the Imperial Guard, who had crossed the stream. The French were driven back with considerable loss in killed, wounded, and prisoners, among the latter being General Lefebvre Desnouettes, commander of the Imperial Guard. At the battle of Corunna Lord Paget had the command of the reserve, and his charge in support of the right wing, which was menaced by a far superior force, decided the fortune of the day.

Lord Paget returned to England in 1809, and did not again serve abroad during the Peninsular war. In 1810 he was divorced from his first wife, by whom he had had eight children. Soon after the divorce Lady Paget married the Duke of Argyll, and Lord Paget married Lady Cowley, who had just been divorced from Lord Cowley. In 1812 he succeeded, by the death of his father, to the title of Earl of Uxbridge.

In the early part of 1815 the Earl of Uxbridge commanded the troops collected in London for the suppression of the corn-law riots; but a more important service soon devolved upon him. When Napoleon escaped from Elba, and startled Europe by the ease with which he re-assumed the imperial crown, the armies of the allied sovereigns were at once set in motion against him. The Earl of Uxbridge was appointed commander of the cavalry of the English army, and his management of this arm of the service excited general admiration. At the battle of Waterloo his gallantry, as well as his skill, was conspicuous amidst the almost unequalled gallantry of which that field was the theatre. It was the final charge of the heavy brigade, led by the earl, that destroyed the famous French Guard, and with it the hopes of the emperor. Almost at the close of the battle a shot struck the earl on the knee, and it was found necessary to amputate his leg. The limb was buried in a garden by the field of battle, and some enthusiastic Belgian admirers erected on the spot a monument, with an inscription commemorating the circumstance, which is always one of the objects shown to visitors to Waterloo. The service rendered by the earl at Waterloo was generally recognised and duly rewarded. Immediately the despatches of the commander-in-chief were received the earl was raised to the dignity of Marquis of Anglesey, and nominated a Knight Grand Cross of the Order of the Bath; while he received from the emperors of Austria and Russia, and other European sovereigns, corresponding knightly dignities. In 1818 he was elected Knight of the Order of the Garter; in 1819 he attained the full rank of general; at the coronation of George IV. he held the office of Lord High Steward of England; and in 1826 he received the sinecure office of Captain of Cowes Castle.

When Canning became prime minister, April 1827, the Marquis of Anglesey formed one of his cabinet, having succeeded the Duke of Wellington as Master-General of the Ordnance; but this office he resigned in the following spring to become, under the ministry of the Duke of Wellington, Lord-Lieutenant of Ireland. To the duties of this important station the marquis addressed himself with characteristic energy, and by his zeal, impartiality, and ardent temperament, won a remarkable share of popularity. But his ardour outran his discretion. He had already in conversation expressed opinions which the ministry regarded as imprudent, and found to be inconvenient; and when, in December 1828, he wrote a letter to the Roman Catholic primate directly favourable to Roman Catholic emancipation, he was at once recalled. The day of his departure from the castle was kept in Dublin as a day of mourning; the shops were closed, business was suspended, and his embarkation was attended by large numbers of all classes of the citizens. In the House of Lords the marquis was a warm advocate of the measure which his letter had done much to hasten forward. Earl Grey became prime minister in November, 1830, and the Marquis of Anglesey was restored to his vice-regal office. But his popularity did not return to him. He set his face against the proceedings of O'Connell, and his former services were forgotten. The coercion acts which he thought it needful to obtain for securing the public peace in Ireland led to great dissatisfaction: misunderstandings and recriminations occurred between O'Connell, who declared himself tricked, and the ministry, and in consequence Earl Grey resigned July, 1833; and with him the Marquis of Anglesey, who was regarded as the cause of the ministerial break-up, also quitted office. Of the thorough honesty of purpose of the marquis's administration of his vice-regal functions, after the temporary clamours against him had subsided, there has been nowhere any doubt. That he displayed any high order of statesmanship there can be no pretension raised. The institution by which his tenure of office is most likely to be remembered is the Irish Board of Education, which was originated and carefully fostered by him, and which has proved one of the greatest benefits conferred on Ireland in recent years.

From this time the marquis took little part in public affairs until the formation of the administration of Lord John Russell in July, 1846, when he again became Master-General of the Ordnance; the duties of which office he sedulously performed till February, 1852, when the Russell ministry was replaced by that of Lord Derby. He was made colonel of the Horse-Guards in 1842, and was advanced to the dignity of field-marshal in 1846. He died full of years and honours April 29, 1854. By his first wife the Marquis of Anglesey had issue two sons and six daughters; by his second wife he had six sons and four daughters. He was succeeded in his title, and as lord-lieutenant of Anglesey, by his eldest son, the present marquis.

ANGOULÊME, DUC and DUCHESSE D'. *Louis Antoine de Bourbon*, Duc d'Angoulême, and afterwards Dauphin of France, the son of the Comte d'Artois (afterwards king by the name of Charles X.), and of Marie Thérèse de Savoie, was born at Versailles on the 6th of August, 1775, and died at Göritz on the 3rd of June, 1844. He was fourteen years of age when the revolution broke out. The Comte d'Artois, in order to protest by his absence against those concessions for which he blamed his brother, the king, emigrated in 1789; his two sons followed him to Turin, the court of their grandfather, where for some time they devoted themselves to th military sciences. In 1792 the young duke received a command in Germany, but attained no distinction. The ill success of this campaign induced him to return to a state o inaction, in which he continued until 1814. In 1799 he married his cousin, the unhappy orphan of the Temple, whose whole life had been one continued series of misfortunes.

Marie Thérèse Charlotte, the daughter of king Louis XVI. by his marriage with Marie Antoinette of Austria, and who from her cradle bore the title of Madame Royale, was born at Versailles on the 19th of December, 1778, and died October 19th, 1851. She was not fourteen years old when the events of the 10th of August, 1792, overthrew her father's throne, and drove her entire family from the pomps of Versailles to the prison of the Temple. Her parents were led thence to the scaffold; and the young princess had successively to deplore her father, her mother, her aunt Elizabeth, and her brother. At last Austria remembered the grand-daughter of Marie Thérèse; negociations were made in her favour; and on the 26th of December, 1795, at Riehen, near Bâle, they effected an exchange of the daughter of Louis XVI. for four members of the National Convention. Arrived at Vienna, the princess remained there more than three years, living on a legacy bequeathed to her by her aunt, the Duchess of Saxe Teschen. She married her cousin at Mittau on the 10th of June, 1799. The newly-married couple remained at Mittau till the commencement of 1801. They then sought an asylum at Warsaw. Fortune tossed them from place to place. Given up by Prussia, they returned to Mittau in 1805; and the following year the Emperor Alexander, in his turn, abandoned them. England, to which the power of Napoleon could not reach, alone offered them a lasting refuge. Here Louis XVIII. repaired towards the end of 1806, and some time after purchased a residence at Hartwell, in Buckinghamshire, where all the family were soon re-united. There the Duc and Duchesse d'Angoulême lived in the most profound retirement, until the Anglo-Spanish army passed the Pyrenees, when the Duc d'Angoulême joined it, having landed at a Spanish port on the Mediterranean.

After the restoration of the Bourbon family the Duc and Duchesse d'Angoulême were at Bordeaux, which was regarded as an eminently royalist town, and very favourable to the Bourbon cause, when on the 9th of March the news of Napoleon's landing was conveyed to them from Paris. Having been appointed the preceding year colonel-general of the Cuirassiers and Dragoons, and high-admiral of France, the duke then received the extraordinary powers of a lieutenant-general of the kingdom. He immediately formed a government for the southern provinces, collected troops, and on the road to Lyon gained several advantages over the Bonapartists. On her part, the duchess evinced great resolution; reviewed the troops, visited them in barracks, and endeavoured to rekindle the dying spark of love for the Bourbons. It was no doubt concerning this conduct that Napoleon remarked of her, that she was "the only man of her family." Her efforts were however as fruitless as those of her husband. But the second abdication of Napoleon after the battle of Waterloo decided the question without a civil war.

On the accession of Charles X., September 16th, 1824, the Duc d'Angoulême took the ancient title of Dauphin.

The decrees of the 25th of July, 1830, re-opened the road which was for the third time to conduct the royal family to the land of exile. They arrived in England on the 23rd of August, and were received as private individuals. Charles X. asked and obtained leave to take up his abode, when at Edinburgh, in Holyrood Palace.

They soon after removed to the continent, and fixed their residence at Göritz, in Hungary. The duchess survived her husband seven years.

ANILINE. [Chemistry, *S.* 2.]

ANISOINE. [Chemistry, *S.* 2.]

ANISOLE. [Chemistry, *S.* 2.]

ANISYLE. [Chemistry, *S.* 2.]

ANNI, a ruined city in the Kars district of Turkish-Armenia, is situated on the right bank of the Arpa, a feeder of the Araxes, in 40° 25′ N. lat., 43° 34′ E. long., at a distance of about 65 miles N.W. from Erivan. It was founded in the 6th century, and became the residence of the Armenian kings from the 8th century till the year 1064, when it was taken and ravaged by Alp Arslan. The Armenian patriarchs also resided in Anni from 993 to 1064. The town stood upon an area terminating on two sides in abrupt and rocky declivities; on the south is a deep ravine, in the bottom of which the Arpa flows: the area is open towards the north, on which side it is defended by a massive wall flanked with numerous towers. The towers are remarkable for the gigantic crosses formed by huge blocks of red sandstone let into the masonry. The walls, towers, and churches are in good preservation; so much so, that at a distance the city does not seem deserted. Besides the buildings named there are several baths, a mosque, and a palace. All the public buildings display much splendour and architectural beauty, and the fretwork of the arches is very rich. Some of the churches are decorated with rude wall-paintings representing scriptural and legendary subjects. There are inscriptions on most of the buildings chiefly in Armenian, but some are Turkish. The private houses of Anni are supposed to have been of an humble description, as none of them are left standing, and the whole area on which they stood is covered merely with mounds of loose stones. The city continued to be inhabited till A.D. 1319, when its ruin was completed by an earthquake. (Wilbraham's *Travels in the Trans-Caucasian Provinces of Russia*.)

ANNUITY. The restrictions imposed on contracts for annuities by the Statute 53 Geo. III., c. 141, have been removed, and parties are now left perfectly free to make their bargains in the terms on which they can agree. (17 and 18 Vict. c. 90.)

ANOPLURA, a family of insects, including the *Aptera* of Linnæus, and the various forms of *Pediculus* [Pediculus] and Parasitic Insects of other authors. The researches which were commenced on this family by Dr. Leach have been carried on by Mr. Denny, and resulted in the discovery of a vast number of new forms. The result is that it has been found that every animal is infested with, or, for some wise purpose is accompanied by, one or more creatures belonging to this family, having a peculiar form in each species. Nearly 500 different forms of these curious insects, all formed on the type of the common human louse, have been described by Mr. Denny, in the catalogue of the specimens which at present exist in the British Museum. In most cases but one species of the parasite exists on one species of animal, but there are instances, as in the eagles and gulls, in which a species of the bird is attacked by five species of *Anoplura*. The best series of illustrations of these insects which exist are contained in Denny's 'Anoplura Britannica,' published in 1842.

ANTARCTIC REGIONS. [Polar Countries and Seas, *S.* 2.]

ANTHERI'DIA, in Botany, organs found in many of the tribes of Cryptogamic or Flowerless Plants. They have been observed in the Characeæ, Horse-Tails, Ferns, Mosses, and Algæ, and are supposed to represent the anthers in Phanerogamic or Flowering Plants. In the cells of which they are composed certain moving filaments are observed, which have received the name of *Phytozoa* or *Spermatozoids*. Many of these phytozoa move by cilia attached to their surface. For the nature of their functions, development, and forms, see Reproduction in Plants and Animals, *S.* 2.

ANTHRI'SCUS, a genus of plants belonging to the natural order *Umbelliferæ* and the tribe *Scandicineæ*. It is known by possessing little or no calyx, with heart-shaped petals bent down at the point; a fruit narrowed below the short beak, and without any ridges. The beak has five ridges.

A. sylvestris, Wild Chervil, is known by its terminal stalked umbels, and its linear glabrous fruit with a short beak. It is a common weed in hedges and banks throughout Europe.

A. Cerefolium (*Scandix Cerefolium*), the Garden Chervil, is probably an escape from cultivation in England. It is common enough in waste places. [Scandix.]

A. vulgaris has the umbrels lateral and stalked, and an ovate hispid point. The leaves are slightly hairy. It is common in the waste places of Great Britain. (Babington's *Manual of British Botany*.)

ANTHRO'POLITES, the name given to Human Fossil Remains. Although at one time it was thought that human remains were often found fossilised, the investigations of modern anatomists have shown that in most of these cases the supposition has been false. Daubenton first demonstrated that some bones which had long been regarded in Paris as the remains of a gigantic human being belonged to a lower tribe of beings. The researches of Cuvier gave a clue by which all cases might be tested, and most of the earlier instances brought forward have been referred to their correct types.

Human fossil bones have, however, been discovered in the

Belgian bone-caverns, with bears, rodents, &c., and are figured by Dr. Schmerling, in his interesting work on the bones found in a cavern near Liège.

Dr. Buckland ('Bridgewater Treatise') remarks that frequent discoveries have been made of human bones and rude works of art in natural caverns, sometimes inclosed in stalactite, at other times in beds of earthy materials, which are interspersed with bones of extinct species of quadrupeds. These cases, he thinks, may be explained by the common practice of mankind in all ages to bury their dead in such convenient repositories. "The accidental circumstance," continues Dr. Buckland, "that many caverns contained the bones of extinct species of other animals, dispersed through the same soil in which human bodies may, at any subsequent period, have been buried, affords no proof of the time when these remains of men were introduced. Many of the caverns have been inhabited by savage tribes, who, for convenience of occupation, have repeatedly disturbed portions of soil in which their predecessors may have been buried. Such disturbances will explain the occasional admixture of fragments of human skeletons and the bones of modern quadrupeds with those of extinct species introduced at more early periods and by natural causes. Several accounts have been published within the last few years of human remains discovered in the caverns of France and in the province of Liège, which are described as being of the same antiquity with the bones of hyænas and other extinct quadrupeds that accompany them. Most of these may probably admit of explanation by reference to the causes just enumerated. In the case of caverns which form the channels of subterranean rivers, or which are subject to occasional inundations, another cause of the admixture of human bones with the remains of animals of more ancient date may be found in the movements occasioned by running water."

The same learned author observes that the most remarkable and only recorded case of human skeletons imbedded in a solid limestone rock is that on the shore of Guadaloupe, adding that there is however, no reason to consider these bones to be of high antiquity, as the rock in which they occur is of very recent formation, and is composed of agglutinated fragments of shells and corals which inhabit the adjacent water. Such kind of stone is frequently formed in a few years from sand-banks composed of similar materials, on the shores of tropical seas. ('Bridgewater Treatise,' vol. i.) One of these skeletons, described by Mr. König (Phil. Trans.,' 1814) is in the British Museum. See further as to the rock in which the skeletons are imbedded, 'Linn. Trans.,' 1818, vol. xii.

Dr. Lund published, some years ago, the discovery of human remains with those of *Megatherium*, &c.; and he was of opinion that the former were of the same epoch as those of the latter. The cranium had the peculiar shape which distinguishes the ancient Peruvian.

ANTIORIN. [Chemistry, *S.* 1.]

ANTOMMARCHI, FRANCESCO, a surgeon of some reputation as an anatomist, but more likely to be remembered in his capacity of physician to Napoleon I. at St. Helena. Antommarchi, a native of Corsica, studied medicine at Pisa, and was towards the close of the year 1812 elected anatomical dissector to the hospital of Santa Maria Nuova of Florence, attached to the university of Pisa. This appointment rendered him the principal assistant of his anatomical teacher, Mascagni. In 1818 the Chevalier Colonna, chamberlain to Madame Mère, made overtures to Antommarchi for the purpose of inducing him to accept the appointment of surgeon to the Emperor Napoleon I., and he accepted the offer. The history of Antommarchi, from this time till his return to Europe in 1821, is part of the biography of Napoleon. Immediately on his return he was involved in a dispute with the heirs of Mascagni, who wished to reclaim from him the plates and manuscript of the 'Grande Anatomia,' which he had undertaken to edit, and he eventually gave them up. In 1825 a series of anatomical plates, the size of life, by Antommarchi, were announced as on the eve of publication at the lithographical establishment of Count de Lasteyrie at Paris. The heirs of Mascagni forthwith published a letter to the count, in which they asserted that Antommarchi's lithographed drawings were mere copies from the plates of Mascagni. A favourable report of the work however was presented to the Académie des Sciences by Mageudie and Duméril. Fifteen parts of this work were published with the title 'Planches Anatomiques du Corps Humain,' Paris, 1823-1826, royal folio, including forty-five finished and thirty-five outline lithographed drawings of inconsiderable merit. The controversy appears to have died away, through lapse of time, without a positive decision being pronounced in favour of the claims of either party. During the Polish revolution he went to Warsaw, where he was appointed general inspector of military hospitals.

The following account of another curious controversy, in which Antommarchi was engaged, is translated from the 'Nouvelle Biographie Universelle,' Paris, 1852:—"Soon after the revolution of July," says Dr. Bourdon, "Antommarchi remembered that he had taken a cast of the head of the dying hero. Now, about nine years after his return from St. Helena, he first decided on publishing this cast of the emperor. It created a great sensation [in Paris], and for a time drew Antommarchi from his obscurity, probably also relieving him from pecuniary distress; but at the same time it greatly injured his reputation. As it did not appear from this cast that Napoleon's skull presented that phrenological conformation which, according to Gall, ought to have indicated the most glorious and least contested of his faculties, the adversaries of that science made use of it as an argument against Gall and Spurzheim; and thence sprang the disputes which still continue. The fact is, that there were some reasons for doubting whether the cast published by Antommarchi had really been moulded at St. Helena after the death of the emperor; it was found to bear more resemblance to Bonaparte the first consul than to the illustrious exile, worn out by six years of sorrow and want of sleep, emaciated by disease, and with the furrows ploughed by 52 years. Neither does this cast of Antommarchi accord with what Dr. O'Meara and General Montholon have related of the thinness of Napoleon, and of the alteration of his features in the latter part of his existence. Suspicions were set afloat of Antommarchi's veracity; it was affirmed that he had unlawfully assumed the title of professor, and that nobody had been able to find two works that he said he had published—the one a treatise on the cholera, the other concerning physiology. The advocates of the new science of phrenology, in their spiteful ardour, went so far as to throw a suspicion upon the identity of the cast considered with regard to the material. 'Your cast,' they said to him, 'is of a fine plaster; it is white and pure, such as is only to be seen at Lucca, where beautiful statuettes are formed of it; you could not have found any such at St. Helena.' Wearied with all these vexations, Antommarchi about 1836 took the desperate step of emigrating, in order to practise homœopathically at New Orleans, and afterwards at Havanna." He died at St. Antonio in Cuba, about 1844.

ANUS, DISEASES OF. [Surgery, *S.* 2.]

AORTA, DISEASES OF, [Surgery, *S.* 2.]

APIIN. [Chemistry *S.* 1.]

APIUM. [Celery.]

APOPHYLLIC ACID. [Chemistry, *S.* 1.]

APPERLEY, CHARLES JAMES, a writer on sporting subjects of considerable reputation, better known by the pseudo-name of *Nimrod*, was the second son of Thomas Apperley, a Welsh country gentleman, and was born at his father's seat of Plàsgronow, in Denbighshire, in the year 1777. At Rugby school he acquired some knowledge of the classical languages, and much more of the sports of the field. In 1801 he married the daughter of William Wynne, Esq., and in 1804 he took up his residence at Bilton Hall, once the country seat of Addison, in Warwickshire. Here he devoted himself so entirely to the chase that for some years his only pursuit was that of a fox-hunter. He often rode thirty or forty miles to distant covers, and he contrived to defray the expenses of the sport by disposing of hunters, after he had ridden them for some time, to those of his friends whose knowledge of the horse was not so intimate as his, and who therefore could not trust their own judgment in the purchase of an untried animal. In 1821 he removed into Hampshire, and commenced farming on a large scale; and in the same year he began to write for the press. His contributions to the 'Sporting Magazine,' especially his Hunting Tours, attracted so much attention that the circulation of the work was doubled in two years; and Mr. Pitman, the proprietor of the magazine, not only remunerated him handsomely, but also paid the expenses of his tours, and kept for him a stud of hunters. On Mr. Pitman's death differences followed, which led to a suit by his representatives for money advanced, the result of which was that, to avoid a prison at home, Nimrod was compelled to take up his residence in France. In

1830 Mr. Apperley established himself at a château called St.-Pierre, near Calais, where he chiefly resided for the remainder of his life, supporting himself by his pen. He died in London on the 19th of May, 1843.

Nimrod's superiority consisted in his perfect knowledge of his subject, and in a certain air of good humour, which won upon the reader. His works are made up almost entirely of anecdote, and partake of a gossiping character. His knowledge of fox-hunting could not be disputed, for previous to his leaving England he had hunted with no less than eighty-two different packs, in every quarter of Great Britain.

Almost all Mr. Apperley's works were written for periodicals, but many afterwards appeared in a collected shape. 'The Chase, the Turf, and the Road,' may be classed as Nimrod's best production. Published separately in the 'Quarterly Review,' in 1827, their appearance in so grave a periodical excited no small sensation. The liveliness with which they were written however carried them through triumphantly, and the result was a considerable addition to the number of Nimrod's admirers, as a consequence of his introduction to a new and wider circle of readers.

APTENODYTES. [Penguins.]

APTERYX, a genus of Struthious Birds, inhabiting Australia and the islands of New Zealand. It was first described by Dr. Shaw, who regarded it as an extinct form of bird. It evidently belongs to a group of birds that were destined to live on the earth, only as long as they were free from the attacks of carnivorous enemies endowed with greater powers of motion than themselves. Numbers of wingless birds, not belonging to the Struthious division, as the Dodo and Solitaire, seem already to have become extinct; whilst the smaller congeners of the *Dinornis* are suffering in like manner. The Apteryx is not however extinct, as many stuffed specimens exist in the museums of England; and a living specimen has been exhibited in the gardens of the Zoological Society, Regent's Park. Of all birds at present known the Apteryx appears to have the wings the most reduced to their simplest rudiments. Its general form is that of the Penguin, and in size it is seldom quite so big as our common goose. The beak is very long and slender, marked on each side with a longitudinal groove, and covered with a membrane at its base. It differs from other birds in the completeness of its diaphragm, and in the absence of abdominal air-cells. The bones are not hollow, as is mostly the case in birds; the sternum is very small, and the ribs are extraordinarily broad; the feathers have no accessory plume, and their shafts are prolonged beyond the back; the feet have a short and elevated hind-toe, of which the claw alone is externally visible.

The native name of this bird is *Kiwi-Kiwi*, given it on account of its peculiar cry. It is a nocturnal bird, and preys on snails, insects, and worms. Whilst at rest it has the singular habit of resting on the tip of its bill, which is its most characteristic position.

Apteryx (*A. australis*).

It runs with considerable rapidity, and when hunted by dogs it makes a hole in the earth for the purpose of concealment, or it retires into the natural cavities of the rocks. When attacked it defends itself with considerable vigour. The natives hunt it for the sake of its skin, which is used by the chiefs for their dresses, and on this account it is highly valued.

AQUARIUM, a contraction for *Aquavivarium*, a term applied to arrangements of living aquatic animals and plants inhabiting either fresh or salt water. Although it has been known from the earliest times that animals living in water may be kept in small glass vessels for exhibition by the daily supply of fresh-water, the discoveries of modern chemistry have pointed out how animals may be kept living in only limited quantities of water which never demand renewing. The possibility of accomplishing this depends on the absolute balance in nature which exists between the animal and vegetable kingdoms. The one set of these beings are engaged in giving off what the other requires, and in taking up what the other rejects. It is thus that the carbonic acid which is thrown off from the tissues of animals is taken up by plants, and thus prevented from contaminating the atmosphere; whilst the plant gives off oxygen gas, and supplies the atmosphere with this element of its composition which is necessary to the life of animals. The relations which are thus found to exist on the large scale of the whole surface of the earth, are found also to occur in a jar of water. If an animal is placed in pure water it quickly exhausts the oxygen it contains, and gives out into it carbonic acid gas; the consequence is, that it dies. But if we place with the animal some plant that lives in water, it will be found that the carbonic acid given out by the animal will be taken up by the plant, and that the plant will give out oxygen in its place. Thus the water becomes cleared of its injurious compound, and the needed element, oxygen, is supplied. Such an arrangement on a small scale is called an Aquarium.

The first experiments were made with fresh-water by Mr. N. B. Ward, and one of the earliest accounts of such an arrangement was given by Mr. Warington, chemist to the Apothecaries' Company. The latter found out, however, that it was not sufficient to have simply any kind of plants and animals; but that, in order to maintain the balance correctly, it was necessary that certain animals which lived on decomposing vegetable matter should be present. At certain seasons of the year the tendency to decomposition in the water-plants becomes so decided that the water would be rendered impure if this decomposition was not arrested. The cure for this was found in the addition of Fresh-Water Mollusca to the jars containing such fish as the gold-carp and stickleback, and such plants as the *Valisneria spiralis*, *Callitriche*, &c. The best kind of snails for this purpose are the various species of *Planorbis*. Not only is it necessary that this latter precaution be taken to ensure the success of the experiment, but it is of importance to guard against the preponderance of animal life. Although in most cases it appears that there cannot be too many plants for the health of the animal as long as they grow healthily and do not decompose, yet it often happens that the excess of animals over plants in a given space will destroy the balance, and lead to the destruction of life.

Amongst the fresh-water plants adapted for growing in the Aquarium are the *Valisneria spiralis*, the various species of *Chara*, *Anacharis Alsinastrum*, *Stratiotes Aloides*, *Callitriche autumnalis*, *C. vernalis*, *Myriophyllum spicatum*, and *Ranunculus aquatilis*. Such jars afford a good opportunity for cultivating the various species of fresh-water Confervæ, which all assist in keeping the water pure.

Although these results have been known for many years, it is only recently that any attempts have been made to carry out the same plan with regard to marine animals and plants in sea-water. The difficulties, however, are greater in maintaining the balance between the plants and animals in sea-water than in fresh. This arises from the more sluggish life, both of marine plants and animals, and the greater amount of disorganised matter which they throw from their surfaces. By care in the selection of sea-weeds, avoiding those which are large and throw off much matter from their surface, and not overcrowding the water with animal life, jars or tanks containing sea-animals and sea-plants can be easily managed. Mr. Warington recommends green sea-weeds, such as the species of *Porphyra*, &c. Mr. Gosse speaks favourably of *Chondrus crispus*, *Iridæa edulis*, and the *Delesseriæ*. In jars or tanks containing these plants various forms of sea-animals have been successfully kept for many months.

The greatest experiment of this kind which has hitherto been attempted is in a large glass-building that has been erected in the gardens of the Zoological Society, Regent's Park. It was opened to the public in May, 1853. This building contains an area of 60 feet by 25 feet. The sides of this parallelogram are bounded by reservoirs of plate-glass, each being about 6 feet in length and 2 feet 6 inches in depth. They are placed at a height of about 3 feet from the ground, so that each division presents as it were a submarine picture 'on the line,' and may be approached so closely that the minutest animals not microscopic, may be watched with the most perfect success, under circumstances which differ as little as possible from those of nature. The whole of these tanks are supplied with gravel, sand, rocks, and sea-weed, so as to imitate the rock-pools left on the sea-shore by a receding tide, which indeed they may be said to represent; but with this great advantage to the observer, that instead of looking vertically into a cavity in which the light becomes less and less in proportion to the depth, he has here the means of examining each animal in its turn, under an effect which is not only most delightful in itself, but which, the water being seen in section through perfectly transparent walls, affords the best possible position for investigating the structure and functions of the living beings contained in it.

The tanks contain fresh-water animals and marine animals. The fresh-water tanks present all the more common species of British Fishes, as the Pike, Tench, Perch, Roach, Rudd, Carp, Eel, Stickleback, Minnow, Gudgeon, &c. Some of the larger forms of fresh-water Crustacea, as the Crawfish, have also been introduced. With these are placed a large variety of the fresh-water Mollusca, belonging to the genera ***Limneus***, ***Planorbis***, ***Anodon***, ***Unio***, &c. These tanks have been occupied since Christmas, 1852, with scarcely any loss.

Amongst the Radiate Animals none are more remarkable for their power of resisting destruction than the *Actiniadæ*, and all experimenters agree that they are amongst the animals which may be most successfully kept in the Marine Aquarium. All the more common British species are now to be seen in the Regent's Park, and some of remarkable size and beauty. The Sertularian Zoophites and the Polyzoa are also there, but their animal inhabitants are too minute to be seen with the naked eye. Specimens of the *Echinodermata*, including several forms of Star-Fishes (*Asterias*), the Sun-Star, the common Sea-Egg, the *Holothuriæ*, and other rare forms of this class of animals have been from time to time introduced.

As was to be expected, the ***Mollusca*** thrive. In the sea they play the same part as in the fresh-water: they are the scavengers of the ocean. The Pinna, the Oyster, the Pecten, the Cockle, amongst bivalves; and the Whelk, the Periwinkle, with many other univalves, have demonstrated how large a field of observation is in store for those who study the Mollusca. Several species of those gems of the ocean, the Nudibranchiate Mollusca, whose forms and colours are only known to us through the great work of Alder and Hancock, have been successfully kept alive; whilst the red leaves of the species of ***Rhodymenia*** have been starred with their eggs. Various forms of Ascidian Mollusca have lived, and complete the evidence that this great group of animals may be watched in their living habits as easily as their shells may be examined in a cabinet.

The ***Articulata*** have been represented in these tanks by species of Lobster, Crab, Shrimp, and Prawn. Though many of these are inhabitants of the deep ocean, and only reward the labours of the dredger, yet they live perfectly well in the shallow lodgings provided for them by the Zoological Society. These facts demonstrate that amongst the Invertebrate tribes there are none whose habits may not be studied in the Aquarium.

With regard to fish it is found that those which live in shallow water thrive best in the Aquarium. The Cork-Wing (*Crenilabrus Cornubicus*), the Fifteen-Spined Stickleback, the Long-spined Cottus, two species of Blenny, the Goby, the Grey Mullet, and the Flat Fish have lived remarkably well.

(*Athenæum*, May 28, 1853; ***Annals of Natural History***, May, 1853; Gosse, ***A Naturalist's Rambles on the Devonshire Coast***; Dalyell, ***Remarkable Animals of Scotland***; Lankester, ***The Aquavivarium.***)

AQUILA. [FALCONIDÆ.]

ARABGIR, a town of Asia Minor, in the pashalik of Sivas, is situated on an elevated plateau between the Göl-Dagh and Sari-Chi-Chak branches of the Anti-Taurus [ANATOLIA]; at a distance of 16 miles N.W. from the junction of the Kara-Su and Murad-Su, on the caravan route from Aleppo to Trebizond, from which places respectively it is distant 270 and 198 miles. It is built amidst a forest of fruit-trees, among which the White Mulberry is most common. The fruit of the mulberry is eaten fresh, or used for making brandy, or it is made into a sweetmeat called Petmez, which is common all through Armenia. The soil in the neighbourhood where it is free from rocks yields fine crops of wheat. The climate is cold in winter, and much snow falls. The town contains 4800 Turkish and 1200 Armenian families. A few years ago the Armenian population had 1000 hand-looms at work, weaving cotton goods from British yarn. This industry and the caravan trade rendered Arabgir a thriving place. In the surrounding highlands, which are bare and barren, iron-ore is abundant; and near the spot where the above-named two rivers meet and form the Euphrates, are the lead and copper-mines of Kaben-Maden. (*Royal Geographical Journal.*)

ARAGO, FRANÇOIS JEAN DOMINIQUE, was born in the commune of Estagel, near Perpignan, province of Roussillon (now the department of the Eastern Pyrenees), on the 26th of February, 1786. His father, a licentiate in law, supported a numerous family on the income derived from a small landed property. François, the son, acquired the rudiments of reading, writing, and vocal music at the primary school of his native place, and in private lessons at home. He became an eager reader, and at an early age conceived a taste for a military life, which was nourished by the continual passing of troops on the march to or from the frontiers of Spain. When but seven years old he attacked with a lance the leader of a few Spanish troopers who had ridden by mistake into the village after a battle, and was only saved from a sabre-stroke by the arrival of the neighbours armed with hay-forks. His father having been appointed Treasurer of the Mint in Perpignan, the family removed to that town, where the boy entered as out-door pupil at the municipal college, and pursuing his literary studies, made himself acquainted with the classic authors of his native country. But walking one day on the ramparts, a little incident occurred that confirmed his military inclinations. Seeing a youthful officer directing the repairs of the walls, and surprised at one so young wearing an epaulette, he inquired by what means it had been won, and was answered—By study at the Polytechnic School, which was open to those who had passed a preliminary examination. From that time Arago, then in his twelfth year, betook himself to the study of mathematics and geometry, not in elementary manuals, but in the original works of the best authors, and mastered their contents with characteristic energy. He soon outstripped the abbé who taught mathematics in the school; and assisted by the kind advice of a neighbouring proprietor, who was a mathematician, he familiarised himself with the writings of Legendre, Lacroix, and Garnier. His real master, to quote a passage from his autobiography, "was a cover of Garnier's 'Treatise of Algebra.' This cover consisted of a printed sheet, on the outside of which blue paper was pasted. The reading of the uncovered side inspired me with a desire to know what the blue paper concealed. I damped it, and removing it with care, read underneath this advice given by D'Alembert to a young man who was telling him of the difficulties he met with in his studies: 'Keep on, sir, keep on, and conviction will come to you;' which was for me a ray of light. Instead of trying obstinately to comprehend at first sight the propositions that came before me, I kept on, and was astonished the next day at understanding perfectly that which, the evening before, had appeared to me wrapped in thick clouds."

In eighteen months Arago was ready for his examination, but the examiner having been detained by illness, a delay occurred, during which his friends sought to divert him from the pursuit he had chosen. He kept on, however, and studied the works of Euler and Laplace, and took lessons in fencing and dancing, having heard that these accomplishments were essential to an officer. In the summer of 1803 he was examined by Monge at the University of Toulouse, and passed with high commendations first of his class. He repaired forthwith to Paris, and entered the Polytechnic School, where, after a few months, he came off as triumphantly from an examination by Legendre as from that at Toulouse. In either case, his readiness and familiarity with the subjects required, overcame the prejudices of the examiners.

He was studying for the artillery branch of the service when, in 1804, the post of Secretary to the Observatory at Paris, then under Bouvard's direction, having fallen vacant, he was persuaded, but with great reluctance on his part, to undertake the duties. The temporary appointment, as he thought it, effected an entire change in his pursuits, for he remained attached to the Observatory for the rest of his life. At the instance of Laplace he worked with Biot, who was assistant-observer, at experimental researches for determining the refractive power of different gases—an inquiry commenced by Borda—the results of which formed the subject of a paper presented to the Academy of Sciences, and printed in their 'Memoirs' for 1806. In the same year the two young men were appointed by the government to extend and complete the measurement of the arc of the meridian, which, carried from Dunkirk to Barcelona by Delambre and Méchain, had been interrupted by the death of the latter. It was now to be extended from Barcelona to the Balearic Isles, and from thence to Formentera, by an immense triangle, the measurement of which had been thought impossible. The fatigues of this survey in a wild mountain region, exposed to heat, cold, and storm, were excessive. For six months Arago was stationed on an elevated peak in the Desierto de las Palmas, watching for the light set up on Ivica, which, owing to a defect in fixing the mirror, was seldom visible. A space of about seventy-five square yards was all the ground he had for exercise; and two Carthusian monks, who, forgetting their vow of silence, used to ascend the mountain to converse with him in the evenings, were his only society. The work involved frequent journeys, in which, apart from the fierce heats, much risk was incurred owing to the hostile feeling between France and Spain, and from parties of brigands. On two occasions a notorious robber-chief intruded himself as a nightly guest on the zealous surveyor.

The geodesical union from the mainland to Ivica, and thence to Formentera—an arc of parallel of one degree and a half in one triangle—was successfully accomplished. Biot had returned to Paris, when, in the summer of 1808, the fire-signals on Mount Galazo in Majorca were suspected to be advices to the French army then invading the Peninsula, and Arago was denounced as a spy. To escape the threatened violence, he obtained permission from the governor to imprison himself in the citadel of Belver. Having a safety-pass from the English Admiralty, he escaped in a half-decked boat to Algiers in July. In August he sailed for France in an Algerine frigate, and was in sight of the coast of Provence when the vessel was captured by a Spanish privateer, and carried into Rosas. Here he was again exposed to great danger: the authorities, bitterly suspicious, subjected him to repeated examinations, and consigned him to the hulks at Palamos, where his sufferings from want of food were, as he tells us, aggravated by the sight of the Pyrenees, and the thought that his mother might then be looking up at their peaks, anxious for her son.

Being liberated on demand of the dey, he sailed once more for France on September 28, and was off the port of Marseille when the ship, caught by the mistral, was drifted all across the Mediterranean to the coast of Africa. Arago landed at Bougie, and having travelled to Algiers, found a new dey in power, who would have sent him to the galleys but for consular interference. Here he lingered, waiting for an opportunity to return home, until June, 1809, when he again sailed, and though chased by an English cruiser, landed at Marseille on the 2nd of July, with his manuscripts and instruments. For eleven months had he been tossed about amid hardships and privations, of all of which he has left a narrative, interesting as a romance, in his 'L'Histoire de ma Jeunesse.'

While yet in the lazaretto, he received a letter from Humboldt—the commencement of a lasting friendship with the illustrious Prussian. Tenderly attached to his mother, his first visit was to her at Perpignan. She had mourned him as dead.

Arago hastened to Paris to communicate his observations to the Academy and the Bureau des Longitudes. Though but twenty-three years of age, he had already gained a reputation by his labours and misfortunes; and the death of Lalande having left a vacancy in the Academy, he was elected a member by 47 out of 50 votes on the 17th of September, and had the honour of the usual presentation to the Emperor. Thereafter Arago's influence was felt in the learned body; and his opposition to unworthy candidates brought him at times into collision with some of the most eminent of his colleagues. Before the close of 1809 he was appointed assistant-astronomer to the Observatory, and to succeed Monge in the chair of analytical mathematics at the Polytechnic School.

In 1811, taking up the researches of Malus, he read a paper to the Academy in which knowledge of the laws of light was greatly extended, and the changes described that take place in polarised rays on passing through different kinds of crystalline plates. The phenomena of colour, of intensity, of rotation, and of reflection, were examined, and in a way that laid the foundation of that branch of physical optics known as 'chromatic polarisation;' and the interesting fact was first announced, that "while the light from a clouded sky undergoes no modification, that reflected from the atmosphere when the sky is unclouded is polarised, the intensity of the polarisation varying with the hour of the day and the position of the point with respect to the sun."

In 1812, authorised by the Bureau des Longitudes, Arago commenced that course of lectures on astronomy and kindred subjects which he continued up to 1845 with the most brilliant success. The high and the low thronged to hear him; the learned to catch his animated manner and lucid style—the many to be charmed. As the Emperor Napoleon III. said, when a captive at Ham, Arago "possessed in a high degree those two faculties so difficult to meet with in the same man—that of being the grand-priest of science, and of being able to initiate the vulgar into its mysteries." The effect was heightened by the tall commanding form of the lecturer, his full sonorous voice, his striking features, and dark piercing eyes, shaded by thick bushy brows.

Conjointly with Gay-Lussac, Arago established the 'Annales de Chimie et de Physique' in 1816—a serial still published, and much valued by scientific men. In the same year he announced what has been received as a crucial experiment, demonstrating the truth of the undulatory theory of light over the rival theory of emission. Young had shown in his experiments that the interposition of an opaque screen in the path of a ray under certain circumstances, prevents the formation of fringes. Arago found that the ray was only retarded, and that by a modification of the apparatus the fringes were still discernible.

In 1816, also, Arago for the first time visited England, where he made the acquaintance of Young and other eminent men of science. With a Frenchman's feeling, he had a painful dislike to hear any allusion to the battle of Waterloo; and while in London he positively refused an invitation to see Waterloo Bridge. His entertainers adopted the stratagem of proposing an excursion on the Thames, which, being accepted, the party descended the river admiring the prospect, and presently coming to the imposing structure of granite then stretching fresh and new from side to side, Arago was asked for his opinion of it. He perceived the trick, and replied—"Your bridge has at least an arch too many; and that one, to be in its place, should be transported to Berlin."

Another task commenced by Arago in 1818, again in conjunction with Biot, was the connection of the French arc with the English arc by a system of signals and measurements from one side of the channel to the other. The results, together with those of the Spanish triangulation, were published by order of the Bureau des Longitudes, in a volume entitled 'Recueil d'Observations Géodesiques, Astronomiques, et Physiques.' In 1819, jointly with Fresnel, Arago published a series of experiments on the action exercised by polarised rays on each other, singularly remarkable for the ingenuity of the methods employed. Space fails here to give the details; but it was by means of these experiments that Fresnel was enabled to give a complete explanation of the production of colours in crystalline plates, which had been referred by Young to the interference of transmitted rays. The co-operation of the two savants produced happy results; for Arago, though rich in inventive faculty, lacked the perseverance which works a thought out to its ultimate consequences. "We complete one another," he used to say; "I know how to point out the difficulty, and Fresnel how to conquer it."

In 1820 Arago took up a new line of inquiry. Having witnessed a demonstration of Oersted's discovery at Geneva, he repeated it before the Academy, and with further results. The Danish philosopher had shown that a voltaic current passing along a wire would deflect a magnetic needle: Arago found that non-magnetic substances were equally affected; that bars of iron and steel became temporary magnets, and lost their magnetism with the cessation of the current. He proved moreover the best magnet to be a steel bar inclosed by a helix of copper-wire, to which we owe the discovery of the electro-magnet, and all that has since been accomplished thereby. Four years later other facts were published. Arago showed that metals not magnetic exert a powerful influence on the magnetic needle, particularly when in movement. Such metals appeared to become magnetic by mechanical motion—a phenomenon which has since been referred by Faraday to general laws of magnetic induction.

In 1822 Arago was chosen a member of the Bureau des Longitudes, and from 1824 till his death the 'Annuaire,' published by the board, contained a notice on some scientific subject from his pen as delightful as instructive. "They will always be reperused," says M. Combes, president of the academy, "with the same pleasure by men of science and by the ordinary reader. In them we find an admirable clearness, with an erudition as correct as it is extensive, and joined thereto the most rigorous accuracy in the statement of the phenomena, and the consequences which result from them." Arago won the position and honour he most prized in 1830, when on the death of Fourier he was elected Perpetual Secretary of the Academy. And now the duty devolved upon him of writing those 'éloges' of deceased members which are among the most interesting of his literary productions—graceful in style, and abundant in anecdote and illustration. They appeared to be written with a fluent pen; but he was a slow composer, and only acquired his felicities of expression by real and repeated hard work of mind and hand. In the same year he was appointed director of the Observatory.

In 1834 Arago visited England a second time, and attended the meeting of the British Association at Edinburgh. He continued his scientific researches, among which are—the discovery of a neutral point in the polarisation of the atmosphere—determination of the synchronous perturbations of the magnetic needle at places wide apart, by observations carried on simultaneously with Kupffer at Kasan—and the suggestion of a decisive proof of the truth of the undulatory theory, which has since been demonstrated by Foucault—besides other points of photometry and astronomy.

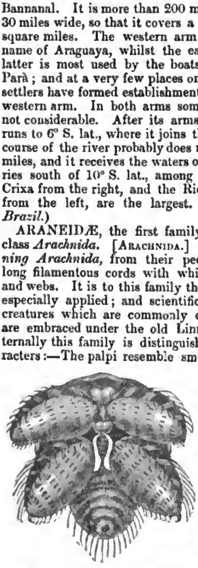
The later years of Arago's life were passed amid much bodily suffering, when, with failing sight and afflicted with diabetes, he set himself to finish his incomplete papers. In the summer of 1853 he went, attended by his niece, to his native place, seeking relief in change of air; but the hope was disappointed: he returned to Paris and died on the 2nd of October, aged 67. He was buried in the cemetery of Père-la-Chaise, followed by a concourse of 3000 persons to the grave, where Flourens pronounced the funeral oration.

Arago was elected a foreign member of the Royal Society in 1818. In 1825 their Copley medal was awarded to him for his "discovery of the magnetic properties of substances not containing iron;" and their Rumford medal in 1850, for his "experimental investigations of polarised light." The Royal Astronomical Society elected him one of their associates in 1822; he was also a member of some of the leading scientific societies on the continent. Arago was once married: his wife died in 1829, leaving two sons, who still survive. He had been accused of hoarding up wealth, but he left no other fortune to his relatives than a name and reputation of which they may be justly proud. His entire works are easily accessible, as they have been collected and published in a series of octavo volumes in French and English. It is said that he has left a narrative of his later years, not less interesting than that to which reference has been made above, for publication when the fitting time shall arrive.

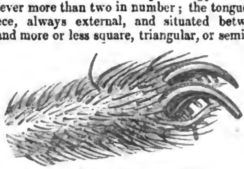
National vanity and an impassioned nature at times involved Arago in bitter controversies with other savants, in which he too often lost sight of truth and justice. It is certain also that he was occasionally tempted to sacrifice accuracy to effect. In politics he was an ardent republican, to which he owed his election to the Chamber of Deputies after the 'Three Days' of July, 1830. By his eloquent advocacy the observatory of Paris was placed on its proper footing among the observatories of Europe, and the works of Laplace and Fermat were published at the national expense. His voice was always raised in favour of science. To him Melloni, the Italian philosopher, owed his return to Naples from a wearisome exile. In 1840 he became a member of the Council-General of the Seine; and in 1848 he was chosen into the Provisional Government, in which he discharged the functions of minister of war and marine. In bitterness of spirit he despaired of the republic on witnessing the popular caprice. He refused to take the oath of allegiance after the coup-d'état of 1851, and justified his refusal in a memorable letter to the government, which elicited a concession alike gratifying to his conscience as a politician and his dignity as a philosopher. "A special exception," so wrote the minister authorised by the Prince-President, "would be made in favour of a philosopher whose labours had rendered France illustrious, and whose existence the government would be loth to sadden."

ARAGUAYA, one of the largest and most important rivers in the interior of Brazil, though up to the present time it is not much navigated, because the countries along its banks are unreclaimed, except at a few isolated places. It divides the province of Goyaz, which lies east of it, from Matto Grosso, which extends west of its course. It rises in the Serra de Santa Martha, south of 18° S. lat., in a lake, and runs under the name of Cayapo about 180 miles, when it unites with the Rio Claro, which traverses the town of Villa Boa, the capital of Goyaz, and takes the name of Araguaya. Continuing in a northern direction to about 12° 30′ S. lat., the river divides into two branches, which do not re-unite until 9° 30′. The island which is thus formed is called Ilha de Santa Anna or Bannanal. It is more than 200 miles long, and at an average 30 miles wide, so that it covers a surface of more than 6000 square miles. The western arm of the river preserves the name of Araguaya, whilst the eastern is called Furo. The latter is most used by the boats bound from Villa Boa to Parà; and at a very few places on its shores the Portuguese settlers have formed establishments, whilst none exist on the western arm. In both arms some falls occur, but they are not considerable. After its arms have re-united, the river runs to 6° S. lat., where it joins the Tocantins. The whole course of the river probably does not fall much short of 1000 miles, and it receives the waters of several navigable tributaries south of 10° S. lat., among which the Vermelho and Crixa from the right, and the Rio das Mortes and San João from the left, are the largest. (Henderson's *History of Brazil.*)

ARANEIDÆ, the first family of the first order of the class *Arachnida*. [ARACHNIDA.] They are also called *Spinning Arachnida*, from their peculiar habit of producing long filamentous cords with which they form their nests and webs. It is to this family that the term *Spider* is more especially applied; and scientifically it embraces all those creatures which are commonly called Spiders. All these are embraced under the old Linnean genus *Aranea*. Externally this family is distinguished by the following characters:—The palpi resemble small feet without a claw at the tip, terminated at most in the females by a small hook, but in the males supporting various appendages, more or less complicated, connected with the function of reproduction in this family. The frontal claws are terminated by a moveable hook which curves downwards, and has on its under-side a little slit for the emission of a poisonous fluid which is secreted in a gland of the preceding joint. The maxillæ are never more than two in number; the tongue is of a single piece, always external, and situated between the maxillæ, and more or less square, triangular, or semicircular. The thorax has upon it a V-like impression indicating the region of the head; it consists of a single piece, to which is attached behind a moveable and soft abdomen. This part of

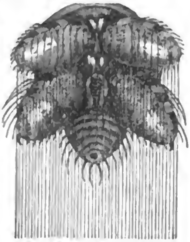


Spinnerets of a Spider, magnified.

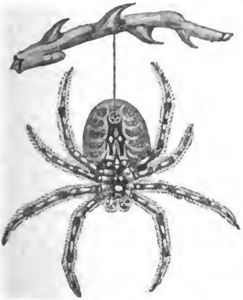


Clawed foot of a Spider, magnified.

the body is furnished with four or six nipples, fleshy at the tips, round or conical, jointed, placed close together, and pierced at the extremity with an immense number of minute orifices for the discharge of silken threads, which are produced from matter formed in internal reservoirs. These are called Spinnerets. The legs vary in length, but are composed of seven joints, of which the first two form the haunch, the next the femur, the fourth and the fifth the tibiæ, and the two others the tarsus. The last is ordinarily terminated by two claws, generally toothed beneath, and by a third smaller claw which is not toothed.

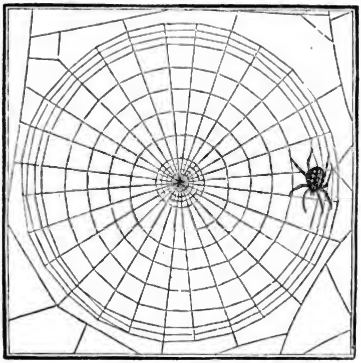

Single thread of a Spider, magnified.

The most remarkable function performed by the *Araneidæ* is that of producing silken threads by means of the Spinnerets above described and figured. From each one of the minute orifices of the spinneret there exude as many little drops of a liquid, which becoming dry the moment it comes in contact with the air, forms so many delicate threads. Immediately after the filaments have passed out of the pores of the spinneret they unite first together and then with those of the neighbouring spinnerets to form a common thread; so that the thread of the spider, when it suspends itself from any object, is composed of an immense number of minute filaments, amounting even to many thousands, each of which is of such extreme tenuity that the naked eye cannot detect them till they are formed into a common thread. The spinnerets of the same spider differ in structure, and Lyonnet has shown that one set of spinnerets is employed in producing threads which are glutinous, whilst another set produces threads which are smooth. This may be seen by throwing a little dust on a spider's web, such as that of *Epeira diadema*, when it will be found that it adheres to the threads which are spirally disposed, but not to those that radiate from the centre to the circumference. These last are also found to be stronger than the spiral ones.


Garden-Spider suspended by a thread.

The spinnerets are in connection with an internal apparatus which secretes the matter they thus elaborate. This apparatus consists of a number of intestine-like canals which are united together, and vary both in number and extent according to the species in which they occur. These canals empty themselves into tubes which open into the spinnerets from whence the thread is extruded.

It is by means of these threads that spiders construct the various webs which they throw from one object to another, for the purpose of entrapping their prey. It is said that some of the larger species construct webs in which even small birds, such as the humming-bird, are caught and made subservient to the wants of the spider. No sooner is an insect or other small animal ensnared than the spider, placed in the centre of its net, or in a cell built at its side for the purpose of watching, darts forth, and uses all its efforts to inflict upon it wounds into which it pours the venom contained in its frontal claws. When the creature thus caught offers too great a resistance, so that the spider becomes endangered, he retires for a time from the contest to renew his strength, leaving his victim secure in his meshes, and gradually getting exhausted from the attempts it makes to escape. When the spider returns he frequently twists the web round and round the body of his victim, and then either at once commences to make a meal of him, or waits till his appetite suggests the proper time for feeding.


Geometric Net of *Epeira diadema*.

Although Spiders are not provided with wings, and are consequently incapable of flight, they have a power of ballooning with their silken threads, by means of which they can make distant journeys through the atmosphere. These aërial excursions, which appear to result from an instinctive desire to seek some more favourable spot for the gratification of their appetite or other cause, are undertaken when the weather is bright and serene, especially in the autumn, both by adult and immature individuals of many species, and are effected in the following way:—They first mount to the summit of an object, and then raise themselves still higher by straightening their limbs; the abdomen is then elevated into an almost perpendicular position, and they emit from their spinnerets a small quantity of viscid fluid, which is drawn into fine lines by the ascending current of air from the heated ground. Against these lines the current of air from below keeps impinging till the animals, finding themselves acted on with sufficient force, quit their hold of the earth and mount into the air. It has been sometimes stated that spiders can forcibly propel or dart out lines from their spinnerets; but when placed on sprigs set upright in glass vessels, with perpendicular sides, all their efforts to escape are unavailing.

The webs named gossamer are composed of lines spun by spiders, which on being brought into contact by the action of a gentle air, adhere together, till by continual additions they are accumulated into irregular white flakes and masses of considerable extent.

The poisonous effects of the wounds of spiders are produced by means of the mandibles, or frontal claws, which are each armed with a moveable and extremely sharp unguis, near to the point of which is a minute orifice, whence there is poured out a drop of poison into the wound. This orifice, which is very difficult to detect, communicates with a canal in the interior of the mandible; this canal proceeds from a gland situated in the interspace of the muscles of the thorax. The gland consists of a vesicle having internally a number of spiral filaments, which are connected together by a membrane in the form of a bag. Although dreadful stories are related of the effects of the bites of spiders on the human body, it appears from experiments made by Mr.

Blackwall on British Spiders, that none of these have the power of producing any ill effects on human beings. There is still wanting good evidence on which to rest a charge of poisoning man by biting him, even against the larger forms of spiders, which inhabit tropical climates.

A curious feature in the history of spiders is the power they possess of reproducing their limbs after they have been broken off. This power, however, is not confined to spiders, as we find it in the *Crustacea* [CRUSTACEA], and even in the vertebrate animals amongst the *Amphibia*. [AMPHIBIA.] In the case of the spiders, it is never a part of a limb which is reproduced, but if a part of a leg is removed, it proceeds to throw off the remainder, and after the next moult the missing member reappears.

The species of the family *Araneidæ* are very numerous and have been arranged by naturalists under several genera. They have been investigated with great care by M. Walckenäer, who has made them the special study of his life, and has drawn up a natural arrangement of them according to their structure and habits of life. A synopsis of this arrangement we subjoin, as by a little study it will furnish an insight into the surprisingly varied habits of this family:—

TABLE OF THE SUBDIVISION OF THE ARANEIDÆ OR ARACHNIDA FILOSA, INTO GENERA.

				Genera.				
First Family.—ARANEIDÆ—SPIDERS.	*Mandibles* articulated horizontally; moving vertically.	8 Eyes.	*Eyes* aggregated.	Mygale.	LATEBRICOLÆ, hiding in holes and fissures.	*Venantes*, incessantly running or leaping about the vicinity of their abode to chase and catch their prey.	*Terrestres*, living on land or in holes in the ground.	ARACHNIDA.
				Oletera.				
				Filistata.				
			Eyes segregated.	Missulena.				
				Sphodros.				
		6 Eyes.	*Eyes* anterior.	Dysdera.	TUBICOLÆ, inclosing themselves in silken tubes.			
				Segestria.				
			Eyes anterior and lateral.	Uptiotes.	CELLULICOLÆ, sheltering themselves in small cells.			
				Omosites.				
				Scytode.				
	Mandibles articulated vertically or on an inclined plane; moving laterally.	8 Eyes.	*Eyes* anterior and lateral, very unequal in size.	Lycosa.	CURSORES, running swiftly to catch their prey.			
				Dolomedes.				
				Storena.				
				Ctenus.				
				Hersilia.				
				Sphasus.				
				Dolophones.				
				Myrmecia.	SALTATORES, leaping and springing with agility to seize their prey.			
				Eresus.				
				Platiscelum.				
				Attus.				
			Eyes anterior, almost equal in size.	Delena.	LATERIGRADÆ, walking and running sideways or backwards; occasionally throwing out threads to entrap their prey.	*Vagantes*, wandering abroad, and incessantly spying out for prey; no fixed residence except at the period of oviposition.		
				Thomisus.				
				Selenops.				
				Eripus.				
				Philodromus				
				Sparassus.				
				Clastes.	NIDITELÆ, going abroad, but making a web for their nests, whence issue threads to entrap their prey.	*Errantes*, prowling about the neighbourhood of their nests, or near the threads which they throw out, to catch their prey.		
				Clubiona.				
				Drassus.				
				Clotho.	FILITELÆ, going abroad, but spreading long threads of silk about the places where they prowl in order to entrap their prey.			
				Enyo.				
				Latrodectus.				
				Pholcus.				
				Artema.				
				Tegenaria.	TAPITELÆ, spinning great webs of a close texture like hammocks, and dwelling therein to catch their prey.	*Sedentes*, spinning large webs to entrap their prey, lying in wait in the middle or at the side.		
				Lachesis.				
				Agelena.				
				Nyssus.				
				Epeira.	ORBITELÆ, spreading abroad webs of a regular and open texture, either orbicular or spiral, and remaining in the middle or on one side to catch their prey.			
				Tetragnatta.				
				Uloborus.				
				Zosis.				
				Lynyphia.	RETITELÆ, spinning webs of an open meshwork and of an irregular form, and remaining in the middle or on one side to catch their prey.			
				Episina.				
				Theridion.				
				Argyroneta.	AQUITELÆ, spreading filaments in the water to entrap their prey.	*Natantes*, swimming in water and there spreading their filaments to entrap their prey.	*Aquaticæ*, living in water.	

(*Cyclopædia of Anatomy and Physiology*, article '*Arachnida*;' Blackwall, in *Report of British Association*, 1844; Owen's *Lectures on Comparative Anatomy*; Cuvier's *Règne Animal*; *Insect Architecture*, in *Library of Entertaining Knowledge*.)

ARBITRATION. The defects in the law, which permitted any agreement to refer disputes to arbitration, if disregarded by any of the parties thereto, to be of no avail, and which allowed arbitrations to come to an end by the death of arbiters or umpires, or the refusal of any of the parties to proceed therein, have been remedied by the Common Law Procedure Act, 1854. (Blackstone's 'Commentaries,' Mr. Kerr's ed., vol. iii., p. 17.)

ARCHER-FISH. [TOXOTES, *S.* 1.]

ARCHES, COURT OF. The jurisdiction of this Court in Testamentary and Matrimonial Causes has been transferred partly to the Court of Probate (20 & 21 Vict. c. 77), and partly to the Court for Divorce and Matrimonial Causes (20 & 21 Vict. c. 85); and as no suit for subtraction of legacies, (20 & 21 Vict. c. 77 s. 23), or for defamation (18 & 19 Vict. c. 41), can now be entertained by any Ecclesiastical Court whatever, its jurisdiction is now confined to a few pecuniary causes, peculiarly connected with the Established Church. (Blackst. 'Comm.,' Mr. Kerr's ed. vol. iii. p. 93.)

ARCHITECTURE. [PUBLIC IMPROVEMENTS.]

ARCTIC REGIONS. [NORTH-WEST PASSAGE, *S.* 2; POLAR COUNTRIES AND SEAS, *S.* 2.]

ARDEA, ARDEIDÆ. [HERONS.]

ARENICOLA, a genus of Annelidous Animals, referred by Cuvier to the Dorsibranchiate group on account of their external gills. The general structure and habits of the genus determine most naturalists in placing it with the Terricolous Annelids. [ANNELIDA.] The gills are branched, and placed upon the rings of the middle part of the body only. The mouth is fleshy, more or less dilateable, but there are no discernible teeth, tentacles, or eyes. The posterior extremity of the body has not only no gills, but is devoid of the silky bristles which are found on every other part.

A. Piscatorum, the Lob or Lug-Worm, is the most common species. It is found very abundantly in the sand of the seashore, where its habits afford a close resemblance to those of the earth-worm away from the shore. It is bigger than the earth-worm, sometimes being found nearly a foot in length. It is of a reddish colour, and when touched throws out a quantity of yellow fluid which stains the hand. It is employed by fishermen as bait for various kinds of sea-fish.

AREOLAR TISSUE. [TISSUES, ORGANIC, *S.* 1.]

ARGELES. [PYRÉNÉES, HAUTES.]

ARGULUS, a genus of Entomostracous Crustacea, belonging to the section *Pœcilopoda*. There is but one species of this genus, the *A. foliaceus*. This little creature is not unknown to fishermen, as it is frequently found parasitic upon various kinds of fish. It was first described by Baker in his 'Employment for the Microscope,' in 1753, under the name of the 'Louse of the Carp and Banstickle or Prickleback.' It is about the tenth of an inch in length, and is almost as broad as it is long. The head is in the form of a circular-shaped shield. The antennæ are short, thick, and two-jointed. Instead of a second pair of foot-jaws it has a pair of circular or disc-shaped suckers, by means of which it attaches itself to the animals on which it is parasitic. These suckers are admirably constructed for their use. Four muscles are attached to the base of each of these organs, and extend up by the sides. By this arrangement the creature can make use of these organs, by exhausting the air in the same way as in cupping glasses, to fasten itself, and also by relaxing the muscles, to walk, when it wishes to change its position. These little creatures are nearly transparent, or of a slightly greenish hue, so that its internal organisation can be readily seen by means of the microscope by transmitted light. The body is marked on both sides by a series of ramifications of a dark colour. The female is larger than the male, and is distinguished, in addition to the ovary, by a black mark on each lobe of the abdomen.

The Argulus is found upon various fresh-water fishes. It is most frequently met with near London on the Stickleback, but it has been noticed as occurring on the Carp, the Roach, the Trout, the Pike, the Rudd, and even upon the tadpole of the common Frog. It seems to abound especially when fish are in ill health.

Although mostly found upon fish it frequently leaves them, and swims freely about in the water. Fish have an instinctive knowledge of these creatures as their enemy, and it is amusing to watch in a basin of water the efforts which the stickleback will make to avoid its minute persecutor; but the efforts of the fish are in vain, for it is opposed to a creature which has the power of darting through the water with such rapidity that it is almost impossible to follow it with the naked eye. The females deposit their eggs from 400 to 1500 in number on stones or other solid bodies. They are laid side by side in rows and glued together. They are hatched in about 35 days, and the young resemble their parents to a greater extent than is the case with many of the forms of *Entomostraca*. The best account, with figures and anatomy, of this parasite, is given in Dr. Baird's 'History of the British Entomostraca,' published by the Ray Society. Mr. Yarrell has given a figure of it in the second volume of his 'British Fishes.'

ARICINE. [Chemistry, *S.* 2.]

ARIÈGE. [Arriège.]

ARQUERITO, a native amalgam, consisting of six parts of silver and one of quicksilver. It has been regarded as native silver. It is malleable, and is worked with great success in the mines of Arqueros in Chile.

ARREST. The Commissioners of the district Courts of Bankruptcy and the Judges of the County Courts have now power to grant a warrant for the arrest of absconding debtors and for their detention for seven days, until a writ of *capias* can be procured from one of the Superior Courts of law. By this means debtors absconding from the seaports at a distance from London, may be arrested on the spot, and detained until they pay the debt or give bail to an action, or deposit the money in the hands of the sheriff. ('The Absconding Debtors Arrest Act,' 1851.)

ARSENIC, DETECTION OF. [Chemistry, *S.* 1.]

ARTERIES, DISEASES OF. [Surgery, *S.* 2.]

ARTERIOTOMY. [Surgery, *S.* 2.]

ARTERY, from the Greek *ἀρτηρία*, signifying an air-vessel, because the ancients, ignorant of the circulation, and finding the arteries always empty after death, supposed they were tubes containing air. Why after death the arteries are empty and the blood accumulated in the veins will be explained hereafter. By the term Artery is meant a vessel which conveys blood from the heart to the different parts of the body: a Vein, on the contrary, is a vessel which conveys blood from the different parts of the body to the heart. [Circulation of the Blood.] All the arteries of the system proceed from two great trunks immediately connected with the cavities of the heart, namely, the Pulmonary Artery, which arises from the right ventricle, and the Aorta, which springs from the left ventricle. [Aorta; Heart.]

The arterial system is arborescent, that is, the branches which spring from the aorta successively increase in number and diminish in size as they proceed from the heart towards their ultimate terminations in the system. Each trunk commonly ends by dividing into two or more branches, the combined area of which is always greater than that of the trunk from which they spring. The capacity of the branches is estimated to exceed that of the trunks in the proportion of one and a half to one. The arterial trunk always dividing into branches, and the larger branches into branches more and more minute, it is obvious that the blood in the arterial system is always flowing from larger into smaller tubes.

The arteries are of a yellowish-white colour, loose and flocculent on their external surface, but their internal surface is smooth and polished. They are composed of three distinct membranes, which are super-imposed one upon the other, and which are ultimately united by delicate cellular tissue. Each of these membranes is called a tunic, or coat, and each possesses a peculiar structure, and performs a separate function in the circulation of the blood.

1. The internal tunic consists of a membrane, colourless, transparent, and thin, yet so firm and strong that it is supposed to resist more than any of the others the bursting of the artery by the current of the blood; for if, in a living animal, the other coats be entirely removed, this alone is found capable of sustaining the impetus of the circulation, and of preventing rupture from the dilatation of the artery.

2. The middle tunic, called also the fibrous and the muscular, is composed of yellowish fibres, which pass in an oblique direction around the calibre of the vessel, forming segments of circles which are so joined as to produce complete rings. In the larger trunks, several layers of these fibres can be raised in succession by the forceps, so that this coat is of considerable thickness, and it is proportionally thicker in the small branches than in the large trunks. This coat is firm, solid, and highly elastic. It is the main tunic by which the artery resists dilatation in the transverse direction, which it does so effectually that when the left ventricle of the heart propels a fresh current of blood into the aorta little or no dilatation of the vessel is perceptible. The characteristic property of the fibrous coat is contractility. If it be mechanically irritated, or if a chemical stimulant, such as ardent spirit or ammonia, be applied to it, the vessel contracts forcibly upon its contents. The contractile power, which properly belongs to the muscular fibre, induced anatomists to believe that the fibrous tunic consists of muscular fibres; but careful examination has shown that its organisation possess nothing in common with that of the muscular tissue, while chemical analysis has demonstrated that it contains no fibrin, which is the basis of muscle.

3. The external tunic, called also the cellular, consists of small whitish fibres, very dense and tough, interlaced together in every direction. It is much thicker in the large trunks than in the small branches, the reverse of the fibrous coat. Its outer surface is covered by a loose and flocculent cellular substance, which connects the artery with the surrounding parts, and particularly with the sheath of the vessel. Its firmness and resistance are so great that it is not divided however firmly a ligature may be placed around the artery; and its elasticity, especially in the longitudinal direction is so remarkable that it has been called, by way of eminence, the elastic coat.

Arteries are themselves abundantly supplied with arteries, constituting their nutrient vessels, and called *Vasa Vasorum;* but these nutrient vessels of the artery form but few anastomoses, that is, few communications with any other arteries.

The principal nerves of arteries are derived from the ganglionic or the organic system, but with these are mingled branches derived from the sentient or the animal system. [Nerve.] Accordingly, under ordinary circumstances, arteries carry on their functions independently of any influence derived from the brain and spinal cord, but they are capable of being affected by agents applied to those organs.

Among the physical properties of arteries, the most important are their extensiblity and their elasticity. Their extensibility is chiefly in the direction of their length.

After an artery has been extended, either lengthwise or transversely, it suddenly retracts on itself when the extending force is removed. If the finger be forcibly introduced into the section of a large artery, the sides of the vessel re-act on the finger, and proportionally compress it. If an artery be divided in the dead body, though emptied of its contents, it maintains its cylindrical form, and preserves its capacity unimpaired. The elastic property on which these phenomena depend is common to all the coats, but it is greatest in the external tunic, and least in the internal tunic, and it is also much greater in the large trunks than in the small branches.

The most important vital property of the artery is its contractility, that is, its power of diminishing its capacity, or approximating its parietes, and thus proportionally acting upon its contents. Even the large trunks possess this property in some degree; but it resides chiefly in the ultimate divisions of the arterial branches, that is, the capillary vessels. [Capillary Vessels.]

ASARONE. [Chemistry, *S.* 2.]

ASHBURTON, ALEXANDER BARING, BARON, was born October 27, 1774, and was the second son of Sir Francis

Baring, Bart., an eminent merchant in the city of London. He was removed from school at a rather early age, and placed in the mercantile establishment of his father. Having here completed his commercial training he was sent to the United States, where, and in Canada, he for some years conducted the American business of the firm. Here he acquired much of that wide and varied commercial knowledge which, later in life, gave so much authority to his opinions on all matters connected with trade and commerce. In 1798 he married the daughter of William Bingham, Esq., Senator of the United States; and on the death of his father in 1810 he became the head of the great firm of Baring, Brothers, and Co.

Mr. Baring entered Parliament in 1812 as member for Taunton, which town he continued to represent till 1820, when he was returned for Callington, and remained its representative until it was disfranchised by the Reform Act. Prior to the introduction of the Reform Bill, Mr. Baring had voted steadily with the whig party; but he warmly opposed that measure, and in future ranked among the supporters of Sir Robert Peel. When Peel accepted office in December, 1834, he acknowledged the advantage which he had derived from the adhesion of his proselyte, by introducing Mr. Baring into his Cabinet as President of the Board of Trade and Master of the Mint. The appointment was a popular one, especially in the City and with the House of Commons, where Mr. Baring had long been regarded as a high authority on all commercial subjects. But the ministry had but a short tenure of office, Peel resigned in April, 1835, and the President of the Board of Trade of course went out with him—having, however, first been created Baron Ashburton. When Sir Robert Peel returned to office, September 1841, the differences of the United States respecting the boundary question excited some anxiety, and Peel requested Lord Ashburton to proceed to America as special commissioner, with powers to conclude a definite treaty. Both in England and America the nomination was received with satisfaction; and Lord Ashburton conducted the negociations in so conciliatory a spirit, that Sir Robert Peel was able at the opening of the session of 1843 to announce that a treaty had been concluded with the United States, in which "the adjustment of the boundary question was far more favourable to this country than the award of the King of the Netherlands," and that the other points under discussion between the two governments had been arranged in an equally satisfactory manner. In the House of Lords, Lord Ashburton continued to support the policy of Sir Robert Peel until that statesman brought forward his bill for the repeal of the duties on the importation of corn, when he gave to that measure a resolute opposition. After it became law he took little part in politics. He died May 13, 1848, and was succeeded in the title by his son the present peer.

Lord Ashburton cannot be termed a statesman in the proper acceptation of the term. But he brought to the consideration of political questions a clear calm business-like understanding and considerable experience, and though far from an eloquent speaker, his extensive knowledge and unquestioned probity, as well as his high mercantile standing, caused him in his place as a member of either branch of the legislature to be always listened to with respect. As a public man he will be remembered in connection with the treaty which is usually called by his name. Lord Ashburton was also well known as a liberal patron of arts and artists, not neglecting while forming a valuable collection of pictures by ancient masters to employ living painters. He held the office of trustee of both the National Gallery and British Museum.

ASIA. Of late our knowledge of Asia has been considerably augmented. The Russians have steadily and systematically pursued the exploration of their vast dominions in the north; while the English have continued their surveys and researches in the south and west. The eastern and central portions of Asia alone, particularly the Chinese and Japanese empires, have remained little known; hitherto inaccessible to and unaffected by the rapid tides of progress and civilisation which have extended over the rest of the world. The Euphrates and the Tigris, with the adjoining regions from the Mediterranean to the Persian Gulf, were thoroughly explored and surveyed by the expedition under Colonel Chesney in 1835 and 1836, despatched to ascertain the practicability of a steam-boat communication with India by that route. In 1836 an expedition was despatched by the Imperial Academy of Sciences at St. Petersburg, for the purpose of making a trigonometrical survey from the shores of the Black Sea to those of the Caspian, in order to ascertain the difference of their comparative levels; a question which had excited great interest for twenty-five years previously. This expedition consisted of Messrs. Fuss, Sabler, and Sawidsh, who within two years succeeded in making a most accurate survey, by which it was determined that the level of the Caspian was 84 feet below that of the Black Sea.

During the years 1834 to 1837 Asia Minor was explored by Callier, De Texier, Brant, and W. J. Hamilton, the last of whom has given us a very valuable account of the physical geography of the peninsula, and has ascertained the sites of many ancient cities. From 1832 to 1837 Fedorow accomplished an important journey through Siberia, between Orenburg and Irkutzk, and between the parallels of 46° and 66° N., and determined many points astronomically and trigonometrically, which formed a new basis for the geography of those regions. During the same years Baer, Pakhtusow, and Ziwolka made additions to the geography of Nova-Zembla, and determined a portion of its eastern coast. In 1836 and 1837 Professor Koch explored the Caucasus, and published the results of his researches in various works, to which a large map was subsequently added.

In 1837 the interesting discovery was made by Moor and Beke of the level of the Dead Sea being considerably below that of the ocean. Shortly afterwards Shubest corroborated this curious fact, and ascertained that this great depression extends over the whole of El Ghor, comprising the valley of the Jordan as far as the Lake of Tiberias. The first accurate measurements of the altitude of both the Dead Sea and the Lake of Tiberias were made in 1838 and 1839 by De Berton and Russegger, and subsequently repeated by Symonds, Wildenbruch, and the American expedition in 1841, 1845, and 1848. By Symonds's trigonometrical survey it was found that the depression of the Dead Sea amounted to 1312 feet; but his result for the depression of the Lake of Tiberias was shown to be very erroneous. This latter point has been ascertained by the American expedition to be 652 feet below the level of the sea, a result which agrees satisfactorily with the previous observations of De Berton, Russegger, and Wildenbruch.

Arabia, particularly its eastern extremity, was explored by Wellsted in the years 1835 and 1836; and in the latter year Lieutenant Cruttenden visited the south-western portions of the same country. In 1843 Baron von Wrede made an important journey to Hadramaut, and in 1853 Lieutenant Richard F. Burton, of the Bombay army, in the disguise of an Afghan pilgrim, performed an interesting journey from Yamba on the Red Sea to Medina and Mecca. In 1836 an interesting journey was made in Kuzistan and Luristan by Major Rawlinson; and an expedition to Kurdistan, under Ainsworth, started from Constantinople in 1838, and during two years explored a considerable portion of Asia Minor, Armenia, and Kurdistan. The still more recent travels and discoveries of Dr. Layard have greatly increased our acquaintance with the geography of Kurdistan and Assyria. In the regions of the Himalaya Mountains and Afghanistan important additions to geography were made by Burnes, Wood, Vigne, and others. Vigne proceeded as far as Iskardoh, and thoroughly explored the valley of Cashmere; while Lieutenant Wood reached the source of the river Oxus, or Amur of the moderns, formed by a lake on the plateau of Pamir, at an elevation of upwards of 15,000 feet above the level of the sea. Cashmere was also visited by Baron von Hügel. Lycia and other parts of Asia Minor were visited by Fellows in 1839 and 1840, and also by Hoskyn. In 1843 a Russian expedition under Middendorf was despatched for the purpose of reaching Cape Taimura, the northernmost point of Asia; but the country they had to traverse was found to consist of immense marshes, uninhabited, and possessing scarcely any animal or vegetable life, and after having undergone considerable hardships the expedition had to return without having reached its destination. About the same time the northern Ural was scientifically explored by Hoffmann, Keyserling, Krusenstern, and others, and rich gold alluvia were discovered in the regions of the Altaï. The Aralo-Caspian regions were also visited by Basiner and Lehmann. In 1847 an exploring expedition to the Tibetan frontiers was undertaken by the Indian government. This expedition consisted of Captain Cunningham, Lieutenant Strachey, and Dr. Thomson. Previously, in 1846, Lieutenant Strachey had succeeded in reaching the lake of Manasarowara

(Cho Mapan), and Rakas Tal (Cho Lagan), situated far within the Tibetan frontier on the northern flank of the Himalaya Mountains, and the reputed source of the Sutlej and Sampoo. Their elevation he found to be 15,250 feet above the level of the sea. The expedition proceeded along the upper valley of the Sutlej, Lieutenant Strachey continuing his course down the Parang River, while Captain Cunningham and Dr. Thomson proceeded to Haulé, over the Ladak Pass, and subsequently proceeded to Lé, the capital of Ladak, whence Dr. Thomson proceeded to the Karakorum Pass. Independently of this expedition great additions were made to the geography of the Eastern Himalaya by Dr. Campbell and Dr. J. W. Hooker. The latter gentleman has examined the whole of the Sikkim and Himalaya of East Nepaul, with the adjacent provinces of Tibet to the north. Among other researches Dr. Hooker traced the course of all the Sikkim rivers to their sources in Tibet, and examined glaciers and moraines at heights extending to 19,000 feet. He confirmed the statement first published by Dr. Thomson, and afterwards by Captain R. Strachey, that the Himalaya mountain ridge of our maps is an imaginary line drawn through certain lofty peaks which, catching all the moisture of Hindustan, retain it in snow and ice; and that the country of Tibet, north of the snowy Himalaya, is no plain or plateau, but presents for seventy miles a succession of mountains, which, though ranging from 19,000 to 20,000 feet in height, with flat narrow valleys between, are wholly uncovered by snow.

The brothers, Adolf and Robert Schlagintweit, who travel by the desire of the king of Prussia, and at the suggestion of Baron Humboldt, were employed, under the patronage of the East India Company, in the physical survey of the distant trans-Himalaya regions. They have laid down the entire mountain-system of Kumaon. Adolf Schlagintweit, after visiting the glaciers of Pindari, was joined by his brother Robert; and they examined together the glacier of Milum, which surpasses in extent all those of Switzerland, being from eight to ten miles in length, and 3000 feet broad. In 1855 their geological excursions in Eastern Tibet by Niti and Gertope to the glacier of Ibi Gamin, have been of great interest. They reached it in August 1855, and fixed the height they attained on Ibi Gamin at 22,260 feet. In Western Tibet, in August, 1856, they passed the chain of the Kuen-Luen mountains, the axis of which had never before been crossed by any European traveller, and reached Eltsehi in the province of Khotan. These two brothers have, in fact, penetrated farther into Tibet and Tartary, from the plains of India, than any other European; they have even made photographic sketches at heights of 20,000 feet above the sea, and their physical, geological, and geographical observations are of the highest value.

Borneo of all the East India Islands has most advanced in respect to geographical elucidation. The researches of Sir James Brooke, Captain Keppel, Mr. Low, Marryat, Captain Mundy, Sir E. Belcher, and Baron Melvill de Carnbee have accumulated and brought to public notice a rich store of geographical knowledge, particularly on the north-western side of that magnificent island.

The trigonometrical survey of India has steadily progressed under the superintendence of Lieutenant-Colonel Waugh, the surveyor-general. Among other interesting results he carefully measured the altitude of the Sikkim Himalaya, and found Kunchinjinga to be 28,178 feet above the level of the sea, the highest point of the globe as yet measured. A valuable map of the whole of India, divided into collectorates and provinces, with some of the recently acquired territories, was published by the East India Company in June, 1853. As already mentioned in a preceding part of this article, our knowledge of the Chinese empire has but little increased; Mr. Gutzlaff has left voluminous but rather undigested materials; Mr. Fortune's explorations of the tea-growing provinces are interesting, but do not extend far into the interior. The travels of the French missionaries, Huc and Gabet, have given some insight into the interior of this vast empire. Some light has likewise been thrown by French missionaries on the great northern region of China, called Mandchouria. A complete and exhaustive account of the island of Chusan has been published by Sir John Davis.

ASPARAGIN. [Chemistry, *S.* 1.]

ASPE'RULA, a genus of plants belonging to the natural order *Rubiaceæ* or *Galiaceæ*. The genus is known by its funnel-shaped corolla, and by the fruit being dry and not crowned with the limb of the calyx.

A. odorata, the Woodruff, has its leaves six or eight in a whorl, with perfectly white flowers. It occurs in woods, and is found throughout Europe. It is abundant in some parts of England. The whole plant is remarkable for its fragrance when dried.

A. Cynanchicha has it leaves four in a whorl, and flowers of a lilac colour. It is found on dry banks and hills in limestone districts. It is common in Great Britain, where it is called Quinsy-Wort on account of its supposed value as a remedy in sore throat. It is slightly astringent. Two other species, *A. arvensis* and *A. taurina*, are doubtful natives, but found wild now in England.

ASPIDOPHO'RUS, a genus of Acanthopterygious Fishes. One species, the *A. Europæus* is found on the coasts of England and Scotland. It is known by the names of the Armed Bullhead, the Pogge, the Lyrie, Sea-Poacher, Pluck, and Noble. It is a small fish seldom exceeding 6 inches in length. (Yarrell, *British Fishes*.)

ASSIGNMENT OF CHATTELS. [Bill of Sale, *S.* 2.]

ASTERI'NA, a genus of Star-Fishes, including the smallest of the British species, *A. gibbosa* of Pennant. The Gibbous Starlet has a 5-sided body, which is thick and covered above and below with short spines; the avenues are bordered by a single row of spines, and the suckers are in two rows. De Blainville makes out of this species two, which he calls *Asterias minuta* and *A. pulchella*. *A. gibbosa* is found very generally around the British Islands, and also in the Mediterranean, and on all the shores of Europe.

ASTRONOMY. [Uranography.]

ASTROPHY'TON, a genus of Star-Fishes, remarkable for the branched character of its rays. One species, the *A. scutatum*, is British. It is however a rare animal; and although occasionally found in other places, is most commonly caught off the Shetlands: hence it is called the Shetland Argus. (Forbes, *British Star-Fishes*.)

ASTUR. [Falconidæ.]

ASUNCION, the capital of the department of Asuncion and of the republic of Paraguay, in South America, is situated on the eastern or left bank of the river Paraguay, in 25° 16′ S. lat., 57° 47′ W. long., at a short distance above the mouth of the Araguai branch of the Pilcomayo. The city, which stands upon a commanding spot, was built in 1535 by a colony of Spaniards under Juan de Salazar; and from the convenience of its situation speedily became a place of some consequence. It was nearly destroyed by fire in 1543, the greater part of the houses being built of wood. From this calamity it speedily recovered; and in 1547 was a place of sufficient importance to be erected into a bishop's see. It contains a cathedral, three parish churches, and four convents and monasteries. It once contained a college of Jesuits. Properly speaking the town consists of only one street surrounded by several lanes and a great number of houses which stand apart and are surrounded by groves of orange trees. Even in the principal street most of the houses are small and consist merely of a shop with two or three apartments attached to it. Few of the houses have flat roofs; the greater part are covered with tiles. The best buildings in the city are those mentioned above. The inhabitants are of European and Indian descent with the addition of a few negroes; their number is estimated at 10,000. Asuncion carries on a considerable trade in the export of hides, tobacco, sugar, and maté or Paraguay Tea, which is largely used all through South America. Great numbers of horned cattle, horses, mules, asses, sheep, and goats are bred by the farmers, who grow wheat, maize, sugar, tobacco, cotton, mandioc, potatoes, and other vegetables. Honey and wax are produced in abundance; and the rivers supply large quantities of fish.

The air in and about Asuncion is generally temperate and genial; for the greater part of the year the wind blows from the south.

The policy of the late Dictator of Paraguay, Dr. Francia, in prohibiting all intercourse with foreigners and with the surrounding states, preserved the republic from the miseries of constant civil and political commotions so characteristic of the neighbouring American republics; but was very detrimental to the trade of Asuncion and of the republic generally. By treaties however concluded with the President of Paraguay in March 1853, the subjects of Great Britain, France, Sardinia, and the United States are free to navigate the rivers of Paraguay, and to settle and trade in any of the towns of the republic. In the dry season vessels drawing 6 feet water and in the wet season vessels drawing 12 feet can sail up to

Asuncion, above which the river Paraguay is navigable for vessels of considerable size for 600 miles.

ATHAMANTINE. [CHEMISTRY, *S.* 2.]

ATROPINE. [CHEMISTRY, *S.* 2.]

ATTACHMENT OF DEBTS. A creditor who has recovered judgment against his debtor, may now, on obtaining a judge's order to that effect, attach the debts due to the judgment debtor by third parties; then either by a summary application to a judge at chambers, or where the debt is disputed by the garnishee (the person in whose hands the attachment has been laid), by proceedings similar to those in an ordinary action, enforce payment of these debts to himself, in discharge of his own claim; such payment operating as a discharge to the debtor. ('Common Law Procedure Act,' 1854.)

AUCKLAND. [ZEALAND, NEW.]

AUCKLAND, GEORGE EDEN, 2ND LORD AND 1ST EARL OF, eldest surviving son of the 1st lord, was born in 1784. After receiving his education at Eton and Oxford, he entered the House of Commons as M.P. for Woodstock, but was soon removed to the House of Lords by his father's death. He formed a part of the Whig administration as President of the Board of Trade, and was appointed First Lord of the Admiralty by Lord Melbourne in 1834. In the following year he went out to India as governor-general. His administration is marked by the ill-advised Afghan war (1838-39.) The Earl of Auckland was recalled to England in 1842, having been previously advanced to an earldom: the final settlement of the Afghan affairs was left for his successor, the Earl of Ellenborough. Lord Auckland died suddenly, January 1st, 1849.

AUCKLAND ISLANDS, named after Lord Auckland, lie in 51° S. lat., 166° E. long., about 900 miles S.E. from Van Diemen's Land, and 180 miles S. from New Zealand. The group, which was discovered in 1806 by Captain Briscoe, consists of one large island and several smaller ones. Auckland, the largest of the group, is about 30 miles long and 15 miles broad, and contains about 100,000 acres. The entire group is of volcanic formation, composed of greenstone and basalt, and has a wild and picturesque appearance. The highest hill, situated on Auckland Island, is estimated at about 1350 feet above the level of the sea. There is a marked difference between the west and east coast of Auckland Island, the west coast presenting towards the sea a line of precipitous cliffs, whereas the east coast exhibits here and there a fine sandy beach, upon which the sea scarcely breaks, and is intersected by numerous streams and inlets; while the elevated land from the sea-beach to the summit is clothed with luxuriant vegetation and covered with a thick layer of vegetable manure, producing an abundant growth of large ferns. The eastern coast contains two principal harbours, formed by inlets of the sea, which reach to within two or three miles of the western coast, and are only six miles from each other. Port Ross, at the western extremity of the island, is protected from all winds except the south-east, and has a good tenacious clay bottom. Port Ross contains an upper inlet called Laurie Harbour, about four miles wide, and perfectly landlocked; while the steep beach on the southern side of the harbour affords great facility for clearing and reloading vessels.

The climate has been described by Sir James Ross, Captain Briscoe, and other navigators who have visited the islands, as mild, temperate, and salubrious. The temperature in the valleys is scarcely ever lower in winter than 38°, or higher in summer than 78°. The weather is generally good, but there are occasional high winds and heavy rains. Auckland Island is abundantly supplied with small streams. The soil is very productive. The hills, except a few of the highest, are thickly covered with large trees. The elevated ground is covered with moss and a kind of tall grass. Dr. Hooker notices the Auckland Islands as remarkable for the variety of their vegetable productions, eighty flowering plants having been found; and no less than fifty-six of them, till then unknown, have been noticed for their beauty and novelty. The only animals found on the island are goats and rabbits. Pigs were left on Auckland Island in 1807 by Captain Briscoe, on his second visit, and these animals have greatly increased in number. In the woods three or four species of small singing-birds were found. On the heights petrels breed in considerable numbers. Hawks, gray ducks, snipes, cormorants, and the common shag also inhabit the islands. Fish are plentiful on the eastern coast of Auckland Island, and the rocks are covered with limpets; while the whale fishing carried on in the neighbouring seas may yet become very valuable. Sir James Ross mentions that while he was in Laurie Harbour many sperm-whales came into the anchorage.

The Auckland Islands were granted by government to the Messrs. Enderby on advantageous terms, in consideration of the services rendered by their father to this country, as also for the more recent discoveries of the southern continent by Captain Briscoe whilst in the employ of the Messrs. Enderby. A company to which the Messrs. Enderby ceded their privileges, obtained a charter of incorporation on the 16th of January, 1849, for the purpose of prosecuting the whale fishery from the Auckland Islands; and Laurie Harbour was chosen as the head station of the company, from the superior facilities it affords to whaling vessels. The islands were uninhabited until the Southern Whale Fishery Company, under the conduct of one of the Messrs. Enderby, made a settlement there in 1849.

AUDOUIN, JEAN VICTOR, was born at Paris on the 27th of April, 1797. His early education was intended to fit him for the law, but his inclinations were towards the study of organic nature, and he accordingly gave up the law for the study of medicine. His mind was early directed to the study of the natural history of insects. The first paper which he published was a description of an animal belonging to the class *Insecta*, in 1818, and from this date to the time of his death, his labours in this branch of study were incessant. The results of most of his investigations were published in the form of contributions to the various journals or in the Transactions of societies. These papers were numerous, and they are all valuable.

His early papers on the anatomy of the *Insecta*, and especially those on the *Annelida*, introduced him to the notice of Cuvier, Geoffroy St. Hilaire, and Latreille, with whom he lived on terms of intimacy, and from whose instruction he obtained those enlarged views of the relations of the animal kingdom which are so conspicuous in all his writings. In 1826 he became connected with M. Milne-Edwards in researches upon the *Crustacea* and *Annelida*, which resulted in a great addition to existing knowledge on the subject of the minute anatomy and functions of these animals. In the same year he became assistant to Lamarck and Latreille in the Jardin des Plantes, Paris, and on the death of the latter he was appointed professor of entomology in the museum attached to that institution. In his lectures here he paid particular attention to those insects which were injurious to vegetation. His investigation of the economy of insects was very extensive, and only a small portion of the matter he had collected was published before his death. He left behind him fourteen quarto volumes of manuscript on this subject, with numerous drawings. Audouin, at the request of the government of France, prepared and published a work, entitled 'Histoire des Insectes nuisibles à la Vigne, et particulièrement de la Pyrale qui dévaste les Vignolles des Départemens de la Côte-d'Or, de Saône-et-Loire, du Rhône, de l'Herault, des Pyrénées-Orientales, de la Haute-Garonne, de la Charente-Inférieure, de la Maine, et de Seine-et-Oise.' It came out in six parts quarto. The first part appeared in 1840, but the last did not appear till some time after the author's death, in 1843. The work treats not only of the natural history of these insects, but also of the means of preventing their increase and of destroying them. It is illustrated with beautiful plates, after drawings by the author, and, whether regarded as an example of careful observation, and the application of science to a practical subject, or for the beauty of its illustrations, is probably one of the most valuable ever contributed to entomology.

Audouin fell an early victim to the pursuit of his favourite science. In the summer of 1841 he visited the south of France, for the purpose of investigating the habits of the insects which injure the olive-plantations. Here he exposed himself to wet and cold, which brought on an attack of apoplexy, of which he died on the 9th of November, 1841. On the day of his funeral orations were delivered at his tomb by M. Serres, president of the Academy of Sciences; M. Chevreul, director of the Museum of Natural History; by M. Milne-Edwards, and M. Blanchard. Audouin had collected a fine museum, not only of individual insects, but of specimens illustrating their economy. These were exhibited after his death at the museum of the Jardin des Plantes. His library was large, and when sold by public auction at his decease realised 20,000 francs.

It would be unjust to Audouin to regard him as a mere entomologist. He was a comparative anatomist and naturalist, whose power of acute observation peculiarly adapted him for the study of the habits and the structure of insects. In all his more important papers on entomology, it is evident that he did not regard insects as the end of his inquiries, but that he looked upon them as a great class of phenomena, illustrating the general laws that were deducible from the study of the whole animal kingdom. With him external forms were only regarded as dependent on an internal structure, which in its development, and the functions it performed, stood closely related to the whole animal kingdom. It was thus that he was led to investigate the annulose sub-kingdom of animals, and succeeded in adding to science so many important facts which assist in indicating the true relation of these animals to one or the other division of the animal kingdom.

(Abridged from the *Biographical Dictionary of the Society for the Diffusion of Useful Knowledge*.)

AUDUBON, JOHN JAMES, an eminent American naturalist, was born in Louisiana, in the United States, on the 4th of May, 1780. Both his parents were French. His father, who was an ardent admirer of the beauties of external nature, endeavoured from his earliest years to foster in him a similar taste, and especially directed his attention to the many tribes of birds which inhabited that part of the state in which they resided. The boy's passion for the study of birds and everything connected with them, soon outran his father's promptings. While still a child he obtained possession of several of the splendid-plumaged specimens of American birds, and cherished them as his choicest treasures. At this period, when any of his birds died, his chief regret was that he could no longer, either himself retain what had been so bright, or convey to others a notion of the departed brilliance. His father having placed under his eyes a book of ornithological illustrations, the boy determined to become a draughtsman himself.

Feeling his deficiency in the elements of drawing, he applied himself with great assiduity to acquire the ability to draw well. At length, when he was about fourteen, his father took him to Paris, and placed him in the studio of the celebrated David. Here, though he neglected the study of the higher principles of art, he became a skilful draughtsman; and satisfied with having obtained the competency necessary to his views, he threw aside the lessons of the famous master; and, at the age of seventeen, returned to the 'Birds of America.'

In 1798 his father gave him a farm in Pennsylvania, near the river Schuylkil, but he sadly neglected his agricultural duties. Of his occupations here, he says, "my rambles invariably commenced at break of day, and to return wet with dew and bearing a feathered prize, was, and ever will be, the highest enjoyment for which I have been fitted." About this time he married a very interesting and accomplished young lady, who shared his after honours. For nearly twenty years he now pursued commerce (nominally); and his success was what may be easily supposed. He removed westward to Louisville, and there first met Wilson, whose example excited still more a zeal that needed no spur. In 1810 he sallied forth on a great exploring expedition, and sailed down the Ohio with his wife and child, bird-sketching as he went. In the next year he explored Florida. Finding the joint pursuit of business and science impossible for him, he at length abandoned his nominal business altogether.

On the 5th of April 1824, he visited Philadelphia, where Dr. Mease, his only intimate friend in the place, introduced him to Charles Lucien Bonaparte, prince de Musignano, himself an ardent ornithologist, and who, as is well known, published a splendid continuation of 'Wilson's Ornithology.' The prince warmly encouraged him in his plans, and he now began seriously to contemplate publication. From Philadelphia he went to New York; and thence, taking the Hudson for his high-road, penetrated into the pathless forests. It was now he projected, in a methodical manner, his famous publication of illustrations, which he divided into numbers, to each number five plates, according to the size of the objects. All Audubon's illustrations are of the dimensions of nature; and very often they are presented also in the most capricious attitudes, but with the strictest fidelity to nature.

After a ramble of eighteen months, he returned to his family in Louisiana; explored all the surrounding forests, and then sailed to Europe. Without the means of publishing his great work, the third part of which, when it appeared, cost 40*l.* per copy to the purchaser, he landed at Liverpool in 1826. His letters of introduction procured him a cordial, and even enthusiastic, reception in that town, in Manchester, and in Edinburgh, where he commenced the publication of his illustrations and descriptions of the 'Birds of America.' The work, however, was quickly transferred to the hands of London artists. In September 1828, he once more visited France, where he was rapturously welcomed by the scientific world. Baron Cuvier pronounced a panegyric of him before the Institute. Charles X., Louis Philippe, and the Duchess of Orleans, the Duke of Messina, Cuvier, Humboldt, the Institute, and others, joined his subscription list. By the 25th of November 1828, the eleventh number of the work, and 100 plates, had appeared.

He now determined to revisit America for the purpose of refreshing some of his drawings, and of bringing his wife back with him to Europe. On the 1st of April he set sail, and in about a year he returned with Mrs. Audubon. Having again gone back with his wife to America in August 1831, he proceeded to Florida, explored the forests of Maine, made a voyage to the Gulf of the St. Lawrence and the coast of Labrador, and visited Newfoundland and Nova Scotia. On the 28th of April 1833 he held at New York, where now the greatest honour was paid to him, an exhibition of his illustrations of American water-birds. In 1834 he again went to Florida, and thence to Texas. The scientific fruits of Audubon's romantic rambles had procured him many tokens of respect. He became a Fellow of the Linnæan and Zoological Societies of London; of the Lyceum of Natural History at New York; of the Natural History Society at Paris; of the Wernerian Society of Edinburgh; honorary member of the Society of Natural History at Manchester, of the Royal Scottish Academy of Painting, Sculpture, and Architecture, and other less important associations. Audubon's book was the largest and grandest which had been published on Ornithology. Every sort of bird is engraved, male, female, and young. The drawings are admirable; and the descriptions are second in merit to those of Wilson only. Audubon's peaceful and enthusiastic life of exploration and study was prolonged to the ripe age of 71. He died on the 27th of January 1851, at Minnies-land, near the city of New York.

AUSTRALIA. In the article AUSTRALIA, of the 'Penny Cyclopædia,' a brief narrative has been given of the successive discoveries of the various exterior portions of the continent, and also of the most important surveys of the coasts. The principal journeys of exploration of the interior which had then been made were conducted by Wentworth, Hume, Cunningham, Oxley, and Sturt, and the information acquired is embodied in the article above-mentioned.

Further Progress of Discovery. Captain Sturt, in 1828, had discovered the river Darling, and traced it downwards to 30° S. lat., where he was obliged by want of water to abandon it. At the end of 1829 Captain Sturt was again sent into the interior, to trace the farther course of the rivers. He proceeded to the south of Sydney, and intersecting the Murrumbidgee, passed thence to the Murray. Sir Thomas Mitchell, in 1835, traced the Darling from the point where Sturt had left it in 1828 down to 32° 26′ S. lat. In 1836 Sir Thomas Mitchell followed the course of the Lachlan downwards, and crossing from that river to the Murrumbidgee, from it gained the banks of the Murray, and, following its course, reached the Darling at its confluence with the Murray.

In 1837-38-39, Captain George Grey conducted two expeditions in north-west and western Australia, and made some important discoveries in Western Australia between Cape Cuvier, 24° S. lat., and Swan River 32° S. lat.

In 1838 Captain Sturt led an exploring party overland from New South Wales along the banks of the Murray. He commenced his journey at the ford where the Hume intersects the road to Port Philip, and in so doing connected the whole of the waters of the south-east angle of the Australian continent.

In 1839 Mr. Eyre fitted out an expedition, and tried to penetrate northwards into the interior; but having descended into the basin of Lake Torrens, he was baffled at every point. He therefore went to Port Lincoln, whence he proceeded along the line of the south coast to Fowler's Bay, the western limit of the colony of South Australia. He then left the coast, and pushed boldly forward to the N.E. for Mount Arden along the Gawler Range, but was unable to advance farther than 29° 30′.

In 1840 Mr. Eyre again conducted another expedition towards the central part of the continent. He was unable to penetrate to the north, but steadily advancing westward, after a journey of excessive difficulty and privation, established the startling fact that there is not a single water-course to be found on the south coast of Australia from Port Lincoln to King George's Sound, a distance of more than 1,500 miles.

Whilst these attempts were being made to penetrate towards the interior from the south, Captain Wickham, in Her Majesty's naval service, was actively engaged on the northern coast. In command of the Beagle, he carried on a survey of the intertropical shores of the continent, which led to the discovery of two considerable rivers—the Victoria, in 14° 26′ S. lat., 129° 22′ E. long, and the Albert, in 17° 35′ S. lat., 139° 54′ E. long. Captain Stokes succeeded Captain Wickham in the command of the Beagle, and penetrated nearer to the centre than had been done before.

Captain Sturt, in his last journey, left Adelaide on the 15th of August, 1844, and following the course of the Murray as far as its confluence with the Darling, then struck northwards. Crossing vast tracts of barren ground and the great stony desert, on the 8th of September, 1845, he reached 24° 30′ S. lat., 138° E. long. He arrived at Adelaide on his return, Jan. 19, 1846.

Sir Thomas Mitchell spent the year 1846 in an exploring journey into the interior of tropical Australia, making his way immediately to the westward of the mountain range which bounds the country to the west and north of Moreton Bay. He had to pass over a great deal of dry and barren land, but he also discovered a large extent of singularly beautiful and rich country, especially about the head of a river which he discovered near 25° S. lat., and which he named the Victoria. It trended to the north-west. Mitchell, however, was unable to continue his way to the head of the Gulf of Carpentaria, the main object of the journey; but as he was strongly of opinion that the Victoria would be found to fall into the Gulf of Carpentaria, Mr. Kennedy, after the return of the expedition, was despatched to continue the search along its banks. He found that the Victoria, called by the natives the Barcoo, soon turned to the south-west towards the interior. He followed it for about 100 miles beyond the point where it was left by Mitchell, and until it dwindled away and was lost in the sand in 26° 15′ 9″ S. lat., when, owing to the failure of water, he was compelled to return. Making his way homeward by a route much to the west of that by which he as well as Mitchell had before proceeded, he discovered a wide extent of rich and well-watered pastoral country.

Dr. Leichhardt started on his overland expedition from Moreton Bay to the north coast, at the end of September, 1844, and reached Port Essington, at the end of the year 1845. In this journey Dr. Leichhardt crossed a large extent of beautiful and fertile country. At the end of 1846 he started on a still more difficult and perilous journey, from the eastern coast to the western, across or on the skirts of the great desert which had been partly explored by Sturt in 1844, 1845, and 1846. In this last and fatal journey he found a country of remarkable beauty and fertility—a discovery which he, with characteristic ardour, returned 300 miles to the nearest frontier station to report. The richness of this part of Australia is therefore well established; and although the frequent failure of the streams is at present a complete bar to any successful squatting settlements, little appears to be wanting for the development of its resources besides the construction of dams, by which the channels of many of the streams might be at once converted into canals for the reservation of the water, and of reservoirs, for which the undulations of the land afford peculiar facilities. Dr. Leichhardt, in this last journey, was accompanied by Mr. Lynd, whose name has been given to one of the rivers on the east coast. Dr. Leichhardt has not since been heard of, and there seems to be hardly a doubt that he and all his party have perished in the great central desert.

The latest expedition to the interior of Australia was that of Mr. A. C. Gregory, from the north coast, which was organised at Moreton Bay, and proceeded by sea to the mouth of the Victoria River. The horses were landed at Point Pierce, in Sept. 1855; and to the 9th of May, 1856, the party was employed in preliminary details, and in the exploration of the country to the south of the Victoria River, having penetrated the interior deserts to 18° 20′ S. lat., 127° 30′ E. long. On the 21st of June Mr. Gregory left the encampment on the Victoria River, accompanied by six persons. The arid nature of the country compelled them to increase the latitude to 15° S., after which they kept parallel to the coast as far inland as water could be found in the rivers, the greatest distance from the sea not exceeding 100 miles. Proceeding thus they reached the Albert River, Aug. 30, and left it Sept. 3, and made some ineffectual attempts to proceed to the south-east. Want of water compelled them to pursue a route parallel to the coast, to 17° 20′ S. lat., when the Gilbert River enabled them to follow a south-east course. Crossing the head-waters of the Lynd in 18° 40′ they reached the Burdekin, Oct. 16. Their route was then along the right bank of that river to the junction of the Suttor River, which was followed up to the Beylando. Tracing that river to lat. 22° they then pursued a south-east course to the junction of the Comet and Mackenzie Rivers, whence their course to the Dawson brought them, on the 22nd of November, to the farthest station of the settlers, whence they proceeded to Brisbane.

Surface, Hydrography, &c.—The Australian Alps, which occupy the south-eastern angle of the Australian continent, rise to an elevation of 7000 feet above the sea, and their summits are perpetually covered with snow. In the rest of the mountain-range which flanks the eastern coast, the loftiest summits seldom exceed the elevation of 4000 feet, though there are some which rise to 6000 feet.

North of 33° S. lat. the principal valleys are transverse, and the course of the rivers is consequently west and east. The Hunter river runs about 140 miles in that direction, declining, however, considerably towards the south. Its entire length from its source in the Liverpool range is above 200 miles. It is navigable for small vessels up to Morpeth, about 35 miles from its mouth. Its two principal tributaries, the William and the Patterson, both of which join it on the left, are navigable for a somewhat greater distance. At the mouth of the Hunter is the town of Newcastle, the chief shipping-town of the Hunter coal district. In the vicinity are extensive beds of good coal, which are largely wrought. Much of the copper from the Burra Burra and other South Australian mines is smelted here. Up the Hunter the land is much more fertile than along the coast, and the towns of East and West Maitland and Morpeth are the centres of thriving agricultural districts. The Manning River to the north of the Hunter, and the Hastings, which falls into Macquarie Bay, still farther north, also run nearly east and west: neither exceeds 100 miles in length. Port Stephens, about 20 miles north of the Hunter, is a bar-harbour, but convenient for small coasting vessels, and the outlet of the produce of the Australian Agricultural Company, a part of whose extensive territory stretches along its northern bank, and for a considerable distance up the river Karuah, of which it is the estuary. The estuary of the Hastings forms the small harbour of Port Macquarie.

North of Port Macquarie the country changes greatly in character. The mountains are very lofty, some of them attaining an altitude of 6000 feet, while the formations are granitic, trappean, and schistose. The streams are numerous and among them the Bellengen, the Clarence, the Richmond, and the Tweed, are navigable for coasting vessels. The vegetation is more luxuriant, assuming more and more of a tropical character as we proceed northward. The timber is of a larger and more useful character. Moreton Bay especially is characterised by its pines, of which the finest are the Moreton Bay Pine (*Araucaria Cunninghamii*) and the Bunya Bunya (*A. Bidwellii*). The cedars are also in great repute for the beauty of their wood, and the chestnuts are much valued. Cotton, coffee, sugar, and tobacco grow vigorously in this part of Australia; except tobacco, however, they are little cultivated, in consequence of the impossibility of obtaining labourers. Moreton Bay is a fine harbour, 60 miles long from north to south by from 3 to 20 miles wide. The islands Moreton and Stradbrooke stretch across its mouth, leaving on the south merely a narrow passage navigable only by boats, but on the north there is an entrance sufficiently wide and deep for ships of the largest size. Between the islands lies a dangerous sand-bar. The navigable rivers Brisbane and Logan, with several smaller streams, fall into the bay. The Brisbane is a large and important river, having its farthest source in the coast range near 152° E. long., and being fed in its course by numerous tributaries. It is navigable by vessels drawing 16 feet of water 20 miles from its mouth, where the ship navigation is stopped by a rocky shoal, but boats ascend 40 miles higher. The Moreton Bay district and the country northward appear to be free from the droughts which are so destructive in the southern parts of the country.

North of Moreton Bay the mountains recede to the west, and about 25° S. lat. become much lower, losing in fact, in a great measure, the character of mountains, and permitting a comparatively easy access to the extensive pastoral regions which Sir Thomas Mitchell and Dr. Leichhardt here discovered in the interior. On this part of the coast, near 22° S. lat., is Port Bowen, near Broad Sound, the outlet of the Nogoa and some other streams. Port Bowen is well adapted for steam navigation, and appears likely some day to become an important harbour. The country northward is almost unknown. The entire north-eastern coast, from 23° S. lat., is bordered by small islands and rocks forming what is known as the Great Barrier Reef.

We now return to the south and west coasts. To the west of Wilson's Promontory and the Australian Alps rise several chains of hills with intervening fertile plains and valleys. The chief are the Pyrenees, the Grampians, and the Victoria Range. The Grampians, which stretch north and south near 142° 20′ E. long., are the loftiest of these western mountains, the highest summit being Mount Williams, 4500 feet. From this chain descend several rivers. The most considerable of these is the Glenelg, which descends from the western slopes; it has a large body of water, but on account of sand-banks is unnavigable. The Wimmera and other streams which flow northward from the Grampians are lost in shallow lagoons, which are formed in the barren sands of the northern part of Victoria. The Yarra Yarra, which rises in the mountains east of Melbourne, flows past that city, below which it is navigable. The country north of these mountains, which forms the north-western portion of the province of Victoria, was named by Sir Thomas Mitchell, who first explored it, Australia Felix, on account of its apparent fertility. This tract affords very fine and extensive cattle-runs, but between it and the Murray is a dry and barren tract.

West of the Glenelg, in the colony of South Australia, near the coast, are low ranges of wooded hills and grassy plains, with more extensive and very rich plains farther inland, together with luxuriant forests, which extend to the foot of the Burr Mountains, the highest of which are 1000 feet above the sea. An isolated mountain, Mount Gambier, has an extinct crater on its summit. Between this and the Murray are low ranges of hills generally running parallel to the shore, and separated from each other by level plains, which are subject to inundations, but afford excellent pastures. Between the Murray and the Gulf of St. Vincent are several ridges of mountains, extending from Bryan Range in the north to Wakefield Range, which terminates in Encounter Bay. Mount Brown, near the head of Spencer's Gulf, is 3000 feet high. Beyond the mountains, and curving round their bases, is the remarkable depression known as Torrens Lake. At least a third of the tract between the Murray and the Gulf of St. Vincent is computed to be barren. In the narrow tract between the mountains and the eastern shore of the Gulf of St. Vincent stands the city of Adelaide. On the western shore of Spencer's Gulf is Port Lincoln, the best harbour in South Australia, and around it is much fertile country. Off the entrance of Spencer Gulf lies Kangaroo Island. West of this, to Streaky Bay, is a mountainous tract, known as Gawler's Range, the summits of which increase in height towards the west, where they attain an elevation of 2000 feet. West of Streaky Bay, and extending into Western Australia, is a waste and dreary country, covered merely with scrub.

The whole of the western end of the continent is included in Western Australia. The coast from Port Lincoln to King George's Sound forms the Great Australian Bight, and presents a very remarkable appearance; from Streaky Bay to Cape Arid, about 600 miles, there is an unbroken line of cliffs from 300 to 500 feet high. The interior here, as far as it has been explored, consists of apparently interminable plains: no river is visible and no fresh water procurable. Immediately west of the Great Australian Bight lies the Archipelago of the Recherche. About King George's Sound, at the mouth of which is the town of Albany, the country improves considerably. The surface is much broken, and there are lofty hills and rapid streams. From the south-west angle of the island a lofty range, called the Darling Mountains, which terminates there in Point D'Entrecasteaux and Cape Leeuwin, runs northward as far as Shark Bay, at a distance of from 50 to 100 miles from the coast, and rising from 800 to 3000 feet above the sea. Portions of these connected mountains are known as the Gairdner's, Moresby's, Herschel, and Victoria ranges. The highest summit, Tulbanop, is said to attain an elevation of 5000 feet. The formations are chiefly of red sandstone or limestone. They are mostly barren, but at some distance inland near the Blackwood River, which falls into the sea at the western angle of Flinders Bay, Mr. Roe found considerable forests of timber-trees fit for naval purposes; he also discovered good coal in two or three places. East of the mountains towards the interior are sandy deserts. Swan River has a bar at its mouth, but within it is navigable for some distance. The bed of the river rises rather rapidly from its mouth, and some distance inland the channel is frequently dry. Perth, the capital of Western Australia, is built at the mouth of Swan River.

Along the north-western coast the country differs considerably from any part of the continent hitherto described. Instead of a lofty range of hills rising at a short distance from the shore, the coast from North-West Cape along the Dampier Archipelago, to Roebuck Bay, and thence along Buccanier Archipelago up to the rocky promontory, near Prince Regent's River, is a low sandy level, covered with salsolaceous plants. Near Prince Regent's River the coast is broken into bold granitic head-lands, some of which are 800 to 1000 feet high. Numerous islands, some of them basaltic, line the coast, and the scenery is wild and striking. Mounts Trafalgar and Waterloo rise to the height of 900 feet, and numerous streams flow from them. Thence around the coast as far as Cambridge Gulf, are low hills. At Cambridge Gulf a river of some importance falls into the sea. It was named the Victoria by its discoverer, Captain Stokes, R.N., who traced it upwards for 140 miles, to a range of low hills, which he called the Fitzroy Range. In its lower course the Victoria flows through low, sandy, mangrove flats, which at its mouth have been cut into numerous islands, covered during floods; but higher up, its banks are hilly and very fertile. The Fitzroy range rises in one or two places to the height of 840 feet. From the Mosquito Flats a connected range, from 700 to 800 feet high, runs off to the north-east. Stretching away from the river towards the interior Captain Stokes saw apparently interminable plains.

North-east from the Victoria and the Fitzmaurice rivers is the Macdonald range, which consists of hills averaging from 400 to 600 feet in height. Nearer the shore, between Cambridge Gulf and the Gulf of Carpentaria, these hills become lower, and terminate generally in sandstone cliffs, seldom exceeding 50 feet in height. But about Melville Bay granite occurs. At Coburg Peninsula, where was the now abandoned colony of Port Essington and the town of Victoria, the cliffs are of red sandstone; the interior of the peninsula, the surface of which is broken by low hills, consists of a continuous forest.

The shores of the great Gulf of Carpentaria are almost invariably low and flat, and generally covered with mangroves. The banks, which are of clay or sand, are seldom more than from 10 to 30 feet above the beach. On the eastern sides there are more small trees, but the shore is one wide, low, level, sandy waste. The rivers which fall into the gulf are few and unimportant. One or two inlets which appear to be the mouths of rivers, have indeed not hitherto been explored, but there is nothing to lead to the belief that they differ from those which have been followed up. The chief of the rivers in the Gulf of Carpentaria are the Flinders and the Albert, but like the others they consist merely of short and narrow streams opening into wide shallow estuaries. The Albert was ascended by its discoverer, Captain Stokes, in a boat for about 50 miles from its mouth. He found it bordered by open woodlands of acacias and gum-trees. When unable to ascend the river higher, he made a journey for some distance towards the interior of the country, and found it to consist of vast and apparently boundless grassy plains, relieved by occasional clumps of gum-trees; he named them the plains of Promise. Another river which he ascended, and named Disaster River, was bordered by rich alluvial flats, evidently subject to considerable floods. Beyond the river valley were wide plains as before. It was in endeavouring to explore Cape York Peninsula, which forms the eastern boundary of the Gulf of Carpentaria, and the north-eastern angle of the continent of Australia, that the adventurous Kennedy was murdered by the natives.

The farthest point to which the interior has yet been explored is 24° 30′ S. lat., 137° 59′ E. long. Here Captain Sturt found a boundless arid plain, covered with bare ridges of drift sand sometimes 100 feet high, running in parallel lines as far as the sight could reach. The dryness and the heat were almost intolerable. In the midst of this plain, near 26° 33′ S. lat., 139° 30′ E. long., was a remarkable stony and quite sterile desert, which extended, as far as he could ascertain, about 80 miles in length and 35 miles in width. Near 27° 35′ S. lat. Captain Sturt discovered a sheet of water which he called Cooper's Creek, extending east and west for nearly 80 miles, and ending on each side in arid sands. It has been supposed that this creek may be in seasons of flood connected with the singular horse-shoe shaped depression known as Lake Torrens, which as already mentioned in part encompasses the mountains at the head of Spencer's Gulf, and that on the other side it might unite with Sturt's Stony Desert. Lake Torrens, it may be as well to mention, though called a lake, is not filled with water, but is merely an extensive depression, the bed of which is for the most part dry, with occasional unconnected pools and muddy holes. In seasons of great floods it would no doubt be filled with water, which it is possible may find an outlet in Spencer's Gulf. In a country where rain was abundant Lake Torrens would of course be a permanent lake, according to the ordinary acceptation of that term.

Generally it may be said of the continent, that the ranges of mountains mentioned as stretching along the south-eastern and eastern coasts, in some places come close down to the shore, but elsewhere permit wide, fertile, and thinly wooded plains, with occasional sandy tracts, to extend between them and the sea. Towards the interior, beyond and nearly parallel with the mountain ranges, are undulating downs of moderate height and great extent, such as the Darling Downs discovered by Mr. Cunningham, the Fitzroy Downs discovered by Sir T. Mitchell, the Goulburn, Bathurst, Maneero or Brisbane Downs, and the New England district, with vast fertile plains, lying along and between the great rivers. These downs afford the chief sheep runs, the plains the cattle pastures. Farther inland are wide-spread marshes and worthless jungle, and enormous barren, arid, and sandy, or stony deserts wholly uninhabitable, and which have hitherto baffled all attempts to explore them. No dense forests have been found; the densest are those which occur in the Moreton Bay district and in tropical Australia. The trees are almost invariably light of foliage and very marked in character. The herbage is thin; the grasses are nutritious, but generally grow in detached clumps.

The river system of Australia, as far as known, is peculiar. Many of the rivers of the interior are lost in the sands, others are subject to immense overflows so as to convert in the wet season a large portion of the adjacent country into vast swamps, while in the dry season their channels are in many places quite dry and they are converted into a number of scarcely connected lagoons. Few of the rivers which fall into the sea are navigable, and nearly all have bars or other encumbrances at their mouths.

The Murray is an exception to the other known streams of the Australian continent. The basins of this fine river are in the deepest recesses of the Australian Alps. The headwaters of its immediate tributaries extend from the 36th to the 32nd parallel of latitude, and from 146° to 148° of longitude. It reaches the lowlands near 36° S. lat., 147° E. long., not far from the rising town of Albury. Its course from this place is exceedingly tortuous, the curvatures being short, abrupt, and very numerous. The whole of the upper course is obstructed by sand shoals, and snags formed by trunks of trees, and other objects which have caught in the bed of the stream; but there appears to be no insuperable obstacle to the clearance of the channel if there were sufficient intercourse to render it profitable. It would however be a costly and tedious process, and useless also unless an embankment was formed, as the river is subject to annual overflowings, when the country for a considerable space on both sides is converted into a swamp. These floods prevent agricultural operations being carried on along the banks of the Murray, above the junction of the Murrumbidgee. Attempts have been made to raise wheat on the sandy heights, but they have not been successful. On its left bank the Murray receives in this part of its course the Ovens, the Goulburn, the Campaspe, and several other streams; on its right is the vast impassable tract known as Murrumbidgee, which lies between the Murray and the Murrumbidgee rivers. No river here falls into the Murray on the right bank, but there are numerous creeks which pass from the Murray to the Edward River, which is a great arm of the Murray which runs between the main stream and the Murrumbidgee for many miles, and receives near its eastern end the Billibong River. A large portion of the level country between the Murray and the Murrumbidgee is a swamp; much of the remainder is cut up by the Edward, and the many connected channels, and the innumerable lagoons, or 'billibongs' as they are called by settlers. Many of these lagoons have on the top a thick crust of salt; indeed the whole of the Murray district is rich in this mineral. The soil is generally a gray clay. The Murray receives the Murrumbidgee in about 143° E. long. The river is here about 350 feet broad, from 12 to 20 feet deep, and flows at the rate of 2½ miles an hour. In 141° 30′ E. long. it is joined also on the right bank by the Darling, which is here 100 yards wide and rather more than 12 feet deep. As far as the junction of the Darling the Murray continues to flow to the west-north-west, but afterwards it passes between some limestone cliffs and its course is changed to the west, and the river is considerably increased in size. After passing the meridian 140° it trends to the south; and in this direction it flows without receiving any tributary of consequence till it expands at its mouth into the Lake Victoria, which is 50 miles long and 40 miles broad, but generally very shallow. The water of the lake is brackish, and it communicates with the sea at Encounter Bay by a passage impracticable even for boats. The river Murray however is navigable for vessels of considerable burden, being for 50 miles from the head of the lake 350 yards broad and from 20 to 25 feet deep. It appears certain indeed that it is navigable for steamers of light draught up to its junction with the Darling; and recent explorations have shown that it is probably navigable for a much greater extent. Following the course of its windings, the length of the Murray is probably not less than from 1300 to 1500 miles. Little influenced by the sudden floods to which the other Australian rivers are subject, its rise and fall are equally gradual. Instead of stopping short in its course, as they do, and terminating in a marsh or exhausting itself over extensive plains, its neverfailing fountains have given it strength to cleave a channel through the interior desert, and carry its broad and transparent waters to the sea.

The Murray receives the first addition to its waters from the eastward in the month of July, and rises at the rate of an inch a day till December, in which month it attains a height of about seventeen feet above its lowest or winter level. As it swells it fills in succession all its lateral creeks and lagoons, and ultimately lays many of its flats under water. As it rises, so it falls, gradually. No river falls into the Murray after its confluence with the Darling, nor does any fall into the Darling from the west after it reaches the low lands of the interior at about 30° S. lat., 140° E. long.

Geology, Mineralogy, &c.—We possess so few facts, comparatively, respecting the geological structure of Australia, beyond an enumeration of a somewhat limited number of localities in which granite, limestones, sandstones, and other rocks, distinguished only by their mineralogical characters, occur, that it would be of little use to attempt to give a general description, or even to institute comparisons with the known European deposits. Here we shall do little more than enumerate the principal varieties of rocks—merely stating as a general law that, as far as known, the geological formations are almost entirely of the kinds commonly termed primary and tertiary. Secondary rocks are scarcely anywhere met with. It is however premature to draw general conclusions. The mineralogy of Australia is exciting at present an extraordinary amount of attention, and the geology is also being with more or less care and skill investigated, so that additions are almost daily being made to our previous store of information. The results will be more conveniently given in our notices of the several colonies.

The direction of the mountains and the strike of the rocks of which they are composed are almost invariably north and south; the only important exception being on the north side of the continent, where there is an inclination to the east and west. Granite forms the axes of the ranges of mountains described as occupying the south-eastern and eastern portions of the island, having frequent masses of metamorphic rocks in connection with it. Much of the granite is highly quartziferous; in other extensive formations the felspar and hornblende so largely abound as to modify the granitic type; in some places the hornblende predominates, and frequently, as between Arnprior and Braidwood, the granitic passes into sienite and porphyry. Examples of all these varieties are met with in the Australian Alps, about the sources of the Murray, in Mooneroo, in the Curramben, a Range, the Araluen and the Main ranges, Mount Victoria, and many other parts of this vast tract of country. Trap rocks prevail very widely, and vary as usual very much in their mineralogical structure. Very commonly they consist of basalt, greenstone, and various amygdaloids, and have an overlying deposit of conglomerate grit and sandstone. The trappean region of Maneero, which may be taken as illustrative of the trappean regions of the south-eastern portion of Australia, is of this character. According to the Rev. W. B. Clarke, the government commissioner, "the physical features of this region are precisely similar to those of the Grampians and Lammermuir Hills in Scotland. Each occupies a trough between granite mountains (here the Snowy and the Coast mountains), which it has filled up, sending its streams of subaqueous lava to considerable distances on each side of the general line of the axis of eruption. In Maneero this axis has a north-west and south-east direction, and ranges from the head of the Towamba towards the principal head of the Murrumbidgee, at the northern extremity of the Snowy Mountains, or Australian Alps. Connected with this general trend of the trappean formation, which has produced the plateau or 'plains,' as bare tracts occupied by basalt, &c., are improperly locally designated, are various outlying hills and ranges, insulating patches of the schistose rocks, or piercing and transmuting the larger masses of that system. But the disposition of these local exhibitions of igneous agency, their texture, structure, and composition, prove them to have a common relation with each other, and with the great development which has occasioned the remarkable connection between the Snowy ranges to the west and the Coast ranges to the east, and the no less remarkable anticlinal division between the waters flowing on the northern side to the Murrumbidgee, and on the southern to the Snowy River. It is to the trappean outburst, which is undoubtedly of considerable antiquity, that the broken and disturbed condition of the present surface of the counties of Beresford, Wallace, and Wellesley is in a considerable measure due; it has directed the principal drainage of the country in two opposite courses, and has produced innumerable physical disarrangements."

A large portion of the basin of the Murrumbidgee is occupied by quartz porphyry, which is also largely developed in many other places. Porphyritic and basaltic dykes are very frequent. Very fine examples of columnar basalt occur at Cooroo and elsewhere on the great dividing range, and not unfrequently in other parts of the great mountain district. Serpentine, soapstone, pitchstone, and a fine red jasper are frequently met with in the trappean districts. Laminated, compact, and fossiliferous limestones are found in numerous places. In the ridges of the gullies running into the Shoalhaven, a little below Glenrock, the limestone is seen passing into statuary marble, white and crystalline; black marble occurs in strata in Borough Creek. A bed of limestone, which appears to range with considerable thickness both north and south of Bathurst, has been termed carboniferous. The coal and associated bed of sandstone and shell, which occur extensively on the eastern coast from Port Stephens to Botany Bay, occasionally ranging into the interior, have been considered equivalent to the coal-measures of Europe, merely from their mineralogical characters. What the age of this Australian coal deposit may be we have no means of accurately judging; but it is worthy of remark, that a fossil plant (*Glossopteris Browniana*) detected in it is also discovered in the Damuda coal district in India. The coal itself appears to be abundant and generally of good quality. Coal also occurs in great quantities on the Warranbungall Mountains and elsewhere in the mountain district of New South Wales. Mr. Roe in 1848 discovered coal by the mouth of the Fitzgerald River, about 149° 40′ E. long., 34° 10′ S. lat., and by the Phillips River some distance to the west, both places being in or near to Doubtful Island Bay and easy of access. It has also been met with in several other parts of the continent.

Sandstone rocks extend very generally through the mountain district. Sydney is built upon a sandstone deposit, which extends as far inland as Mount Victoria, and forms the bulk of the Blue Mountains. Its southern limit is Port Stephens. The sandstones are of various kinds, fossiliferous, ferruginous, silicated, argillaceous, and calcareous. In parts they appear very similar to those of the old red-sandstone formation of England. Found in conjunction with fossiliferous limestones and conglomerates they closely resemble those of the Devonian system. Both the limestones and sandstones are of exceeding value for economical purposes. Sandstone and limestone are the prevalent rocks of the shores of Western Australia. In North Australia is a great sandstone plateau rising 1800 feet above the level of the sea.

The slate and other schistose rocks are numerous and important. A quartziferous schist is the predominant rock of the country between the Canobolas and the Wellington Valley, and it prevails extensively throughout New South Wales and the eastern part of Victoria. The soil which covers this rock is generally poor, but the rock itself is rich in minerals. The slates are commonly gray, bluish, and yellowish; good roofing-slates are found in many places. The slates are not unfrequently intersected by veins of quartz and trap. Gray or brownish-white, soft or hard, felspathic beds of schist occur in conjunction with the slates, passing "into a true grit or sandstone, and becoming occasionally very quartzose, bands of quartz and transversely fibrous veins of quartz traversing them." Clay-slates and other argillaceous deposits are also general. The clays and other tertiary deposits occupy a wide area; in fact, it is probable that the whole interior is formed of horizontal tertiary deposits, broken here and there by hilly tracts rising out from them, like islands from the bed of an inland sea. Good brick and pottery clay is found.

Australia was not until lately considered rich in minerals. The discovery of the valuable Burra Burra copper mines in 1845, and still more the extraordinary discoveries of gold in 1851, however led to investigations which have gone far to show that Australia is mineralogically one of the richest countries in the world. The first official mention of gold being discovered in Australia was in a despatch to the Secretary of State from Sir George Gipps, lieutenant-governor of New South Wales, dated 2nd of September, 1840, in which is inclosed a report from Count Strzelecki, stating that he had discovered in the vale of Clwydd, in 1839, a small quantity of gold in an "auriferous sulphuret of iron, partly decomposed." No further notice was taken of this communication. Sir R. I. Murchison, however, in the course of various statements respecting the Ural Mountains, which he read to the Geological and Geographical Societies of London between 1841 and 1843, called the attention of men of science to the fact of the similarity of the formation of the Australian to those of the Ural Mountains, and asserted his belief that gold must exist in Australia. No steps were taken to pursue the inquiry practically, and Sir Roderick in 1846 addressed a letter to the Geological Society of Cornwall, urging unemployed Cornish miners to emigrate and search for gold in the drift and débris of the Australian Alps. In 1848 Sir Roderick addressed a letter to Earl Grey, the then Secretary of State for the Colonies, stating his reasons for believing that gold would be found in Australia in large quantities, but no notice was taken of his communication. Meanwhile efforts had been made to attract attention to the subject in Australia. Small quantities of gold had been found by a shepherd and sold in Sydney. About 1841 gold was found in the bed of the Macquarie by the Rev. W. B. Clarke of St. Leonard's, near Sydney, a gentleman of considerable scientific acquirements, who somewhat later announced the fact in the Sydney journals, and asserted his belief of the extensive prevalence of gold in the colony, on the ground that the strata of the Australian mountains running north and south through Victoria and New South Wales were of the same formation as those of the Ural Mountains in Russia, namely, granite mixed with quartz and schistose slate; and also, as was subsequently pointed out, as the Sierra Nevada in California. But it was not till 1849 that a Mr. Smith communicated to the governor, Sir C. A. Fitzroy, that he had found gold in a particular place, produced a specimen, and offered to discover the locality for a certain reward; and somewhat later Mr. Lancellott forwarded a specimen weighing 3½ ounces, which he had found in the river Turon, near its junction with the Macquarie, with a similar proposal. Sir Charles declined these offers, and the matter dropped till April, 1851, when Mr. Hargraves, who had returned from gold-seeking in California, wrote to Governor Fitzroy, announcing that he had been seeking for and had found gold, and offering to discover the localities on being assured of a reward. The governor replied that any such discovery would meet with a reward, but declined assuring him of any beforehand. Upon this Mr. Hargraves disclosed the places where he had found gold—namely, Lewis Ponds, Summerhill Creek, the Macquarie River, and another in the districts of

Bathurst and Wellington, about 150 miles west of Sydney. When the government officer was sent in May to examine the places, he found persons already working them. The governor immediately issued a proclamation claiming the gold for the Crown, and forbidding any person to dig for it on his private account. But this it was found at once to be quite impracticable to prevent, and on May 22nd instructions were given by the governor to grant licences at the rate of 30*s.* per month. By May 25th there were 1000 persons employed in digging and washing at Summerhill Creek and its neighbourhood, which took the name of Ophir. In July gold was found in two or three places within the colony of Victoria; and from that time the discoveries of fresh localites still richer in gold have been made almost without intermission. On the 3rd of June the governor ordered a reward of 500*l.* to be paid to Mr. Hargraves, who subsequently received a temporary appointment as assistant commissioner; in 1852 a further sum was awarded to him, making his reward in all amount to 5000*l.* Policemen were appointed to the various stations, and escorts furnished for bringing the gold from the diggings to the ports of Sydney or Melbourne. An assay-office was subsequently established at Adelaide, and a mint has been established at Sydney. The effect of the gold discovery on the colonists was most extraordinary. In a short time the towns and villages were deserted, all the usual avocations abandoned, the ships in harbour left unmanned, and every one capable of labour repaired to the diggings, so that serious apprehensions were entertained that the growing crops would be left ungathered, the wool of the numerous flocks remain unshorn, and the flocks themselves be destroyed by being untended. These evils were for the time fortunately averted: the colonists exerted themselves to obtain assistance, and on the news that gold was to be had for gathering being made known in England, an immigration ensued almost without a parallel. It is computed that in 1852 not less than from 90,000 to 100,000 persons left England for Sydney and Melbourne, and it was found difficult to provide ships to convey them. The emigration from England during 1853 was on an equally large scale, but has since somewhat diminished. [Emigration, *S.* 2.] In the meantime the price of provisions rose greatly, particularly at the diggings, which are usually in remote districts, to which there are no roads; the sheep instead of, as previously, being shorn and their carcasses boiled down for tallow, were driven to the diggings for food, and the wool and skin thrown away. The effect on the public revenue is shown in a striking manner by a comparison of that of the colony of Victoria in the first three quarters of 1851 and 1852. In the three quarters ending September, 1851, the total revenue was 226,181*l.* 9*s.* 1*d.*, while in the three quarters ending September, 1852, it was 979,476*l.* 3*s.* 1*d.*, being an increase of 753,294*l.* 14*s.* The revenue of Victoria in 1857 was upwards of 3,000,000*l.* From the first discovery of gold in Victoria up to 5th February, 1853, the quantity of gold found in the colony of Victoria alone is stated by colonial authorities to have amounted to 5,166,234 ounces, of the estimated value of 19,373,377*l.* The gold exported from Victoria during the year 1857 amounted to 2,582,793 ounces, valued at more than 10,000,000*l.*

The places where gold has been found now extend from the Grafton range, New South Wales, in 26° S. lat., 149° E. long., to Ballarat in Victoria, 37° S. lat., 144° E. long.; while two small gold fields have been discovered about 27 miles from Adelaide, South Australia, 35° S. lat., 139° 30′ E. long. What may be called the main gold region of New South Wales alone, including no portion of the northern district, where gold has been found in considerable quantities, and of course wholly omitting the valuable gold-fields of Victoria, has been officially estimated by the government commissioner, the Rev. W. B. Clarke, after several surveying journeys, to embrace an area of 16,000 square miles; and this he says, in a subsequent report, "is strictly within the limits of truth, and very far within them." The gold is found generally among the mountains, in creeks and gullies, and the other water-courses, and on the flanks far above the water level, but usually at elevations not exceeding 3000 feet above the level of the sea. It is found in granite, wherever quartziferous schist occurs, throughout the trappean formations, and largely in bands of argillaceous iron ore.

Copper, as has been mentioned, had been found in large quantities in South Australia some years before gold began to be sought for. The Kapunda mine, the first of any consequence, was discovered and opened with great profit in 1842. In 1845 the Burra Burra mine, apparently one of the richest in the world, was discovered. The total quantity of ore raised from this mine up to September, 1851, was 79,765 tons. The mine occurs in the clay-slate formation; the lode runs from east to west. Many other copper and some lead mines have since been opened in the colony, with more or less success. The gold excitement has for a while almost entirely suspended all other mining operations; but the careful examinations which have been made of the gold regions, especially those undertaken by the government geological surveyors, have made known the existence of numerous and widely-spread metalliferous veins, of considerable richness, which may, when the present excitement has passed away, lead to most important mining operations. The value of some of these regions may be estimated from the Report of Mr. Clarke to the governor-general respecting a portion of country termed Quedong near the junction of the Slaughter-House Creek with the Delegate River, about 37° S. lat., 149° E. long., near the boundary of New South Wales and Victoria. The district is occupied by slates, traversed by quartz and trap, with occasional patches of granite; but, he says, "what renders this locality so interesting and full of promise is the fact, that in addition to the four metals, gold, iron, lead, and copper, existing in so narrow a compass, there is also abundance of excellent limestone to serve as a flux in case of its requirement, and abundance of water in the ever-flowing Delegate River, together with wood upon the ranges at no considerable distance." The whole basin of the Murrumbidgee, from near Bullanamang to the junction of the Queanbayan River, is also said by Mr. Clarke to exhibit "not only metalliferous formations, but in some places veins of lead, copper, and iron," in conjunction with abundance of limestone: quartz porphyry is here the prevalent rock. And in other districts the metals have been found under equally promising circumstances.

Lead has been found in South Australia, and worked successfully at Yattagolinga mine, where the average yield is said to be 75 per cent. of lead and 18 to 20 oz. of silver to the ton of ore; it is also worked at some other mines. In the great mountain ranges of Victoria and New South Wales, as we have seen, lead is said to occur in many places; it has also been found in the Darling Range and near Murchison River in Western Australia.

Iron ore abounds on the eastern coast of New South Wales, where also good coal is found in large quantities; whence we may conclude that at no very distant period the eastern side of Australia may be studded with iron foundries, distributing their products over Southern Asia and among the numerous islands of the Indian and Pacific oceans. Iron has been recently found in conjunction with coal in the Warranbungall mountains. Argillaceous iron ore occurs extensively in the regions of the Australian Alps. In South Australia iron-ore is said to abound in the mountains on the East of Spencer and St. Vincent gulfs; at Rapid Bay, Encounter Bay, and in the ranges from Cape Jervis to Blackrock Hill. No iron works have however, we believe, been yet established.

Native silver has been found in small quantities. Tin occurs in several places. Blacklead is said to have been found near Adelaide, at Mount Torrens, and in the Belvedero Range, South Australia. Manganese and sulphur are also reported to have been found. Indications of quicksilver have been met with in the vicinity of the Ophir gold-field.

In the recent explorations of the mountain regions it has been found that the precious gems exist in many parts of New South Wales, Victoria, and South Australia. The surveyor-general Sir T. L. Mitchell brought with him, on his recent visit to England, a diamond which has been pronounced by competent judges to be of the very finest water. Mr. Stuchbury, the government geological surveyor of New South Wales, reports having seen a small but beautifully crystallised diamond from the Turon River, and topazes, garnets, rubies, sapphires, chrysoberyl, chrysolite, and cairngorm, from various localities in the same district; to which may be added from other authorities and different parts of the country the hyacinth, amethyst, jasper, carnelian, agate, and opal.

Coal appears to exist in Western Australia, South Australia, and Victoria, as well as in New South Wales; but the finest beds yet discovered are those about the Hunter River, in the last-mentioned colony, which are extensively and profitably worked.

Salt is found over a large part of the country, and the salt-works are numerous and extensive.

Large tracts of limestone occur on the eastern and south-eastern side of the continent; clays fitted for the economical purposes of life are common in many places; there are numerous sandstones which seem well adapted for ornamental buildings; gypsum is found abundantly in the clay or marl, extending from Bathurst to Hunter's River, and in the vicinity of Swan River; and there is roofing-slate both in the eastern and western parts of Australia.

Climate.—The climate of Australia differs considerably from that of other countries. The most remarkable as well as the most unfavourable characteristic is the long droughts which occasionally prevail. Captain Sturt says:—"The year 1826 commenced the fearful droughts to which we have reason to believe the climate of New South Wales is periodically subject. It continued the two following years with unabated severity. The surface of the earth became so parched up that the minor vegetation ceased upon it. Culinary herbs were raised with difficulty, and crops failed even in the most favourable situations. Settlers drove their flocks and herds to distant tracts for pasture and water. The interior suffered equally with the coast, and men at length began to despond under so alarming a visitation. It almost appeared as if the Australian sky was never again to be traversed by a cloud." These seasons without rain appear to occur every 10 or 12 years. They are succeeded by excessively long rains, but afterwards the rains decrease gradually year after year until they again wholly cease for a time.

Another peculiarity is the quick transition from heat to cold. There are instances of the thermometer having varied 25 degrees in 50 minutes. This is owing to the sudden change of the winds. The north-west winds blowing over the great sandy deserts in the interior attain such a degree of heat, that they become too scorching to be pleasant to men and animals, or to be favourable to vegetation. The thermometer then rises suddenly from 80° to 110° in the shade. On the other hand, the south-eastern winds are often cold and piercing, especially when there is a sudden shift from a hot north-western: on such occasions the thermometer in South Australia often falls 40 degrees in a quarter of an hour.

But in spite of such occurrences, which are to be considered as exceptions, the climate over most of the settled part of the country, though somewhat too dry, is commonly delightful, and the evenings and mornings as pleasant as in southern Italy. Even the great heat which occurs does not produce relaxing and enfeebling effects on the constitution. On the lower part of the coast the thermometer ranges in summer (from September to March) between 36° and 106°, its mean elevation being 70°; and in winter (from March to September) between 27° and 98°, its mean being 66°.

In the interior and to the west of the mountain ranges the wet season commonly takes place during the summer; on the coast it commences in the beginning of the winter. Dews are very frequent and heavy, and sometimes they fall like a drizzling rain. Hail-storms are common in December and January.

On the low coasts frost is very little felt, but in the hilly districts it is frequent, and very keen on the high terraces on the western side of the mountains, especially on the plains of Bathurst and the plains contiguous to them: these districts are 2000 feet above the sea. It is likewise observed that in these parts of the country the seasons are nearly a month later than on the low district on the coast. The snow lies on the tops of the mountains and occasionally also in the valleys for many days together, but it is absolutely unknown in the neighbourhood of Sydney and other parts of the coast. In his explorations of Tropical Australia, Major Mitchell experienced much frost, the thermometer being on the 24th of June 17° Fahr., or 15 degrees below freezing point: no discomfort however was experienced by any of the party, a circumstance which he attributes to the great dryness of the atmosphere.

The climate on the eastern coast is very favourable to health; and endemic diseases are not known with the exception of ophthalmia, which occurs in the months of October and November, and is produced by the winds which prevail at that time. These winds in general are not unpleasantly warm, but they resemble in some measure the English easterly winds which blow in April and May: like them they occasion blights in vegetation, and are considered as the cause of the then prevailing ophthalmia The country north of the Hunter River appears to be much less liable to droughts, and the wet and dry seasons occur with considerable regularity; but the temperature is hotter on the whole, and the climate less healthy than farther south.

Soil, productions.—The soil of so extensive a country and one where the geological formations are so varied differs of course very greatly in different parts, and the productions of the agriculturist vary in an almost equal measure. For a notice of the usual crops and productions we refer to the several colonies; here it will be sufficient to observe that almost every variety of grain is raised, and generally of excellent quality. The colonies of New South Wales, Victoria, and South Australia are those which best repay the labours of the agriculturist. The soil of Western Australia is of inferior quality. In New South Wales and Victoria, although the cultivation of the soil is very far from being neglected, the breeding of sheep and cattle is the chief occupation. South Australia is especially a grain-growing colony: wheat of the finest quality is raised, and the crops are very large. Maize, which succeeds excellently in New South Wales, seldom succeeds well in South Australia. Barley and oats are much grown for grain crops. Rye is not very extensively raised. Tobacco is grown largely in the Hunter River district of New South Wales. Cotton and coffee are cultivated in North and South Brisbane. Hops are grown in various places. Nearly all European vegetables are cultivated; potatoes form important crops in cool and moist localities. Although Australia was almost entirely without indigenous edible fruits, the fruits of almost every country and climate are now successfully raised there; and the grape and the olive appear likely to take rank among the most valuable of its productions. The vineyards of New South Wales are already extensive, and wine of excellent quality has been made in sufficient quantities to show that the culture may be profitable. Good oil has also been produced.

Native Tribes.—The number of the native tribes of Australia is not great, and it is steadily decreasing; several tribes have already wholly disappeared. Many efforts have been made to protect them, and to induce them to adopt settled and industrious habits, but without much success. Schools have been established by the government, but the young people almost invariably, when passing out of childhood, throw off their clothes, and return to their native haunts and habits. A few girls become house servants, but they are easily induced to leave for the woods. Of late there has, however, been a somewhat important change. The impossibility of obtaining a sufficient number of white shepherds and labourers caused many stock-keepers to offer good money wages to the natives, instead of merely giving them food and clothes, as was before the custom, and to adapt the service to their feelings. The result is said to have been very generally beneficial. They show little inclination, or rather considerable dislike, for manual labour; but they make very good hut-keepers, are careful and gentle as shepherds, and make excellent stock-keepers; and large numbers are now so employed, as well as in wool-washing, and other work connected with sheep and cattle farming. It remains to be seen, however, whether it will be possible to overcome to any extent their migratory habits, which have heretofore always prevented any permanent settlement. The government land commissioners, in their official reports, speak highly of the conduct of the aborigines, where employed either as shepherds or stockmen; instances are mentioned where ten or twelve of them have remained steadily under one employer from a year to three years, and even longer. Some of the large cattle and sheep-holders in New South Wales had not, in 1852, a single white man in their employment. In some cases natives have been receiving 20*l.* a year, and the commissioners seem to be agreed in stating, that "both the disposition of the aboriginal native to work, and of the settler to make use of his labour, is decidedly increasing. The system of paying them by a money wage has tended greatly to produce this change in the habits of the native; and as the settlers are now fully alive to the fact, there can be no doubt that the practice will be continued." (Report of Mr. Commissioner Merewether.) This statement is confirmed by the fact, that in districts where the system of money payments has not been adopted, the settlers still find great difficulty in retaining the natives as servants, and complain of their idleness and misconduct. In Victoria the reports are hardly as favourable as in New South Wales; but in South Australia there seems to be much satisfaction felt at the change in the aborigines. The 'Protector of the Aborigines' in that colony states that upwards of 200,000 sheep were in June, 1852, under the sole charge of native shepherds. A training institution for aborigines has been established at Adelaide, chiefly by the exertions of Archdeacon Hale, who resides on the establishment. He says that even his "own sanguine expectations did not lead him to anticipate a success so complete and triumphant as that which has attended our efforts, nor so rapid an increase in the number of our inmates." Besides the school-room, mess-room, &c., there are 20 huts occupied by native married couples. There is also a small farm, the work of which, with herding, cattle-keeping, &c., is done by the inmates of the institution, who are also taught brick-making, building, and other useful occupations. In New South Wales a "native police corps has been established," which the Governor-General reports to have "done much in maintaining order among the aborigines. There appears," he adds, "to be no difficulty in recruiting for this force, as the young men of the different tribes are found anxious to enlist." Quarterly reports respecting the condition of the aborigines are made by the district commissioners to the governors of the several colonies, by whom they are regularly transmitted to the Secretary of State for the Colonies.

Divisions, Government, &c.—The entire island of Australia is a British possession. It is divided by the British government into the colonies of New South Wales, Victoria, South Australia, Western Australia, and the district of North Australia. New South Wales occupies the south-eastern portion of the island, extending from the shores of the Pacific to 141° E. long., and northward to 26° S. lat. Victoria is separated on the north and north-east from New South Wales by the Murray River, and a line carried from its source on the Australian Alps in a south-eastern direction to Cape Howe. Its southern boundary is the Southern Sea; on the west it is divided from South Australia by the meridian of 141° E. long. South Australia extends from 141° to 132° E. long., and northward to 26° S. lat. Western Australia occupies the entire country west of 132° E. long. North Australia occupies the entire country north of 26° S. lat. and east of 132° E. long. The population is chiefly collected about the south-eastern coast in the colonies of New South Wales and Victoria; Western Australia is very thinly peopled. North Australia is not colonised, the settlement of Port Essington having been abandoned; on this coast there are consequently no European inhabitants, but a considerable number of Malay fishermen have settled upon it. The total population (exclusive of natives and Malays) in 1850 was 335,107, of whom 265,503 belonged to New South Wales and Victoria, 63,700 to South Australia, and 5,904 to Western Australia. It has since very rapidly increased, owing to the immigration consequent on the gold discoveries.

On August 5th, 1850, an Act of the Imperial Parliament received the royal assent, by which representative constitutions were given, as distinct colonies, to New South Wales, Victoria, South Australia, and Western Australia (as well as to Van Diemen's Land); with power to form other districts if necessary, and also powers of modification. The details of the constitutions will be found under the heads of the several colonies. The governors of Victoria, South Australia, and Western Australia have the title of lieutenant-governor; the governor of New South Wales has the title of governor-general, but there is no seat of supreme government in Australia, all the colonies being placed on an equality. Six bishoprics have been founded in Australia, Sydney (metropolitan), Newcastle, Adelaide, Melbourne, Tasmania, and Western Australia. In 1856 a new bishopric was created at Perth, in Western Australia.

(*Narratives, Journals, &c., of Voyages, Travels, Journeys, &c, in Australia,* by Flinders, Brown, King, Earle Cunningham, Frazer, Nind, Péron, Sturt, Oxley, Hunter, Grey, Eyre, Field, Breton, Bennett, Clarke, Melville, Roe, Wentworth, Macgillivray, Mossman and Banister, Lancellott, Gerstaecker, Stokes, Leichhardt, Strzelecki, Jukes, Darwin, &c.; the *Geographical Journal; Parliamentary Papers,* &c. For a clear and comprehensive view of the physical features of Australia, as far as known, the reader should consult Arrowsmith's *Great Map of Australia,* published in 1853; and that also by Arrowsmith which is attached to the *Parliamentary Blue Book* entitled *Further Papers relative to the Recent Discovery of Gold in Australia,* 1853.)

AVARS, or AVARES, a tribe of people of Mongolian descent, who made their first appearance in large numbers in the country around the Don, the Caspian Sea, and the Volga, in the 6th century, after having been driven from their own country by the Turcomans. They are generally supposed to have been of the same stock as the Ugrians or Huns. They had many chiefs, who are called by the Greek writers *χαγανος*, or Chaganus, evidently the same as the better known title of Khan. A part of them remained in the mountainous regions of the Caucasus, but the greater part, about 555, penetrated to the Danube, and settled themselves in Daria. While here many of them served in the army of Justinian; they also materially assisted the Longobards to conquer and destroy the Gepidæ, and by the end of the century, under their most famous chief Khan Bajan, they had possessed themselves by degrees of the whole of Pannonia. They afterwards conquered Dalmatia, penetrated with devastating armies into Germany as far as Thuringia, and also into Italy, where they fought with the Longobards and Franks. They extended their domination over the Slavonians on the Danube and to the north of that river; over the Bulgarians as far as the Black Sea, and in 610 besieged Constantinople. The Emperor Heraclius succeeded in repulsing them, but they retired loaded with booty. The Slaves or Sclaves, and Bulgarians, whom they had cruelly oppressed, making them serve in their armies, and transporting them to various parts of their dominion for the purpose of weakening their strength (Gibbon says they settled some of the Tchecks in the Camarus, where they are yet to be traced), at length rose against them in 640, and drove them out of Dalmatia, but they still retained Pannonia. Here they were conquered by Charlemagne in 796, and after 827 their name disappears from history, but, according to the received belief, their descendants are the Szeklers, who appear to have been anti-Magyars though they now speak the Magyar tongue.

AZADITINE. [Chemistry, *S.* 2.]

B

BAIL, in ERROR, in civil causes, is now regulated by the Common Law Procedure Act, 1852; no practical change having, however, been effected by this statute.

BAILLIE, JOANNA, was born at the manse at Bothwell, near Glasgow, in 1762. She was the sister of Dr. Matthew Baillie. The history of her uneventful life is soon told. The daughter of a Scottish clergyman and professor of divinity, and of a mother in whose family superior intelligence seemed a common property, Joanna, while trained in the strict manner usual in a Scottish manse, not only received an excellent education, but from her childhood was brought into constant intercourse with people likely to call into activity her own mental gifts. Her career through life was quiet, unobtrusive, domestic; her tastes were all studious; her disposition was gentle, kindly, and benevolent. At an early period she removed to London, where her brother, Dr. Baillie, was settled as a physician. After a time, she, with her sister Agnes, took up her residence at Hampstead, which, while from its proximity to the metropolis it allowed her to enjoy ready intercourse with the many friends her literary fame drew about her, insured her at the same time a certain amount of retirement; and here the rest of her lengthened life was spent. She was known and esteemed by the most eminent of her contemporaries of more than two generations, and for very many years, even from the New World, visitors, attracted by the charm of her poetry, came to obtain her acquaintance and to listen to her conversation. Those who visited her out of admiration returned adding to that sentiment feelings of affection and respect. She died at Hampstead on the 23rd of February, 1851, in her 89th year, having retained her faculties to the last.

Though Joanna Baillie possessed in a large measure that keen and sensitive interest in all that developed the feelings or touched the destinies of others, and that sensibility and sympathy which are the special heritage of dramatic poets, yet these sentiments had in her instance more of pensiveness and of speculativeness than of fire, and made her seek and find events in her own thoughts rather than in action and experiment. Adventure may be, and has often been, the school of poetry for men; but a woman, and especially one of Joanna Baillie's feminine and modest disposition, must invoke the muse with a serener and more gentle worship. A close and penetrating observer, and gifted with no common genius, yet not favoured with the highest, nor endowed with the inspiration of 'many-mindedness,' which makes poetry of the first order bear to philosophy the same relation that intuition bears to calculation, Joanna Baillie early in life conceived a literary project based on a principle essentially erroneous, but which led to the production of her greatest works, the celebrated 'Plays on the Passions.' The principle on which all these plays were constructed was to select some one of the more powerful passions that agitate mankind, and to exhibit it in full action, by making the hero of the drama completely subjected to it, and by evolving out of the promptings to which he is represented as paying undivided and uninterrupted allegiance, every incident and situation. Admitting fully the noble poetry with which these plays are filled, and even the deep interest of many positions and events, it is evident that such characters must have a constrained, morbid, and unreal aspect; since in life, as in the dramatic creations of the highest genius, we constantly see that the dominant passion is turned aside or suspended by, it may be transient, but for the time irresistible, counter-thoughts or the force of circumstances; and this is a main reason why her plays have only achieved a partial and temporary success on the stage. Yet the one master passion is often admirably exhibited—laid bare in its most secret workings—subjected to a keen and searching analysis.

It was in 1798 that Miss Baillie published the first volume of her 'Plays on the Passions.' She was then thirty-six years old. As a book the production met with great success; and a second edition was called for in a few months. In 1802 she published a second volume. Two years later, appeared her 'Miscellaneous Plays.' Among these was the 'Family Legend,' a tragedy, which she used to term "her Highland play." It was acted for the first time at Edinburgh, in January 1810, with brilliant but not durable success. The prologue was written by Sir Walter Scott, who interested himself most ardently in its production on the stage; and Mrs. Siddons sustained the principal female part. In 1812 appeared the third volume of the 'Plays on the Passions.' In 1836 she published three more volumes of dramatic poetry. Previously to this, her tragedy of 'De Montfort,' perhaps the finest of her productions, had been brought out in London; and for eleven nights John Kemble sustained the character of the hero. Again, in 1821, this play was put on the stage for Edmund Kean to perform the same part. The 'Separation,' one of the Miscellaneous Plays, and 'Henriquez,' one of those on the Passions, and both tragedies, have also been acted.

Notwithstanding the originality of conception of Joanna Baillie's great dramatic poems, and the fire and inspiration with which passages in all of them are composed, no perfect idea could be gathered of the writer's powers from these performances alone. Her fugitive pieces, her ballads, her occasional lines, and her songs, taken together, afford the true measure of Joanna's powers, and the fairest proof of her versatile genius. They are bright, fresh, simple, and genuine; often humorous; sometimes highly pathetic; occasionally homely; never low, common-place, or gross. We must add that, along with all these natural gifts of the true poet, she possessed those acquired advantages, which nothing but severe and constant labour can bestow. Among her lighter effusions, the 'Woo'd and Married and a,' 'The Kitten,' 'To a Child,' 'The Weary Pund o' Tow,' and 'Tam o' the Linn,' are singularly illustrative of her style, so varied, yet always so simple and so arch.

In the year of her death, her works, which began to appear before the close of the 18th century, being still young in public esteem, she herself superintended their collective publication, prefixing a vigorous and able introductory discourse. Her works have been reprinted since her death in a single volume with a brief memoir.

BAINES, EDWARD, an eminent example of the success of industry, good conduct, integrity, and of unceasing endeavours to make his talents beneficial to his fellow-men as well as useful to himself, was born Feb. 5, 1774, at Walton-le-Dale, a village about a mile from Preston, in Lancashire, of a respectable but not wealthy family, long settled at Marton-le-Moor, near Ripon, in Yorkshire. He was first sent to the free grammar-school at Hawkshead, the master of which was Edward Christian, afterwards Downing Professor of Law in the University of Cambridge, whence he was removed when eight years old to the free grammar-school of Preston. His father had commenced business as a cotton-weaver, and wished to bring his son up to that business, but he preferred a more intellectual employment, and at the age of sixteen was apprenticed to a printer in Preston. After serving about four years and a half, during which time he had seen something of the management of a country paper, his master's business falling off, he transferred his services to Leeds, where he finished his time in the office of the 'Leeds Mercury.' During his apprenticeship he sedulously cultivated his mind. He invited several of his companions to join him in forming reading and debating societies, in the latter of which he is said to have distinguished himself by his liberal opinions, his toleration, and his plain good sense. In September 1797, the day after the expiration of his apprenticeship, he began business for himself in connection with a partner, from whom he separated in the course of the following year. From the political circumstances of the time the dissenters from the Church of England were the most liberal in their political opinions. Mr. Baines, from their consonance with his own, was thus brought into association with many of the most influential among them; and at length joined the body as an Independent. In July 1798 he married the daughter of Mr. Matthew Talbot, an excellent and pious woman, and continued by his industry and attention to business to win the confidence of the dissenting body and to increase his means. In 1801, assisted by some of the wealthier members of that body, he purchased the copyright and the printing materials of the 'Leeds Mercury,' of which he immediately became editor as well as printer. By judicious but not sudden improvements he gradually increased its circulation, and extended its influence, while his good taste and temper led him to abjure all grossness and bitterness of altercation; and he promoted as far as lay in his power all local schemes for the amelioration of the position of his poor fellow-townsmen, by advocating the establishment of hospitals, friendly societies (savings-banks had not yet been established), and the extension of education. A large part of the influence he acquired arose from his being among the first who introduced 'leaders' or original editorial dissertations on political subjects into a provincial paper; these leaders being distinguished by the moderation of their tone, their independence, their fearless advocacy of the opinions he entertained, the force of their style, and their general good sense. In the severely contested election for Yorkshire in 1807, he took an energetic part in support of Lord Milton in opposition to Mr. Lascelles, although he differed in opinion from Lord Milton respecting the desirableness of peace on proper terms, and a reform in parliament, both of which he advocated, while there were few more earnest in supporting the dignity of England when threatened by France, and his appeals to the inhabitants of Leeds to join the volunteers when an invasion was feared, had a most remarkable effect. But we are not about to narrate all the incidents connected with Mr. Baines's conduct of his paper, which was carried on with a strict adherence to the same principles until the close of his life; we shall only say that he was the principal means, in his paper, of developing, in 1817, the conspiracy of Oliver and Castles, the paid emissaries of the government to foment insurrections in the northern counties, and that after his exposure there were no more plots. In 1815 he made his first prominent appearance as a public speaker at a meeting at Leeds to oppose the enactment of the Corn Laws, and in 1817, at another in favour of parliamentary reform. In 1814 he commenced the publication of 'The History of the Wars of the French Revolution,' which met with such success that he continued it under the title of a 'History of the Reign of George III.,' the whole being a compilation of considerable impartiality and talent. In 1822 and 1823 he wrote and published 'The History, Directory, and Gazetteer of the County of York,' in two thick volumes; and in 1824-5 a similar work for the county of Lancaster, subsequently expanded into a 'History of the County Palatine and Duchy of Lancaster,' which was not completed till 1836. In 1834, on a vacancy being made in the representation of Leeds by the appointment of Mr. T. B. Macaulay (now Lord Macaulay) to be one of the commissioners in India, Mr. Baines was chosen member in opposition to Sir John Beckett, after a severe contest. In the House of Commons he maintained the character he had acquired as a journalist, and though not a brilliant speaker, his integrity, independence, industry, and conciliatory manners, with his close connection with the dissenting interest, made him an influential member. In January 1835 he was re-elected, and again in 1837. Though generally supporting the Whig party, he was opposed to them in their schemes for public education, which he always contended would be best effected by voluntary subscriptions, and he deprecated the assistance of the State as tending to give an undue domination to the Established Church. In 1841, his health having suffered from the sedulous performance of his parliamentary duties, he retired from the representation, and proposed Mr. Hume as his successor, who however was defeated. In September of that year his former constituency presented him with an elegant silver service as a testimony of their recognition of his services. From that time he retired to some extent from public life, but continued to take an active part in local affairs, both as a magistrate and a poor-law guardian, in both capacities promoting social improvements as far as lay in his power; and he was always ready to interpose as mediator between the men and their employers in the many strikes that took place in the north, representing to the men the folly of their having recourse to violence in endeavouring to effect their object, and to employers the desirableness of placing the men in as comfortable a position as the circumstances would allow. In 1845 the 'Leeds Mercury' warned the speculators of the danger attending the railway mania, though fully acknowledging the advantages of the railway system. He saw that though the facility of communication was a great good, yet that if it became a mere traffic for premiums, it was likely to produce much distress. In 1846, though he had declined to accept the office, his fellow-townsmen chose him for alderman as a mark of their respect, but he immediately resigned the office. In 1847 he again opposed Lord John Russell's scheme for state education of the poor, and the opposition of the dissenters was so strong that the plan was withdrawn. On August 3, 1848, after a long life of usefulness, and after a short illness, he died, and was honoured by a public funeral.

BALBI, ADRIEN, was born at Venice, April 25, 1782. At an early period of his life he was appointed professor of geography and also of natural philosophy in his native town. In 1820 he took up his residence in Portugal. Here, from the archives of the kingdom, he procured the materials for his 'Essai Statistique sur le Royaume de Portugal et Algarve, comparé aux autres États de l'Europe,' published in Paris in 1822. After having settled in Paris, and employed himself in collecting rich and varied materials for many years, he published in 1826 the first volume of his 'Atlas Ethnographique du Globe; ou, Classification des Peuples anciens et modernes d'après leurs Langues.' This work first made the French public acquainted with the researches of Adelung and other German philologists. Balbi however improved their arrangement, and added much information gathered from the accounts of such travellers as A. von Humboldt, Freycinet, and others, as well as from linguists such as W. von Humboldt, Remusat, Champollion, Klaproth, &c. This work attained a deservedly high reputation. Under the administration of Martignac, Balbi received from the government such pecuniary assistance as rendered his circumstances easy. He had previously published, with the assistance of others whose help he has scrupulously acknowledged, statistical tables of the kingdoms of France, Russia, and the Netherlands. After finishing his 'Abrégé de Géographie, rédigé sur un Plan Nouveau,' which work has been translated into most of the principal languages of Europe, he quitted Paris in 1832, and settled at Padua, where he died March 14, 1848.

We have mentioned the works on which Balbi's reputation rests, but he produced several others, among them are:— 'La Monarchie Française comparée aux principaux États de l'Europe,' 1828; 'L'Empire Russe comparée aux principaux États du Monde,' 1829, and 'The World compared with the British Empire,' 1830.

BALBRIGGAN, county of Dublin, Ireland, a seaport and post-town in the parish of Balrothery, and barony of East Balrothery, is situated in 53° 46′ N. lat., 6° 10′ W. long.; and distant by the Dublin and Drogheda railway, which has a station here, 21¾ miles N. from Dublin, and 10¼ miles S. from Drogheda. The population in 1841 was 2959, in 1851 it was 2310. The harbour is formed by a pier of 200 yards in length, at the extremity of which is a lighthouse. Although dry at low water, the harbour has been found very useful as a place of refuge. Balbriggan supplies the neighbouring district with coals and other heavy articles of import, and has a brisk trade in the manufacture of cottons, and of a very fine description of hosiery. Many of the females are employed in the embroidery of muslins. There is a considerable fishery, for which Dublin is the market. The constabulary and the coast-guard have each a station here. Quarter and petty sessions are held, and there is a savings bank. Fairs are held on April 29th and September 29th.

BALDOCK. [HERTFORDSHIRE.]

BALLINA, county of Mayo, Ireland, a seaport and post-town, and the seat of a Poor-Law Union, in the parish of Kilmoremoy and barony of Tyrawley (with the suburb of Ardnaree, in the parish of Kilmoremoy, barony of Tirera, and county of Sligo), is situated on the Moy River, 7 miles above its embouchure in Killala Bay, in 54° 7′ N. lat., 9° 10′ W. long.; 159 miles N.W. by W. from Dublin. The population in 1841 was 7012; in 1851 the population was 5230 (being 4647 in Mayo, and 583 in Sligo county); besides 1339 inmates of the Union workhouse. Ballina Poor-Law Union comprises 20 electoral divisions, with an area of 150,414 acres, and a population in 1841 of 52,234, in 1851 of 33,611.

The two bridges which cross the Moy at Ballina are the leading means of communication between the county of Sligo and the northern baronies of Mayo. The situation is also favourable for the export of agricultural produce. The town is modern, well built, and clean. On the Mayo side it consists chiefly of one street, running parallel to the river, with cross streets diverging on the roads to Crossmolina and Killala. There are here a court-house, and chapels for Baptists and Wesleyan Methodists. On the Sligo side are the parish church and a spacious gothic Roman Catholic chapel, which serves as a cathedral to the Roman Catholic diocese of Killala. A brisk trade is carried on in the export of agricultural produce. There is a very productive salmon fishery. A fever hospital and a dispensary are in the town. Ballina has a station of the constabulary force. Quarter and petty sessions are held; there are fairs on May 12th and August 12th. The surrounding scenery is remarkably fine, having a fertile and very extensive plain towards the sea, bounded on the south and east by the range of the Ox Mountains in Sligo, and on the west by Nephin Mountain (2646 feet), and the highlands of Erris. Ten miles north-east of Ballina, near the shore of Killala Bay, is the ruined castle of Leacan, now called Castle Forbes, remarkable as having been the patrimony of the Mac Firbises, who held it in virtue of their office as hereditary scribes and historians of the ancient Irish territory of Hy-Fiachra.

(*Tribes and Customs of Hy-Fiachra, Published by the Irish Archæological Society*, Dublin, 1844; Thom's *Irish Almanac*.)

BALLINROBE, county of Mayo, Ireland, a market and post-town and the seat of a Poor-Law Union, in the parish of Ballinrobe, and barony of Kilmaine, is situated on the Robe River, 2 miles from its embouchure in Lough Mask, in 53° 37′ N. lat., 9° 9′ W. long.; distant 141 miles N.W. by W. from Dublin, and 4 miles S.W. from Hollymount on the leading road from Tuam to Castlebar. The population in 1841 was 2678, in 1851 it was 2162, exclusive of 2301 inmates of the Union workhouse. Ballinrobe Poor-Law Union comprises 18 electoral divisions, with an area of 144,888 acres, and a population in 1841 of 52,113, in 1851 of 37,285.

Ballinrobe is picturesquely situated chiefly on the left bank of the river Robe, and has on the whole a clean and neat appearance. It has now little trade, having in this respect much declined from its former importance. In the town are the parish church, a large chapel for Roman Catholics, a chapel for Protestant Dissenters, a market-house, a dispensary, a bridewell, and the Union workhouse. Quarter and petty sessions are held, and in the town is a barrack station and a station of the county constabulary force. A market for agricultural produce is held weekly, and fairs on Whit-Monday and December 5th.

BALLOTA, a genus of plants belonging to the natural order *Labiatæ*, and the tribe *Stachydeæ*. It has the anthers approximating in pairs, the cells diverging, bursting longitudinally. The upper lip of the corolla is erect, concave, the lower three-lobed, the middle lobe cordate. The calyx is funnel-shaped, with five equal teeth. There are two British species of this genus, *B. fœtida* and *B. ruderalis*. *B. fœtida* is the most common plant, and goes by the name of Horehound. The White Horehound is the *Marrubium vulgare*. [MARRUBIUM.]

BALLYMENA, county of Antrim, Ireland, a market and post-town, and the seat of a Poor-Law Union, in the parish of Kirkinsiola and barony of Lower Toome (with the suburb of Harryville in the parish of Ballyclug and barony of Lower Antrim), is situated on the right bank of the Braid River, 2 miles above its junction with the Maine, in 54° 52′ N. lat., 6° 15′ W. long., 33 miles N.N.W. from Belfast by the Belfast and Ballymena railway, and 118 miles N. from Dublin. The population in 1841 was 5549; in 1851 it was 6136, besides 357 in the Union workhouse. Ballymena Poor-Law Union comprises 23 electoral divisions, with an area of 160,853 acres, and a population in 1841 of 74,120, in 1851 of 71,123.

Ballymena stands in the midst of a very densely-populated district, extending from the neighbouring town of Broughshane on the east to the river Bann on the west. The population here unite the manufacture of linen with the pursuits of agriculture, and Ballymena which is their chief market possesses a very considerable and flourishing trade both in linens and agricultural produce. The town is built of stone, and has a respectable appearance. There are an Episcopal, a Roman Catholic, a Wesleyan Methodist, and three Presbyterian places of worship; a market-house with a spire, the Union workhouse, a dispensary, and a bridewell. Quarter and petty sessions are held, and the town is the head-quarters of the county constabulary. Saturday is the market day. Fairs are held on July 26th and October 21st. In the vicinity are extensive bleach-greens. The surrounding district, although divided into very small holdings, is cultivated to advantage, and presents a rich and pleasing landscape.

BALLYMONEY, county of Antrim, Ireland, a market and post-town, and the seat of a Poor-Law Union, in the parish of Ballymoney and barony of Upper Dunluce, is situated on the leading road from Belfast to Coleraine, 3 miles E. of the river Bann, in 55° 4′ N. lat., 6° 31′ W. long., 18 miles N.W. by N. from Ballymena, 8½ miles S.E. from Coleraine, and 140 miles N.N.W. from Dublin. The population in 1841 was 2490; in 1851 it was 2581, exclusive of 373 in the Union workhouse. Ballymoney Poor-Law Union comprises 23 electoral divisions, with an area of 127,115 acres, and a population in 1841 of 50,710, in 1851 of 42,418. The town is irregularly built on a small stream which runs into the river Bann. It contains a church of the Establishment, a chapel for Roman Catholics, several chapels for Presbyterians, a town-hall, a dispensary, the Union workhouse, and a bridewell. Quarter and petty sessions are held, and there are here stations of the constabulary and the revenue police. Ballymoney has a small trade in linens. A market for linens and dairy produce is held monthly, and fairs are held on May 6th, July 10th and October 10th.

BALM. [CALAMINTHA, *S.* 1; MELISSA, *S.* 1.]

BALSAM. [BALSAMINA; IMPATIENS.]

BALZAC, HONORÉ DE, a French novelist, was born at Tours, May 20, 1799. He was the son of a clerk under the government of Louis XV. At the college of Vendôme, where young Balzac was sent early, he gained the character of an idle and disobedient student, and was removed to a private academy. On leaving school he was placed with a notary in Paris, but he almost immediately commenced writing articles for the journals. These are said to be rather testimonies of his perseverance than monuments of his genius. Between 1821 and 1827 he had published a number of tales, none of them exciting or deserving much attention, under the assumed name of Horace de St.-Aubin. In 1826, in connection with one Barbier, he commenced business as a printer and bookseller, and among other things published an edition of Fontaine's works, with a notice of Fontaine, written by himself, and commenced the 'Annales Romantiques.' His speculation was altogether unsuccessful. In 1829 he appeared before the public for the first time, under his own name, with the novel of 'The Last Chouan;' the scene of which was laid in La Vendée, which district he had visited.

It was not however till the publication of his 'Peau de Chagrin,' in 1829, also under his own name, that the Parisians became alive to the piquant originality and lively fancy that distinguished his works. From that period he was a general favourite in France, and many of his productions have been translated into most of the languages of Europe. He was indefatigable in supplying the public craving under the title of 'Comédie Humaine.' He planned a series of compositions that was to embrace every phase of human society; and at this he worked for twenty years. Among the most popular were 'La Femme de Trente Ans,' and 'Le Père Goriot.'

On the publication of the 'Médécin de Campagne,' in 1835, Balzac received a complimentary letter from the Countess Eveline de Hanska, the wife of a Polish nobleman, possessing large estates in Russian Poland. Balzac replied, and an intimate correspondence ensued. To this lady his novel of 'Seraphita' was dedicated. The countess became a widow, and a few months after the revolution of February 1848 Balzac quitted Paris to bring her back as his wife. He inhabited a large house near the Champs-Elysées, which he adorned with a multitude of chefs-d'œuvres of art, and in which he hoped to find happiness and peace. But even before his journey he had been attacked by a disorder which it was found impossible to cure or to postpone—disease of the heart—of which he died, August 20, 1850. He was buried in the cemetery of Père-la-Chaise, an immense crowd attending the funeral; and Victor Hugo pronounced a critical eulogium over his grave. In that eulogium, he says, Balzac "chastised vice, dissected passion, fathomed and sounded man in his soul, his heart, his feelings, his brain—the abyss of each in its very essence." There is more asserted here than an English reader can concur in. Balzac had a rich fancy, but not a pure taste; he was an acute observer, but wanted poetic elevation; he was often extravagant, and sometimes wearisome. His 'Contes Drolastiques'—thirty short tales—are written in an antiquated form, a sort of resemblance to the 'Heptameron Français' of Margaret of Navarre. The 'Contes Philosophiques et Romantiques' are much inferior to the tales of Marmontel or of Voltaire, of which they are in some degree imitations. His dramas, of which he wrote a few, were failures.

(*Nouvelle Biographie Générale.*)

BANAGHER, King's County, Ireland, a post-town in the parish of Reynagh and barony of Garrycastle, is situated in 53° 13′ N. lat., 7° 54′ W. long., on the left bank of the river

Shannon, which is here crossed by a bridge leading to Galway by way of Eyrecourt; distant 2¼ miles S.S.W. from Shannon harbour, where the river is connected by the Grand Canal with Ballinasloe on the west, and Dublin on the east, and 82 miles W.S.W. from Dublin by the high road. The population in 1841 was 2827, in 1851 it was 1846. The town is built on the intersection of the Birr and Eyrecourt road with that leading from Shannon harbour to Limerick. The old bridge of 18 arches was removed in 1843, and a new bridge of 6 arches of 60 feet span each, with a swivel arch of 45 feet span for the passage of vessels, was erected in its stead by the Irish Board of Works. At the eastern end of the bridge are a barrack and a magazine, and there are batteries which command the bridge and its approaches on both sides of the river. The trade consists chiefly in milling and distillation. Prior to the Union, Banagher was a corporate town, and returned two members to the Irish Parliament. Petty sessions are held here. Fairs are held on May 1st, September 15th, October 28th, and November 8th. The adjoining district is flat, and in the immediate vicinity of great tracts of bog, but it is well cultivated.

BANBRIDGE, county of Down, Ireland, a post-town and the seat of a Poor-Law Union, in the parish of Seapatrick and barony of Upper Iveagh, is situated on the left bank of the river Bann, on the leading road from Newry to Belfast, in 54° 20′ N. lat., 6° 16′ W. long., 13 miles N. by E. from Newry, and 76 miles N. from Dublin. The population in 1841 was 3324, in 1851 it was 3301, exclusive of 478 inmates of the Union workhouse. Banbridge Poor-Law Union comprises 23 electoral divisions, with an area of 124,929 acres, and a population in 1841 of 87,100, in 1851 of 74,844.

The principal part of the town is built upon an eminence, having a steep declivity towards the river. To obviate this inconvenience, the centre of the main street, which was of width sufficient to admit of the alteration, was lowered to a depth of fifteen feet, leaving elevated causeways on each side. In carrying this arrangement into effect, it was necessary to remove the old market-house which formerly stood in the middle of the street on the summit of the hill: a viaduct connecting the opposite terraces now occupies the site. The town consists chiefly of this main street, and is substantially and neatly built, but has no building of pretension except the new market-house and the church. The church is pleasingly situated on a level green adjoining the bridge, on the right bank of the river. The Wesleyan Methodists have one chapel, and the Presbyterians have three chapels. Petty sessions are held here, and there is a station of the constabulary force. Twelve fairs are held in the course of the year. The linen trade in all its branches is carried on with great activity in the immediate neighbourhood. The line of the Bann, from a distance of several miles above the town to the border of Armagh, presents an almost continuous succession of bleach-greens. At Huntley Glen, a little below the town, is a large thread-spinning factory; and at Seapatrick an extensive establishment for weaving union cloth by machinery. A bridge has stood at this point of the Bann from a very early period. In the itinerary of King John, A.D. 1210, the place is mentioned under its present name.

(Fraser, *Handbook for Ireland; Original Communications.*)

BAND-FISH. [Cepola.]

BANKRUPTCY. The numerous statutes relating to bankruptcy have been consolidated by the Bankrupt Law Consolidation Act, 1849; which has been amended in one or two particulars by the statute 17 & 18 Vict. c. 119. The class subject to these laws, *traders*, has been further defined and extended, and the proceedings in court simplified. They are commenced by a petition either by the trader himself, or by a creditor or creditors; upon which an adjudication is made, and after notice, gazetted; there being an appeal to the Lords Justices of the Court of Appeal in Chancery, as coming in place of the Court of Review, and from them to the House of Lords. Meetings for the examination of the bankrupt and proof of debts follow at stated intervals [Bankruptcy, *S.* 1, p. 171], the property of the bankrupt being in the mean time vested by the adjudication in an official assignee; and on a choice being made by the creditors, in him and their assignees jointly, the control of the Court being exercised throughout on the collection and distribution of the estate. Companies incorporated by Charter or Act of Parliament (7 & 8 Vict. c. 111), insurance companies, and banking companies of more than seven partners (7 & 8 Vict. c. 113), may be made bankrupt. Joint Stock Companies, with limited liability, are wound up, when necessary, in the Courts of Bankruptcy; and the Court of Chancery may send the winding-up of companies, whose liability is unlimited, to this tribunal (19 & 20 Vict. c. 47; 20 & 21 Vict. c. 14; Blackst. Comm., Mr. Kerr's ed., v. ii. p. 484. See also Insolvency, *S.* 2).

The bankrupt laws of Scotland have been consolidated to some extent, and the procedure in a sequestration simplified and cheapened by the statute 19 & 20 Vict. c. 79.

A similar observation applies to Ireland. The laws relating to bankrupts and insolvents in that part of the kingdom have been consolidated, and the administration thereof committed to a new court called 'The Court of Bankruptcy and Insolvency' (20 & 21 Vict. c. 60).

BANWELL. [Somersetshire.]

BARBERRY BLIGHT. [Æcidium.]

BARBUS. [Barbel.]

BARHAM, REV. RICHARD HARRIS, was born December 6, 1788, at Canterbury, where his family had resided for many generations. He was an only son, and his father, who died in 1795, left him a small estate. In 1802 his right arm was severely shattered by the upsetting of the Dover mail, in which he was travelling to St. Paul's School, London. His life was despaired of for some time, but he ultimately recovered, and regained the use of his arm. From St. Paul's School he removed to Brasenose College, Oxford, where, during a short but severe illness, he first entertained the thought of entering into the church, though he had previously to this intended to become a lawyer, and did afterwards become for a short time a pupil to a conveyancer. Having passed his examination for holy orders, he was admitted to the curacy of Ashford in Kent, whence he removed to Westwell, a few miles distant. Mr. Barham married in 1814, and shortly afterwards was presented by the Archbishop of Canterbury to the rectory of Snargate, and he obtained at the same time the curacy of Wareham, the former in Romney Marsh, Kent, a district much frequented by smugglers, and the latter on the verge of it. The breaking of one leg and the spraining of the other by the overturning of a gig, gave him occasion to employ himself in the composition of a novel, entitled 'Baldwin,' which was published without attracting any notice. Soon afterwards he became a candidate for a vacant minor canonry in St. Paul's Cathedral, and though his friends thought he had no chance of success, he was duly elected in 1821. He thenceforth devoted much of the time not required by his professional duties to contributions in prose and verse to the periodical publications of the day. He wrote 'My Cousin Nicholas' in 'Blackwood's Magazine,' and about one-third of the articles in Gorton's 'Biographical Dictionary' were written by him. 'My Cousin Nicholas' has since been published in a separate form, in 3 vols. 8vo.

In 1824 Mr. Barham received the appointment of a priest in ordinary of the Chapel Royal, and shortly afterwards was presented to the rectory of the united parishes of St. Mary Magdalene and St. Gregory by St. Paul, London.

Till the year 1837, when the first number of Bentley's 'Miscellany' appeared, Mr. Barham had been an anonymous and comparatively unknown writer; but the 'Ingoldsby Legends,' a series of humorous tales in verse, which appeared in rapid succession in that work, brought him so much reputation, that his pseudo name of Ingoldsby no longer concealed him, and he became generally known as the author. In 1842 he was appointed divinity reader in St. Paul's Cathedral, and he was permitted to change his living for the more valuable rectory of St. Augustine and St. Faith, London.

On the 28th of October 1844, when the Queen visited the city to open the new Royal Exchange, Mr. Barham, who was a witness of the procession, caught a severe cold, from which he never recovered. He died June 17, 1845.

Mr Barham was personally acquainted with Theodore Hook, the Rev. Sydney Smith, and several other of the distinguished wits of his day, and was, like them, a frequent diner-out, a sayer of good things, and a teller of droll stories; but he never neglected his more serious duties, and was much respected by those who knew him.

The 'Ingoldsby Legends' have been published in 3 vols., post 8vo. 'A Memoir of the Rev. Richard Harris Barham,' by his son the Rev. R. H. D. Barham, precedes the Third Series.

BARKER, THOMAS, was born near Pontypool, Monmonthshire, in 1769. His father was by profession a barrister, but being a man of desultory and expensive habits, he failed to obtain practice, and, having wasted his property, he took to painting portraits of horses, &c. Thomas Barker early imbibed a passion for art; and some of his drawings so much pleased a Mr. Spackman, a wealthy coach-builder at Bath, where the family then resided, that he took the youth under his protection and kept him for several years in his house, affording him at the same time the means and opportunity of pursuing his artistic studies. When young Barker had arrived at the age of 21, his generous patron sent him to Rome to complete his studies, furnishing him with ample funds to maintain himself while there in something like luxury.

Mr. Barker established himself as an artist in Bath. He painted chiefly landscapes and rustic figures; but he occasionally essayed, though with less success, a more ambitious class of subjects. He speedily obtained popularity and patronage in Bath, and indeed throughout the western and midland counties. He only occasionally sent pictures to the London exhibitions, but his name was well known in the metropolitan art-circles. Perhaps no contemporary painter resident in the provinces (Bird excepted) gained so wide a measure of celebrity. One of his pictures—the Woodman—formed one of the most popular engravings of the day; and the Woodman's well-known figure was reproduced in ruder prints, upon jugs and plates, and nearly every variety of earthenware, upon snuff and tobacco-boxes, pocket-handkerchiefs, and almost every kind of article upon which a design could be painted or printed. Others of his designs were also very extensively employed by manufacturers. As a painter, Mr. Barker displayed in his own peculiar walk great originality, a vigorous though somewhat rude style, considerable powers of colouring, and, above all, the art of rendering his intention plainly perceptible to the general spectator, and of impressing the sentiment strongly upon all. His walk of art was not the highest, but his homely story was unaffectedly and forcibly told, and seldom failed to carry its simple lesson along with it.

Mr. Barker always found ample and liberal patronage; and, having amassed a fair amount of wealth, he erected for himself a handsome mansion at Sion Hill, Bath, filling its apartments with a choice collection of sculpture, pictures, engravings, and other productions of taste and elegance. But the decoration which he specially prized was a large fresco, 30 feet long by 12 feet high, which he painted upon the wall of one of the rooms: it represents the Inroad of the Turks upon Scio, in April 1822, and is a most elaborate composition. His friends and admirers describe it as the noblest of his productions; but neither the character of his mind nor his training as an artist qualified him for a painter of history. Mr. Barker died December 11, 1847, in the 79th year of his age.

BARRHEAD, Renfrewshire, Scotland, a small manufacturing town of recent growth, in the parish of Neilston, 3 miles S.E. from Paisley and about 8 miles S.W. from Glasgow. It is connected with Glasgow and Ayrshire by the Glasgow, Barrhead, and Neilston Railway. Spinning, weaving, and bleaching works are carried on here. The town, in addition to its neat railway station, possesses a chapel of ease and two meeting-houses, one for a congregation of the Free Church, and the other for United Presbyterians: the population of Barrhead in 1851 was 6069.

BARRISTER. [BARRISTER.] In order to be called to the Bar of England it is now necessary either to attend certain public Lectures in the Halls of the Inns of Court, which are delivered by Readers or Lecturers appointed by the Benchers for that purpose, or to pass an examination conducted by these Readers, who are paid partly by the Inns of Court and partly by fees levied from every person admitted to any one of these Inns. To encourage students to submit to examination, three studentships or bursaries of fifty guineas are given away annually to the student who has best answered the questions of the examination.

In Scotland, a preliminary education test, in the shape of an examination in classics and arts, has been imposed on persons applying for admission to the Faculty of Advocates.

BARROW, SIR JOHN, was born at Dragley-Back, near Ulverstone, Lancashire, June 19, 1764. Having passed through the Town Bank Grammar School, young Barrow was placed when about fourteen years old as clerk and overlooker in an iron-foundry at Liverpool, but quitted this situation two years afterwards to make a voyage in a whaler to Greenland. Having removed to London, he for a while was employed as mathematical teacher in a school at Greenwich, when he obtained in 1792, through the influence of Sir George Staunton, to whose son he had given lessons in mathematics, the appointment nominally of comptroller of the household to Lord Macartney in his celebrated embassy to China; but really to take charge of the various philosophical instruments carried out as presents to the emperor of China. Of this journey he published an account some ten years later in a thick quarto volume, entitled 'Travels in China.' In this embassy Mr. Barrow secured so far the good-will of Lord Macartney, that his lordship made him his private secretary on being appointed Governor of the Cape of Good Hope in 1797; and when Lord Macartney quitted the Cape in 1798 he left Mr. Barrow in the post of auditor-general of public accounts. During his stay at the Cape Mr. Barrow devoted his leisure hours to the study of the geography and natural history of South Africa, and made several journeys into the interior. On his return to England he published the results of his investigations in a quarto volume entitled 'Travels in Southern Africa.' In 1804 Mr. Barrow was appointed by Lord Melville to the responsible post of second Secretary to the Admiralty, the duties of which he continued to discharge for a period of forty years under thirteen administrations. In this office Mr. Barrow was earnest and indefatigable in the promotion of every project which commended itself to his judgment as calculated to advance the progress of geographical or scientific knowledge. Especially did he labour by every possible means to commend to the various governments under which he served, and to the country, the prosecution of the various voyages to the Arctic Regions which have so characterised the naval history of England during the forty years of his connection with the Admiralty; and though his services had been fitly commemorated by associating his name with the point of land, Cape Barrow, yet such was the sense entertained of them by those officers who had been engaged in those voyages, that, on his retirement from his secretaryship, they presented him with a costly candelabrum, bearing a suitable inscription on the pedestal.

Mr. Barrow was a man of untiring industry. The leisure hours afforded by his official employment were devoted to literary and scientific pursuits; and his literary labours would in extent have seemed not unworthy of one whose whole time was given to literature. Neither in literature nor science would he be regarded as having attained a high place, but for many years he held a distinguished position in the literary and scientific circles of the metropolis. He was for a long period a member of most of the leading learned societies of London. In 1805 he was elected a Fellow of the Royal Society; in 1830 he took a leading part in the foundation of the Geographical Society, of which some years later he was chosen president. In 1835 he was created a baronet.

In the beginning of 1845 Sir John Barrow, then in his eighty-first year, resigned his office at the Admiralty, and retired from public life. He had as early as 1806 received in consideration of his various public services, the grant of a pension of 1000*l.* per annum, to be deducted from the emoluments of any place he might hold under government. He died almost suddenly on the 23rd of November, 1848, in the eighty-fourth year of his age. Besides the works mentioned above, Sir John Barrow published a 'Life of Earl Macartney;' 'Life of George Lord Anson;' 'Life of Lord Howe;' 'Life of Drake;' 'Memoirs of Naval Worthies of Queen Elizabeth's Reign;' 'Chronological History of Arctic Voyages;' 'Voyages of Discovery and Research within the Arctic Regions;' 'Sketches of Royal Society and Royal Society Club;' the 'Life of Peter the Great;' and the 'Mutiny of the Bounty' in the 'Family Library;' and his 'Autobiographical Memoir,' written in his eighty-third year. He was also for a long series of years a frequent contributor to the 'Quarterly Review,' having in all furnished 195 articles to that journal, and he wrote some papers for the 'Encyclopædia Britannica,' as well as for one or two other periodical publications.

(*An Autobiographical Memoir of Sir John Barrow*, Bart.; Sir G. T. Staunton, *Memoir of Sir John Barrow*, edited by J. B. [John Barrow, son of the subject of the above article].)

BARRY, MARTIN, an eminent physiologist, was born at Fratton, Hampshire, in March 1802. The strong bent which he early manifested for scientific pursuits, led his parents to give up their scheme of a mercantile life for their son, and he studied in the universities of Edinburgh, Paris, Berlin, and other places in Germany, and in the medical schools of London. He entered warmly into the proceedings of the societies of the Scottish metropolis, and spent most of his holidays in geological and botanical excursions on foot among the lakes and mountains. He took his degree of M.D. at Edinburgh in 1833, and in the following year, after a term of study at Heidelberg, he rambled through Switzerland to Chamouni, where, though past the middle of September, too late in the season, as was thought, for success, he went to the summit of Mont Blanc. This was the sixteenth ascent; and Humboldt was so pleased with the narrative of the adventure published by Barry in 1836, that he personally requested him to translate his 'Two Attempts to ascend Chimborazo' from German into English.

Martin Barry has the merit of being one of the few physiologists who devoted their attention to the difficult question of animal development and embryology. He began by making himself well acquainted with the literature of the subject; and in the museums and laboratories of Wagner, Purkinje, Valentin, and Schwann, he brought his knowledge to the test of observation, and acquired that mastery over the microscope which afterwards appeared in the importance and value of his own researches.

Having published in the 'Edinburgh Medical and Surgical Journal' for 1836, a translation of the first part of Valentin's 'Manual of the History of Development,' he commenced his investigations into the development of the mammalian ovum and embryo, at that time, as truly described, "the darkest part of embryological science." The results, communicated to the Royal Society of London, were printed in the 'Philosophical Transactions' under the general title of 'Researches in Embryology.' These, as well as his papers 'On the Corpuscles of the Blood,' 'On the Formation of the Chorion,' 'On Fibre,' &c., will be found in the 'Philosophical Transactions' from 1838 to 1842. The most important—the discovery by which he will be best remembered—'Spermatozoa found *within* the Ovum,' appears in the volume for 1843. The Royal Society recognised the value of Barry's researches by awarding him their royal medal in 1839, and electing him a Fellow in the following year.

The 'Researches in Embryology' exhibit proofs of the author's skill in the grouping and selection of his facts, and of the perseverance by which they were demonstrated. He explains the formation of the ovum in the rabbit and dog, and in some of the oviparous vertebrate classes from the bird to the fish. He determined the order of formation of different parts of the ovum, and the nature and mode of its growth from the ovisac; and showed that the so-called 'disc of Von Baer' contained a retinacula, or peculiar species of mechanism, by which, as he supposed, the passage of the ovum into the Fallopian tube was regulated. He described the changes that take place in the ovum while on its passage—changes before unknown; and Barry was the first to throw light on this interesting process of animal development. Not till his paper appeared in 1839, was it known that the segmentation of the yelk which had been observed in Batrachian reptiles, was also true of mammals. It was an important discovery; and not less so that published in 1840—the penetration of the ovum of the rabbit, by spermatozoa, through an aperture in the zona pellucida. This at first was doubted; but he confirmed it by further observation in 1843; and it was eventually corroborated by the observations of Nelson and Newport, accounts of which are also published in the 'Philosophical Transactions;' and Professor Bischoff, who had denied the truth of Barry's conclusions, at last satisfied himself of their accuracy, and accepted them in full.

The views expressed by Barry in his paper 'On Fibre,' are disputed by physiologists. He assumed a spiral structure for muscular fibre and other organic tissues, and brought speculative arguments to bear in favour of his opinions; but other investigations show one and the other to be fallacious. His speculations have however tended to stimulate physiological research. Whatever may have been Barry's feeling for his own favourite ideas, his character as an amiable and benevolent man is beyond question. Ample private circumstances placed him above the need of practising his profession; and he devoted much of his time to the poor, chiefly as house-surgeon to the Royal Maternity Hospital in Edinburgh. From 1849 to 1853 he lived on the Continent to recruit his health and eyesight, both having suffered from long and severe study. At Prague he renewed his examinations of fibre conjointly with Purkinje; with what result may be seen in Müller's 'Archiv.' for 1850. In 1852 he returned to Scotland, suffering much from neuralgia; and having gone to reside at Beccles, in Suffolk, he died there on the 27th of April, 1855. He was a member of the Society of Friends.

Barry was a member of the Royal Society of Edinburgh, of the Wernerian and other societies, and the College of Surgeons in that city. Some of his papers and translations are printed in the 'Edinburgh New Philosophical Journal,' and others in the works and periodicals already mentioned.

BARTON, BERNARD, was born in London in 1784. His parents were members of the Society of Friends, and to the tenets of that sect Bernard Barton always adhered. In 1806 he went to Woodbridge in Suffolk, and there in 1810 he entered as a clerk the banking-house of Messrs. Alexander, in whose employment he continued almost to his death. Bernard Barton first claimed public attention as a poet in 1812, by the publication of a volume of 'Metrical Effusions.' This was followed in 1820 by a volume of 'Poems,' and thenceforward as long as he lived he continued to issue at intervals either brief occasional pieces, or, though much more rarely, a poem of greater length and loftier pretensions.

Bernard Barton attracted an amount of attention and popularity far beyond that to which his poetic merits would seem to have entitled him. This was perhaps mainly owing to his presenting the then unusual phenomena of a Quaker poet—the title indeed by which he came to be commonly known; but it likewise no doubt was partly due to the evidently unaffected tone of simple religious earnestness which pervades all his writings. He wrote with ease; and like most easily written poetry, his verses are more characterised by fluency than power. But though often diluted almost to feebleness, there is a vein of natural feeling and quiet unobtrusive benevolence running through his verses, which render them pleasing to all but the more critical class of readers. Barton was a man of refined habits; a lover of nature, and fond of paintings and other works of art to a degree then very uncommon among members of his sect. His moral character was blameless, and few men in his position of life won so wide and general a share of esteem as did Bernard Barton. Some years before his death he received, through the instrumentality of Sir Robert Peel, the grant of a pension of 100*l.* per annum. He died suddenly of spasm in the heart, February 19, 1849. Besides the works noticed above, Barton published 'Napoleon and other Poems,' 1822; 'Poetic Vigils,' 1824; 'Devotional Verses,' 1826; 'Household Verses,' 'New Year's Eve,' and numerous occasional verses and poems published separately, and in magazines, annuals, &c.

(*Memoir*, prefixed to his Poems; *Gentleman's Magazine*, 1849.)

BASEVI, GEORGE, an eminent architect, was born at Brighton, in 1794. He was placed as a pupil with Sir John Soane, R.A., in whose office he remained for six years. He then made a professional tour through Italy and Greece for three years. He commenced practice as an architect in 1819. During his comparatively short career Mr. Basevi was employed in the construction of various descriptions of buildings, scarcely any one of which is without manifest evidence of careful study and well-cultivated taste. Among the more extensive of his works may be mentioned Belgrave-square, which was erected entirely from his designs. The churches at Brompton, Twickenham, Hove, &c., show his acquaintance with the requirements of ecclesiastical architecture. St. Mary's Hall at Brighton may also be mentioned among his more successful efforts. But his great work is the Fitzwilliam Museum at Cambridge, one of the most ornate yet chaste and effective classical edifices erected in England during the present century. It was not quite finished at his death, and, like the Conservative Club-House, St. James's-street, another of his latest works, executed by him in conjunction with Mr. Sidney Smirke, it shows that he was rapidly throwing off the trammels of precedent, and giving his fine taste and attainments fuller and freer play. But his career was suddenly cut short by a lamentable accident. Whilst examining, in company with the Dean of Ely, the works in the Bell Tower of Ely Cathedral, the restoration of which was being conducted under his direction, his foot caught against a nail in a beam from which the flooring had been removed, and he fell through an aperture on to the top of the arch under the tower, a distance of 40 feet. He died almost instantly, October 16, 1845, aged 51. The Fitzwilliam Museum was finished under the direction of Mr. Cockerell.

BASSE. [LABRAX.]

BASTIAT, FREDERIC, was born at Bayonne, June 29, 1801. He was the son of a merchant, by whom he was early destined to a commercial career. After receiving a good education at the College of St. Sever, he was placed in the counting-house of an uncle at Bayonne. Here he applied himself sedulously to the study of the principles of trade; and, having to visit Spain and Portugal on business in 1840, he availed himself of the opportunity of studying the commercial regulations of these two countries, lagging behind even those of France at that time. The result of his thoughts was at length communicated to the public by M. Bastiat, in 1844. It appeared in the 'Journal des Economistes,' under the title 'L'Influence des Tarifs Français et Anglais sur l'Avenir des deux Peuples.' In this the author avowed himself as the adversary of the principle of protection to trade—a principle at that time universally acted upon in France, and almost as universally recognised as just and expedient. Bastiat, however, gained adherents, and time and truth, with the example of England, carried his principles forward till they were to some extent acknowledged and adopted by the government of France, and appear likely to be extended still further. In 1845, after a visit to England, where he had made the acquaintance of Mr. Cobden, he translated, under the following title, many of the addresses of the Free-Traders, preceding them by an introduction:—'Cobden and the League; or the English Agitation for the Freedom of Exchange.' In this he adduced all the inconveniences of a prohibitive system. He became secretary in Paris of a society for promoting the freedom of trade, and editor of a journal devoted to the same cause. While thus advocating sound commercial principles, he was opposed to the doctrines of Socialism, and the pretended right of every one to be supplied with work. After the revolution of 1848 he sat for some time in the Legislative Assembly, but his health failing, he proceeded to Italy in hopes of improving it, and died at Rome, December 24, 1850.

M. Bastiat wrote many works besides those mentioned, but all on the same leading subject. Though valuable and novel in France at the time of their appearance, they contain little that had not been before enunciated in England; but the views, although not original, are placed effectively before the reader.

(*Nouvelle Biographie Générale.*)

BATHS AND WASHHOUSES, PUBLIC. In the article Bath ['P. Cyc.' vol. iv. p. 31] it was said "There are but few baths in London, and those established there would not suffice for a small fraction of the population, if bathing were a common practice. Still of late years baths have increased both in London and England generally." The baths here spoken of were private ones of a comparatively expensive character. There were indeed a few public swimming-baths, but no public establishments, where, for a trifling sum, the labouring man might enjoy the use, or the luxury, of a warm, a tepid, or a cold bath.

But if baths of any kind were rare, public washing-houses were quite unknown. In olden days, indeed, the English were not wholly, or perhaps generally, home-washers. The housewife or the laundress carried the linen down to the nearest convenient spot by the side of a stream, where "the shore was shelvy and shallow," like that which the whitsters [washers] of Windsor resorted to, by Datchet Mead, where Falstaff was so unceremoniously slighted from the buck-basket. It is on record that the corporation of Reading, upon the suppression of monasteries, petitioned for the grant of the Friary in that town, for a town-hall, because their old hall stood by the river Kennet, near the spot which was used by the townswomen for washing clothes; and the corporation say in their petition that the noise of the women's clappers caused great interruption to the transaction of public business. These clappers were, of course, wooden ones. Washing in cold water, they used wooden battledores to beat their clothes, just as the *blanchisseuses* of the Seine do still. In the present day, washing by the river-side is, we believe, nowhere to be seen in England, but it is common enough in Scotland, Wales, and Ireland; and, as is well known, the Parisian laundresses pretty generally resort to washing-boats on the Seine. In Pepys's day, London families would seem to have sent their linen to be washed by their servants at some washing establishment; for that most valuable of diarists tells us, that on August 12th, 1667, he dined all alone, "my wife and maids being gone over the water to the whitster's with their clothes, this being the first time of her trying this way of washing her linen." Again he notes (August 19th, 1668), "This week my people wash over the water, and so I little company at home;" by which we may suppose that Mrs. Pepys was satisfied with her trial of "this way of washing her linen," as she continued to practise it for above a year.

It was reserved for our own day to establish public baths and laundries for the community generally, and for the poorer portion of it in particular. The practical philanthropist early saw that the sanitary improvement of the condition of the poor in our larger towns was a work loudly calling for accomplishment. Medical men, clergymen, city missionaries, parochial officers, and all whom either professional duty or benevolence had led to enter the dwellings of the very poor, however their opinion differed in other respects, were at least unanimous in declaring that those dwellings exhibited a degree of dirt and squalor with which health and morality were alike incompatible. Many remedies for the evil were suggested, and several carried into execution. One little knot of practical men resolved fortunately to give their special attention to the matter of personal cleanliness. It had been allowed by all who were really acquainted with the homes of the very poor, that in their crowded and wretched dwellings cleanliness was impossible. In such places not only were there scarcely the means for personal cleanliness, but to wash and dry clothes properly was quite impracticable. It was proposed, therefore, to see whether the establishment of places where, for a small charge, a warm bath could at any time be had, and where all the conveniences for washing and drying clothes should be provided free of charge, or at a trifling cost per hour, would not be gladly accepted by the classes most requiring such conveniences.

The movement was practically initiated by the holding of an influential meeting at the Mansion House, under the presidency of the Lord Mayor, in September 1844; when resolutions were passed for the formation of an 'Association for Promoting Cleanliness amongst the Poor;' and an active subscription was commenced. The first experiment was made in a wretched locality near the London Docks, where in an open court, called Glasshouse Yard, Rosemary Lane, an old but spacious building, which had for some time been occupied by 'sleeping-berths for the houseless poor,' was rented and converted into the first 'Free Baths and Wash-houses,' and opened in May 1845. A portion of the building was adapted, as well as it could be at a small expense, to the purpose, and furnished with a due supply of tubs and boilers, and with a few baths in various out-of-the-way recesses; and soap and soda, as well as hot and cold water, were provided gratuitously. The number of persons who availed themselves of the establishment was, in the first year, 27,662 bathers and 36,577 washers; in the second year there were 84,584 bathers and washers. This, though the first establishment of the kind in London, was not the first in England; a very small one having been previously started, and with much success, in Liverpool, though without the knowledge of the London Committee. The Glasshouse Yard establishment owed its success solely to its usefulness. There was nothing extrinsic to render it attractive. It was placed in one of the worst spots in the metropolis; the building itself was as little suited to the purpose as any building well could be; the accommodation was of the most ordinary kind. Yet it at once proved—if proof were needed—that the poorest in that wretched neighbourhood would gladly be clean when the means were attainable. In August 1846, a second, and much superior establishment, was opened in George Street, Euston Square; a plot of ground having been liberally offered by the New River Company, near one of their reservoirs, with the additional advantage of a free supply of water for the first six months. In the first year there were here some 113,000 bathers and 20,000 washers. This establishment, in which the baths are more varied in price than elsewhere, still flourishes.

The establishment third in point of date was, however, the first in importance and in the value of the consequences which resulted from it. In this the committee first fairly developed their plans. Although the building in Glasshouse Yard was opened gratuitously, it had been desired that the institution should as soon as practicable be rendered self-supporting by means of a small charge to each person who used it. The committee hoped too, to see the system extended throughout the country; and they rightly thought that nothing would so effectually and speedily further that object as to be able to show a Model Establishment, which, while it contained all the conveniences and appliances which those who availed themselves of it could desire, should be in itself all that science, combined with practical skill, could effect in the economy, suitableness, and completeness of its arrangements. Accordingly, architects and others were invited to send in designs for baths and laundries, and all the information which could be obtained was collected. The Model Establishment was then erected on a site which had been purchased in Goulston Square, Whitechapel, a very poor and crowded neighbourhood, but of ready access. The arrangements being almost entirely novel caused a very large original outlay, and many changes have been subsequently made; but as a whole they had been so carefully considered, and were so judiciously designed by Mr. Prichard Baly, the committee's engineer, that no material alteration has since been found necessary; indeed, in a recent Report of the Committee, we are told that "the general arrangements and mode of construction have been almost universally followed in London and the country."

In general character, then, these establishments are pretty much alike. The exterior is usually a plain brick building, with stone quoins and dressings; having a basement, and, in front, a story above it, with a lofty square ventilating and chimney-shaft, somewhat like a campanile in appearance. A brief sketch of the interior of any one will serve to give a general conception of all, it being understood that there are differences of detail in each.

The baths for males and females are on opposite sides of the building, and separated in Goulston Square by the washing-room, in some others by the plunging-baths. In both sides are first and second class baths. The apartment in which these are placed is spacious and lofty, covered by an open roof, and lighted in the day by ample skylights, by gas-lights at night. Each bath-room is a distinct compartment, somewhat more than six feet square, shut in by walls of painted slate, which are carried up to the height of some ten feet; but the top is open, so as, while insuring privacy, to admit of thorough ventilation. The bath, in some establishments sunk in the ground, in others placed as usual above it, is either of iron enamelled, or of zinc. The first and second class rooms are usually alike in every respect, except that the fittings in the first-class rooms are of a superior kind, and more complete than in the second. On each door is a porcelain knob, having a number painted upon it; a similar number is painted inside. An index outside enables an attendant to let in either hot or cold water, as the bather may direct. The charge for a first-class warm bath is sixpence, for which two towels, flesh and hair brushes, and a comb are allowed. For a second-class bath the charge is only twopence, but only one towel is allowed, and the bather most provide his own comb and brushes. The baths are in all respects alike, the same quantity of water (in most places forty-five gallons, but at St. Martin's much more) is allowed, and the bath is invariably cleaned after each person. The most perfect cleanliness is indeed observed in every respect. For a cold bath the charges are respectively threepence for a first and one penny for a second class bath: the regulations are the same as with the warm baths. The baths on the female side are similar to the others, but there is a little more taste in the first-class fittings. At Goulston Square there are only warm and cold baths. At St. Martin's a shower-bath is added. At George Street there are also vapour-baths; and at the more recently constructed establishments there are plunge or swimming baths filled with tepid water. For these swimming-baths the charge is usually fourpence for the first, and twopence each person for the second-class. At the larger of the recent establishments there are two swimming-baths—a first and a second class; the smaller places have only one large bath, using it three days a week as a first, and the other three days as a second-class bath.

The baths have everywhere proved exceedingly popular. The second-class baths are, in the summer particularly, always well attended, and of an evening there are generally many waiting for their turns, which are always strictly in the order of arrival.

The number of baths varies, of course, according to the requirements of the locality, and the size of the building. The number of first-class baths, for example, at St.-Martin's-in-the-Fields is, twenty-four men's, five women's; of second-class, thirty-three men's, and eight women's. At Goulston Square, there are ninety-four first and second class baths. At St. James's, Marshall Street, there are only about fifty of both classes; but there is a swimming-bath. The number of bathers at Goulston Square in the year is above 150,000; at St. Martin's-in-the-Fields the number is above 200,000.

The Wash-houses are more remarkable than the bathing-rooms, because entirely unlike what is seen anywhere else. Along the centre, on one side, and at the ends of a large and lofty room, are ranges of little doorless and roofless compartments, the walls being of unpainted slate, and some six or eight feet high: these are the washing-places. At convenient points are the wringing-machines. Along one side of the room (at Goulston Square) is what looks like a range of wide but shallow deal drawers, turned up endways, the handles being one above the other—that is the drying apparatus. A long flannel-covered board is furnished for ironing on. In some of the latest wash-houses a mangle is provided.

Each washing compartment is six feet long by three and a half feet wide. At the end are two wooden troughs, which serve as a washing-tub and a boiler; these are furnished with taps for hot and cold water, for steam, and for letting off the waste water, so that the tubs are filled and emptied without any more trouble on the part of the washer than turning the tap, and without moving from her standing-place. The water in the boiler is made to boil by the admission of steam into it, which, as we said, the washer can do whenever she pleases. The ventilation is so arranged that the steam from each compartment is at once drawn upwards, and carried off to the great ventilating shaft.

The Wringing-Machine is in effect a sort of wide but shallow colander, the sides, instead of the bottom being perforated, or rather formed of galvanised wire, so arranged that the meshes are about a quarter of an inch apart. When the wet clothes are put in this, it is set in rapid motion by a handle which works a few connecting wheels; the clothes at once by centrifugal force arrange themselves around the sides, and the water is rapidly driven out between the wires, and carried off by water-pipes: an opening at the foot of the machine shows when the water ceases to flow, and when consequently the 'wringing' is completed, and then the pressure of a lever at once stops the machine. The machine has rather a heavy look, but the turning of it is really very light work, and by it three minutes suffice to rid even a thick blanket of its moisture. The Drying-Chamber is a long chamber, heated by hot air to a temperature above 212°, and divided into numerous smaller chambers, so as to separate the clothes of the washers. Each division of the chamber contains a clothes-horse or maiden, one being allowed to each washer. In ten minutes, or a quarter of an hour, the clothes, unless very heavy or numerous, are quite dry. The Committee have published a table in their Report to show the rapidity with which the drying is accomplished. Some of the results are curious. We may take a single instance as an illustration of the processes we have been following. Three large dirty blankets weighed before being washed 9 lbs. 1 oz.; after washing, they weighed 24 lbs. 14 oz.; after leaving the wringing-machine, 12 lbs. 3 oz.; after being dried, 8 lbs. 12 oz. These blankets took twenty-five minutes to dry, at a temperature of 210°. In all other cases the results were similar, establishing the fact that "the articles when taken from the drying-chamber contained decidedly less moisture than they did when they were received for the wash." To show the "satisfactory working of the drying-chamber at the Model Establishment, and also its great advantage in the economy of time, trouble, and expense, to those of the labouring classes who resort to it," the committee give a return of the articles dried there in one week ending January 24, 1852. It is too full for us to copy; but we may state that the number of articles of all kinds, from counterpanes, jackets, and trousers, down to shirts and stockings, was 36,844, belonging to 1373 washers, who occupied 2999½ hours in washing, drying, and ironing them; and that the drying consumed only 282 bushels of coke, which cost under 4*l*.

In most of the establishments there is only one class of washers; but in some there are both first and second classes, the difference being that the first class have a somewhat larger compartment allotted to each washer, and a third or rinsing-tub. The charge for the use of all the apparatus we have described is now generally 1½d. an hour, though in a few places it is only 1d. an hour. Where there are both classes, the charge is 2½d. an hour first-class, and 1½d. second. Soap, soda, &c., have to be found by the washers. The number of washing compartments varies, of course, according to the size of the establishment; at Goulston Square there are 84 of them, at St. Martin's 56. The average time occupied by each washer at the Model Establishment is two hours and a half; and this is the general average time in London; in some country towns it differs considerably. In

London it seems pretty well established that the active wife of a labouring man can at one of these places wash and dry the clothes of her family in two or three hours. The ironing, at least in part, is generally done at home.

Let us now look a little at what has been accomplished. In August, 1846, the royal assent was given to an Act to encourage the establishment of public baths and wash-houses, which, as amended in the session of 1847, empowered parish vestries and borough councils to establish such institutions, and, with the sanction of the Treasury, to borrow money for the purpose on the security of the borough fund or poor's rates. A schedule directs, among other very excellent rules, that baths must be provided in them at 1d. for cold, and 2d. for warm baths; and that the wash-houses shall be furnished with necessary conveniences at a charge not exceeding 3d. for two hours. Baths and wash-houses of a higher class are to be charged as the council and commissioners respectively think fit. The baths and wash-houses "for the labouring classes" in any such establishment, must be not less than twice the number of those of any higher class. This Act at once gave the system a firm standing; and both boroughs and parishes have availed themselves of its powers to a considerable extent. Of course, it is not always easy to persuade vestrymen to permit an addition to be made to their parochial rates for a purpose that does not promise advantage to themselves; but as it has become year by year more evident that these institutions may be made self-supporting, and in due time repay the amount expended on their foundation, so there has been a growing readiness to found them. In London and the suburbs, besides the Model Establishment in Goulston Square, and that in George Street, Hampstead-road, there are several large parochial establishments, some of which are fitted up in an extremely complete manner, while all are well attended by both washers and bathers. Manchester and Liverpool have each several baths and wash-houses, and almost every other large town throughout the country is either provided, or taking measures to be provided with similar establishments; and the example has been followed by several of the smaller towns. Nor have the good effects of the movement been confined to this country. The Committee for promoting the Establishment of Baths and Wash-houses for the Labouring Classes, were able at the end of 1852, to state in the Report before quoted, that the governments of France, Norway, and Belginm, the municipality of Venice, and the authorities at Hamburg, Turin, Munich, Amsterdam, Lisbon, and New York, had applied for, and been furnished with information on the subject; and in some of these countries the example of England has since been followed in providing similar establishments for the labouring classes.

It is evident that the institution has become firmly established. In London alone, the bathers number little short of two millions a year; while the washers exceed half a million. The constantly increasing number of bathers and washers shows that the system is commending itself to a large section of the population. The experience of twelve years has proved that, with proper attention and economy, the establishments may be rendered self-supporting; and the observations of all who have watched them in particular localities, vouch for their beneficial influences. The point in which they appear to have failed, is in reaching the very poorest. That portion of the community for whom the institution was primarily intended, seems to have been scarcely touched by it. Everywhere those who avail themselves of the benefits offered, are of a class above the poorest. The most profitable section of the establishment is found to be the "first class." Whether availing themselves of the hint, the managers of these establishments might not, by furnishing a yet higher class bath (though still at a moderate price), provide the means by which they might support one of a cheaper kind than they have at present been able to afford, and so extend the benefits of the system both upwards and downwards, is a question perhaps deserving of more attention than it has hitherto received.

BATHYANI, COUNT LOUIS, was born at Presburg in 1809. At the age of sixteen he entered the Austrian army as a cadet, and was stationed at Venice. He subsequently travelled in the East and in Europe with his wife, the Countess Antonia Zichy. On his return to his native country, he became at once a leader on the liberal side, a distinguished orator, and a favourite with the public. From 1839 to 1844 he opposed openly the Austrian chancellor Apponyi, in favour of Hungarian commerce and industry. At this time he was alike opposed to Kossuth, with whom however he afterwards allied himself. When, in consequence of the events of March 1848, the Archduke Stephen was created Palatine of Hungary, Count Louis, an old friend of Stephen's, was named chief minister. He strove earnestly in this capacity to maintain the political union between Austria and Hungary. After the invasion of Jellachich, and some fruitless negociations with Austria, he resigned his functions on September 11; the next day he was commissioned to form a new ministry, but this effort failed.

After the dissolution of the Diet, and the murder of Count Lambert, he repaired to Vienna to endeavour to prevent the ill-effects of this crime, and if possible to form a new administration. His exertions were in vain, and he returned to take a part in the hostile struggle now become inevitable. In November 1848 he went to Pesth, to take his seat in the Diet, and was named one of a deputation sent to treat with General Windischgratz, the Austrian general, who was approaching Pesth with an army. The deputation was not received. The Hungarian government removed to Debreczin, but Count Louis remained at Pesth, where, on the arrival of Windischgratz on January 8, 1849, he was arrested. After being transferred to Ofen, to Olmntz, and to Laybach, he was at length brought back to Pesth, where he was condemned by a council of war to be hung. He endeavoured to escape the ignominy of the sentence by destroying himself with a poignard. He did not succeed, but at length the sentence was changed, and he was shot, Oct. 6, 1849. His estates were confiscated, and his wife and children were exiled.

(*Nouvelle Biographie Générale*.)

BATRACHOSPERMEÆ, a tribe of plants referred by some writers to the order *Fucaceæ*. It is regarded by Harvey as an aberrant group of *Chlorospermeæ* leading through *Ectocarpaceæ* to *Melanospermeæ*. [ALGÆ.] The species have a polysiphonous frond composed of a primary thread, surrounded by parallel accessory ones. The vesicles are terminal or lateral and clustered.

The principal genus of this family is *Batrachospermum*, which have got this name from βάτραχος, a frog, and σπέρμα, a seed, on account of their gelatinous fronds giving them the appearance of the ova of the *Amphibia*. The species are flexible, and have a gelatinous character. The surface is covered with innumerable little hairs, looking like cilia, which give them a very beautiful appearance under the microscope. They mostly inhabit pure and running waters where the force of the stream is not considerable. On removing them from the water the hairs, which are expanded whilst immersed, collapse, and they appear like masses of jelly without any traces of organisation.

Several species of this genus have been described by Dr. Hassall as inhabiting streams in the neighbourhood of London. *B. moniliforme* is figured in Lindley's 'Vegetable Kingdom,' p. 20; and Hassall has figured some of his new species in his 'British Fresh-Water Algæ.'

BAVIAN, a small hamlet in Kurdistan, situated on the left bank of the Ghazir, opposite to the village of Khinnis, which stands on the right bank of the river in about 36° 42½′ N. lat. 43° 28′ E. long. The place has become celebrated in connection with the Assyrian rock sculptures discovered near it by the late M. Rouet, French consul at Mosnl, and since visited and described by Dr. Layard in his 'Nineveh and its Remains,' and in his 'Nineveh and Babylon.' The sculptures are carved in relief on one side of a narrow rocky ravine in the Missouri hills, on the right bank of the Gomel, a brawling mountain torrent which joins the Ghazir from the north-west just above Bavian. The sculptures are cut in the face of a limestone cliff that rises perpendicularly from the bed of the torrent. The face of the cliff has been smoothed down into several compartments or tablets, each inclosed in a frame of the living rock, and protected by an overhanging cornice from the water that trickles down the precipice. The bas-reliefs, which are of colossal size and admirable execution, are of the true Assyrian type, and represent gods, kings, warriors, sacred symbols, and mythic animals. They have suffered much from the effects of the atmosphere, but still more from the excavation of tombs in the ready-scarped rocks, by some people who occupied the country after the fall of the Assyrian empire. Across three of the tablets are inscriptions in the cuneiform character, which were copied by Dr. Layard, and have been translated by Dr Hincks. These inscriptions recount the exploits of Sennacherib, and are considered to be of considerable historical importance.

BEAM-TREE. [Pyrus.]

BEAUFORT, REAR-ADMIRAL SIR FRANCIS, K.C.B., F.R.S., &c., late Hydrographer to the Admiralty, is the son of the Rev. Daniel Augustus Beaufort, rector of Navan, county of Meath, Ireland, and author of a Map of Ireland, published with a memoir, in 1792, as well as of some theological publications. Francis Beaufort entered the navy, in June 1787, as a volunteer on board the Colossus 74, stationed in the Channel. He was made midshipman in June 1790, and while holding that rank saw much active service, assisting among other duties in the capture of several vessels. In May 1796 he was created lieutenant, and whilst acting as first lieutenant of the Phaeton, 38 guns, he, having under his orders a barge and two cutters, boarded and took the San Joseph, a Spanish polacre-rigged ship of 14 guns and 56 men, which lay moored under the protection of five guns of the fortress of Fuenzirola, near Malaga, supported by a French privateer. Lieutenant Beaufort in this brilliant affair received a wound in his head, and several slugs in his body and left arm; but was recompensed by obtaining, as a recognition of his skill and courage, a commander's commission. During a cessation from service afloat, he was engaged from November 1803 to June 1804 in superintending the construction of a line of telegraphs between Dublin and Galway. In June 1805 he proceeded as commander of the Woolwich 44 guns, to the East Indies, and thence to the Rio de la Plata, of which river he made, during the campaign of 1807, a very valuable survey. He was afterwards stationed at the Cape of Good Hope, and in the Mediterranean. In May 1809 he was appointed to the command of the Blossom, and the following year with the rank of Post Captain to the command of the Fredericksstein frigate. During 1811-1812, he was engaged in making a minute survey of the coast of Karamania in Asia Minor, but was compelled in the latter year to return home in consequence of wounds inflicted on him by a fanatic Mussulman.

In the course of these services Captain Beaufort had obtained a very high rank, as a scientific as well as a brave seaman, and equally so as a hydrographer and geographer. He was now consequently called upon by the Board of Admiralty to devote himself to working out and embodying in a series of charts, the results of his various surveys. Among other charts constructed by him were one of the Archipelago, three of the Black Sea, including the coast of Asia, and seven of Karamania, these last being accompanied with a 'Memoir of a Survey of the Coast of Karamania in 1811 and 1812.' In 1817 he published in 8vo, a fuller and more elaborate work on the same district: 'Karamania; or a Brief Description of the South Coast of Asia Minor, and of the Remains of Antiquity, &c., with plans, views, &c.' His labours and scientific merits found their appropriate reward in his elevation, in July 1832, to the post of Hydrographer to the Admiralty, to which important office he imparted new honour by the manner in which he fulfilled its duties; and which he continued to hold till he retired full of years and honours on the 30th of January 1855, having very nearly completed his 68th year of service. He was succeeded by Captain Washington. Admiral Beaufort died in Dec. 1857. In April 1835, Captain Beaufort was appointed Commissioner for Inquiry into the Laws, &c. affecting Pilots; and in January 1845 a Commissioner for Inquiry into the Harbours, Shores, and Rivers of the United Kingdom. He was created Rear-Admiral, Oct. 1, 1846.

Admiral Beaufort, besides his memoirs on the coast of Karamania, &c., contributed papers to the Geographical and other learned societies; and the important collection of Maps of the Society for the Diffusion of Useful Knowledge was executed under his supervision. He was elected a Fellow of the Royal Society in June 1814; he was also a Member of the Council of the Geographical Society, a Fellow of the Royal Astronomical Society, a Corresponding Member of the Institute of France, &c.

BEAZLEY, SAMUEL, architect and playwright, was the son of a surveyor in Parliament-street, Westminster, where he was born in 1786. In early life Mr. Beazley served as a volunteer, and some of his adventures in the Peninsula and France were, as related by himself, of a somewhat romantic character. Mr. Beazley's chief claim to remembrance as an architect arises from the fact of his having erected a larger number of theatres than any other contemporary architect in England, or probably in Europe. The Lyceum (both the present one of that name, and the one on its site destroyed by fire in 1830), the St. James's and the City of London theatres in the metropolis were built by him; also two or three in the provinces, and two in Dublin. He likewise furnished the drawings for two in Belgium, one in Brazil, and one or two in India. The Strand front of the Adelphi and the colonnade of Drury-lane theatre were also erected by him; and we believe that he executed other works in connection with theatres. His theatres, though not remarkable for any high order of artistic design, have the very great merit of affording the whole of the auditory a tolerably good view of the stage, while their acoustic properties are considerably above the average. Among his other more important works may be mentioned Studley Castle. For some years before his death he had been very extensively employed in constructing the architectural works of the South-Eastern Railway Company. The terminus at London Bridge, the stations on the North Kent line, the New Town, Ashford, Kent, the Warden Hotel, and the Pilot House, Dover, &c., are among the chief of these works. Like his theatres, they are mostly well adapted to their purpose, and like them, they have little other merit.

But during his life Mr. Beazley was not merely known as an architect. He was also one of the most prolific playwrights of the day, having written, it is said, upwards of a hundred dramatic pieces. They were mostly farces, and other light occasional pieces, which were forgotten by the end of the season in which they were produced: but one or two still occasionally occupy the stage. They have no literary pretensions; but, like his buildings, they appear to have exhibited great mechanical dexterity, and a keen perception of the immediate requirements of the subject. Mr. Beazley wrote two novels, the 'Oxonians' and the 'Roué;' and furnished the words to the English versions of the 'Sonnambula' and some other operas. Though apparently so constantly employed, Mr. Beazley was well known in society as a diner-out and a cheerful companion. He died suddenly at his residence, Tunbridge Castle, Kent, October 12, 1851.

BEBEERINE. [Materia Medica, *S.* 2.]

BEDALE. [Yorkshire.]

BEDWYN, GREAT. [Wiltshire.]

BEECHEY, ADMIRAL FREDERIC WILLIAM, was the son of Sir William Beechey, the painter, and was born in London in 1796. Having entered the navy when only ten years old, he was engaged as early as 1811 in an action off Madagascar, resulting in the capture of the French frigates Renommée, Clorinde, and Néréide. In 1818, when the Dorothea under Captain David Buchan, and the Trent under Lieut. John Franklin, were despatched in search of the north-west passage, Beechey sailed with Franklin, with the rank of lieutenant. Lieut. Beechey had already distinguished himself as an artist, and also by his attention to natural history, and it was given to his charge to collect and preserve such objects as were practicable, or make drawings of such as were not. This voyage, though unsuccessful in its main object, contributed many useful results to science and to natural history, and an account of them in a narrative of the voyage was published by him in 1843. For the ability displayed as an artist in the voyage he was rewarded by a parliamentary grant of 200*l*. In 1819 Lieut. Beechey took part in an expedition under the command of Sir Edward Parry (then commander), which penetrated to 113° 54′ W. long. within the arctic polar circle. In 1821 he was commissioned, together with his brother, H. W. Beechey, to investigate by land the coasts of North Africa to the east of Tripoli. Of this undertaking he published a most interesting narrative, with descriptions of the ancient Syrtis, Pentapolis, and Cyrenaica, with a valuable and detailed chart of the coast, extending from Tripoli to Derna, or from 13° to 23° E. long. After his return home he was appointed to the command of the Blossom, with the rank of commander, and directed to endeavour to penetrate the Polar Sea by the Pacific Ocean and Behring's Strait, while Franklin made the attempt overland from North America. Beechey sailed in 1825, and returned in 1828; the voyage having lasted two years and a half. The extreme point reached in boats was 71° 23′ of N. lat., and 156° 21′ of W. long. While at Barrow Point, Franklin was at Point Turnagain, thus they were only 150 miles apart, but not being aware of each other's position, neither advanced. In 1827 Beechey received the rank of Post Captain, and during the summer of this year succeeded in discovering to the south-east of Cape Prince of Wales, and near to Behring's Strait, two most convenient harbours, to which he gave the names of Port Clarence and Port Grantley. After this voyage Captain Beechey remained unemployed for some time, as his health had suffered; but he occupied himself in preparing and publishing accounts of the various voyages in which he had been engaged. In 1828, the year of his return, appeared 'Proceedings of the Expedition to explore the Northern Coast of Africa, from Tripoli eastward, in 1821 and 1822;' the 'Voyage to the North Pole' followed; in 1831 appeared the 'Narrative of a Voyage to the Pacific and Behring's Strait;' succeeded by the Botany and Zoology of the same voyage, in two expensive quarto volumes. He had also been employed between 1829 and 1839 in surveying the coasts of South America and Ireland. In 1854 he was created Rear-Admiral of the Blue. He died November 28, 1856.

BEES, ST. [CUMBERLAND.]

BELFORD. [NORTHUMBERLAND.]

BELFORT. [BEFORT.]

BELL-METAL. [CHEMISTRY, *S.* 1.]

BELLINGHAM. [NORTHUMBERLAND.]

BELLOT, JOSEPH RENÉ, was born at Paris, in March 1826. His father, who was in humble circumstances, removed to Rochefort when Joseph was five years old. Joseph was placed in the elementary school of that city, and so favourable a report was made by his schoolmaster at the close of his term of instruction, that the municipality at once granted him a demiburse at the College of Rochefort. Here his progress was equally satisfactory; so that when his college term ended, in his 16th year, and he proceeded to the naval school at Brest, the municipality of Rochefort continued to contribute a moiety of the expense. He was two years at the naval school, and on quitting it took rank as fifth on the list at the final examination. Having served six months in port, he received his commission as 'élève de marine' on board the corvette Berceau, bound for the Isle of Bourbon. It is worthy of remark, as characteristic of Bellot's excellent disposition, that, before leaving France, out of his slender salary he assigned to his family the sum of 20 francs a month.

Bellot remained abroad somewhat over three years, returning home in November 1847. During this time, while steadily pursuing his private studies, he had, by the diligent discharge of his official duties, secured the esteem and approbation of his superior officers. M. Romaine Desfossés, the commodore, to whom Bellot had acted as aide-de-camp, in his official despatch to the minister of marine, pronounced Bellot to be "the most distinguished élève on the station, ... and in every respect superior to his age and position." Distinguished merit in a young officer is seldom neglected by the French government. For his conduct and bravery in the expedition against Tamative, Madagascar, in July 1845, in which he had been wounded, he had been already promoted to be an élève of the first class, and, though under twenty, created a Chevalier of the Legion of Honour; and now on returning home with the high commendation of M. Desfossés, he was raised to the rank of Sub-Lieutenant.

The following summer Lieutenant Bellot sailed in the corvette Triomphante to South America, where he remained for about two years. His conduct here affords a fine lesson for the young officer, whatever service he may be in, and to whatever country he may belong. His strictly professional duties, and they were very onerous, were most carefully and sedulously performed, and he obtained, as before, the warmest commendations from his superiors. But his own time was carefully husbanded and admirably employed. He not only extended his knowledge, especially in hydrography and geography, but taught himself to speak English, Spanish, and German fluently; and withal gave up much time and thought to what he had come to regard as an important part of an officer's duty—the training of his subordinates. So far indeed did he carry this, that, both here and on the African station, his biographer informs us, "he gave on board the vessel a course of lectures on geometry and navigation for all those seamen who, being intended for masters of trading vessels, would have to pass on their return the examination in theory and practice required by the rules of the marine."

Bellot's thoughts were now turned to a new sphere of operations. The search after Sir John Franklin and his gallant comrades had directed general attention to the Polar Regions. When he found that his own government would not, as he had hoped, aid in the search, he asked for, and obtained permission to volunteer his services in the expedition fitting out, chiefly at the expense of Lady Franklin, under Mr. Kennedy. His services were gladly accepted, and he sailed in the schooner Royal Albert in the beginning of June 1851, holding no declared rank, but really second in command, with the understanding that he was to act as chief officer in case of Captain Kennedy's death. Of this voyage Lieutenant Bellot left a full and very interesting journal, which has been published under the editorship of M. de la Roquette, along with his memoirs. The Royal Albert was ice-bound in Fury Bay for 330 days, and was compelled to return without having obtained any tidings of Sir John Franklin; but the expedition was so far successful as to have ascertained that Sir John could not have proceeded in the direction indicated for their search, and every man was brought home alive and in good health.

Bellot had displayed in this, as on every previous service, the most intelligent and devoted attention to its duties, and had secured the hearty good-will of both officers and seamen. In England he was received with an amount of enthusiasm for which he was little prepared, and his own government marked its approbation by raising him a step in rank. But he was not disposed to rest on his laurels. He again obtained permission to volunteer in a new searching expedition, and in June 1853 set out in the Phœnix, Captain Inglefield. They anchored safely in Erebus and Terror Bay, where they found lying the North Star, but its commander, Captain Pullen, had been for a month away from his ship on an exploratory journey. Captain Inglefield resolved to set out in search of Captain Pullen, but the latter returned shortly after Inglefield's departure. It now appeared very desirable at once to forward, if possible, the despatches, which it had been a principal object of the expedition to convey, to Sir Edward Belcher. In the absence of his captain, Lieutenant Bellot volunteered to conduct this perilous undertaking. He accordingly set out with four sailors, a canoe, and a sledge. A few days later, on the 18th of August, while crossing the ice, about three miles from the shore, off Cape Bowden, they were caught in a gale, became separated, and Bellot, with two of his companions, drifted on a broken piece of ice towards mid-channel. After cheering his companions as well as he was able, Bellot crossed to the opposite side of the hummock to see how the ice was drifting. As he did not return, one of the sailors went after him; but he was not to be seen, and he was never seen again. His stick lay on the other side of a wide crack, into which he had no doubt been driven by the violence of the wind. His companions happily escaped.

Thus, at the age of twenty-six, was lost one of the most promising men who have adorned the French navy. The news of his sad end was received with general sorrow in both countries. In London a meeting was held, at which resolutions, expressive of admiration and regret, were moved and supported by the First Lord of the Admiralty, the President of the Geographical Society, and various eminent naval officers and scientific men; and a subscription was authorised for raising a testimonial to his memory. The testimonial took the form best calculated to do him honour. Out of the funds a handsome granite obelisk, bearing his name, was placed in the square of Greenwich Hospital, fronting the river; and to each of his five sisters a sum of about 300*l.* was appropriated. The French government provided for his two brothers.

(Lemer, *Memoir of Lieutenant Joseph René Bellot, &c.*)

BELLOWS-FISH. [CENTRISCUS.]

BELO'NE, a genus of Fishes belonging to the family *Esocidæ* of the *Abdominal Malacopterygii.* It has a head and body greatly elongated, the latter covered with minute scales; both jaws very much produced, straight, narrow, and pointed, and armed with numerous small teeth; the dorsal fin placed over the anal fin. The species are remarkable for the green colour of their bones.

One species, the *Belone vulgaris*, is common on the British coast. It is known by various names, but more especially that of Gar-Fish. It was placed by Linnæus in the genus *Esox*, and being an inhabitant of the sea, it got the name of Sea-Pike. From the fact of its leaving the deep water in spring to deposit its ova near the shore in the months of April and May, and thus preceding the mackerel in their annual visit to shallow water for the same purpose, it has received the name of Mackerel-Guide. Its other English names, according to Yarrell, are Greenbone, Horn-Fish, Long-Nose, Gorebill, and Sea-Needle. The usual length of this fish is about 24 inches. It has elongated jaws, beset with numerous minute teeth. The eye is large. The body is uniform in depth to the anal fin, thence tapering to the tail. The dorsal and anal fins begin and end nearly on the same plane. The ventral fins are small. The tail is forked; the external long rays are nearly as long again as those of the centre. The upper part of the head and back is of a dark greenish blue; the sides and belly are silvery white; the pectoral, ventral, and anal fins white. This fish is taken off the coast of Berwick during the mackerel season, and Dr. Johnston says it is not unfrequently called a Sword-Fish. It is taken also on the Devonshire and Cornish coasts. The fish are brought into the London markets in the spring, and eaten in considerable quantities. The flesh has the flavour of mackerel, but it is drier. Great numbers are said to be caught off the coast of Holland, but they are only used there as bait. Mr. Couch says of the Gar-Fish, that it "swims near the surface at all distances from land, and is seen not unfrequently to spring out of its element; its vivacity being such that it will for a long time play about a floating straw, and leap over it many times in succession. When it has taken the hook it mounts to the surface, often before the fisherman has felt the bite: and then with its slender body half out of the water, it struggles with the most violent contortions to wrench the hook from its jaws. It emits a strong smell when newly taken." In the Ionian Islands, according to Mr. Tonna, it is caught by attaching several lines with floats to a raft. In this way a large number are taken in a very short time. Specimens of this fish have been exhibited in the Aquavivarium of the Zoological Society, in the Gardens, Regent's Park.

There are several other species, some of which are said to attain a length of eight feet, and to bite very severely. Their flesh generally is wholesome. (Yarrell, *British Fishes:* Cuvier, *Règne Animal.*)

BELPER. [Derbyshire.]

BEM, JOSEPH, was born at Jarnow, in Austrian Galicia, in 1795. After having studied in the University of Cracow, in 1810 he entered the military school at Warsaw, directed at this period by the French general Pelletier; and from this school, at the end of two years, he issued as an officer of the horse artillery. In 1812 he served as lieutenant in the army under Davoust, and subsequently under Macdonald, with whom he was during the siege of Hamburg. Russia having violated the capitulation, he was forced to return to Poland, residing with his father, who had an estate near Kielce. When the kingdom of Poland was again constituted, Bem resumed his military duties. In 1819 he was created a captain, and became aide-de-camp to General Bontemps. He was next made professor in a school of artillery newly established at Warsaw. Here he introduced into the Polish army the use of the Congreve rocket, and published a work upon this instrument of destruction. Soon afterwards he solicited to be removed from this school, but the Grand-Duke Constantine, who treated this demand as an act of insubordination, had him brought to trial before a court-martial, which condemned him to prison. He was however released, but sent to Ketzk, and placed under the surveillance of the police.

After the death of the Emperor Alexander, Bem obtained his dismission, and went to reside at Leopol, in Galicia. There he devoted himself entirely to science, and commenced a work on the steam-engine. When the revolution of 1830 broke out, Bem immediately betook himself to Warsaw, where he was at once made a major in the Polish army; and shortly afterwards was appointed to the command of a battalion of horse artillery, in which capacity, in the face of a numerous enemy, he displayed all the knowledge of a tactician with the bravery of a soldier. After the defeat of the Polish army he led the remnant towards France, and here he remained for a considerable period in exile, gaining his living by teaching mechanics and mnemonics. He afterwards undertook to raise a Polish legion for Dom Pedro in his expedition to Portugal, but the attempt proved a failure. He himself repaired to Lisbon, where an attempt was made on his life; the ball aimed at him was arrested by a piece of money in his pocket.

On the commencement of the revolution in 1848, Bem at first attempted to organise the insurrection at Vienna, and afterwards joined himself to the Hungarian party. Charged with the command of an army to oppose the Austrians on the side of Transylvania, he at first experienced some checks, but in March, 1849, he made himself master of Hermannstadt, took Cronstadt, and repulsed the Austrian army, though joined by that of Russia, called to its assistance in the previous February. He also compelled the Austrian general, Puchner, to abandon the Banat and Wallachia. The Austrians and Russians rallied in Transylvania; and after attempting in vain to excite the Wallachians and Moldavians to rise, he was attacked and defeated at Segesvar by a greatly superior force under Lüders, the Russian general. He however succeeded in re-assembling his forces, and on August 5, 1849, he a second time possessed himself of Hermannstadt, which however he could not retain for want of reinforcements. At the desire of Kossuth he entered Hungary, and on August 8 took part in the battle of Temesvar, in which the Hungarians were defeated.

Bem then, with others, took refuge in the Turkish territories, embraced the Mussulman faith, was favourably received by the Sultan Abdu-l-Medjid, and was raised to the dignity of a pasha, with a command in the Turkish army. In November 1850 he exerted himself at Aleppo, where he and several other converts had been ordered to reside, in repressing the sanguinary excesses committed by the Mussulman population on the Christian residents. He died at Aleppo, Dec. 10, 1850.

(*Nouvelle Biographie Générale.*)

BEN-NUTS, the fruit of *Moringa pterygosperma*, from which Ben-Oil, much used in perfumery, is obtained. [Moringa.]

BENINCASA, a genus of plants named by Savi, in honour of Count Benincasa, an Italian nobleman. It belongs to the order *Cucurbitaceæ*, and has but one species, *B. cerifera*. The fruit is described as covered with hairs and a glaucous bloom. It grows in the East Indies. Lindley, in the 'Vegetable Kingdom,' calls it the White Gourd, and says it is identical with *Cucurbita pepo*. Ainslie says that in the East it is presented at every native marriage feast, and is supposed to insure prosperity to the married pair.

BENSINGTON. [Oxfordshire.]

BENTINCK, LORD WILLIAM GEORGE FREDERICK CAVENDISH, commonly known as Lord George Bentinck, was the third son of William Henry, fourth duke of Portland, by Henrietta, daughter and co-heiress of Major-General Scott, whose sister was married to the late George Canning. He was born on February 27, 1802, and though only a younger son, inherited a fortune from his mother that placed him above the necessity of adopting a profession. He however entered the army, and gradually attained the rank of major; but a period of profound peace was not calculated to open the way to any ambitious aspirations in that direction. He therefore, when his uncle Canning became secretary for foreign affairs in 1826, became his private secretary, for which he displayed an extraordinary capacity, was treated with great cordiality, had unbounded confidence reposed in him, and it was thought a brilliant political career was opening before him. In 1827, while his uncle was first lord of the treasury, he entered parliament as member for the borough of King's Lynn, and for that borough he sat till the close of his life. He however did not distinguish himself in parliament at this time, except by a very sedulous attendance: he spoke very seldom, and then not well; but he voted steadily on the side of what were known as moderate Whigs. He voted for Catholic Emancipation, but was not very warm in its favour. On Canning's death in 1827, Lord George gave an independent support (this means opposing them occasionally) to Lord Goderich's cabinet, in which his father was president of the council; but he declined voting in favour of Lord Ebrington's motion that defeated the Wellington cabinet. He however continued to support Lord Grey's government till the secession of Lord Ripon, Sir James Graham, and Lord Stanley (now Earl of Derby), to the latter of whom he was strongly united by the consonance of political opinions and the similarity of pursuits; both being strongly attached to the turf. On the accession of Sir Robert Peel in December 1834, he formed one of the small party nicknamed by O'Connell as the Derby Dilly, "carrying six insides." He however vehemently denounced the 'Litchfield House treaty,' by which it was asserted the adhesion of the Irish members was bargained for by the Whigs, and which ultimately led to the resignation of Sir Robert Peel in 1836, and the accession of Viscount Melbourne. From that time until 1841, when Sir Robert Peel again assumed the direction of the government, Lord Bentinck was one of his warmest supporters. On this occasion Sir Robert made him an offer of office, which he declined; but he was most unwearied in his support. It is related that after a late debate, he would travel by rail to Andover to hunt, and return in time to attend the sittings of the House in the evening; throwing a wrapping overcoat of some kind over his scarlet hunting-coat, and exercising indefatigably the office of 'whipper-in,' in the house, that is, bringing up the members to a division. But in 1843 the free-trade measures began to alienate many of Sir Robert Peel's supporters; and when in 1846 he wholly repealed the Corn Laws, Lord George went into the most violent and personal opposition. Sir R. Peel resigned, but Lord George abated but little of his animosity, although he opposed the Whig free-traders who had succeeded him. The country party, as it was termed, had been taken by surprise, and knew not where to look for a leader. At length they selected Lord George, who very unwillingly accepted the post, but having accepted it, he threw himself into the part with his accustomed energy in whatever he undertook. He commenced studying statistics, he spoke on every possible occasion, he inspired his adherents with boldness, he impeded the administration in their measures. But though clever, ardent, indefatigable, and too often unscrupulous, free-trade continued its march in spite of his efforts, seconded by those of his principal ally, Mr. B. Disraeli. He had during all these political avocations continued his attention to racing and race-horses, declaring on one occasion that the winning of the Derby was the 'blue-ribbon' of the turf. On the prorogation of the house in August 1848, he retired to Welbeck Abbey for relaxation; he however attended Doncaster races four times in one week, at which a horse of his own breeding won the St. Leger stakes, to his great gratification. On September 21 he left the house on foot soon after four o'clock in the afternoon, to visit Lord Manvers, at Thoresby Park, and sent his servants with a gig to meet him at an appointed place. He appeared not; the servants became alarmed; search was made for him; but it was not till eleven at night that he was found quite dead, lying on a footpath in a meadow about a mile from the house. At the coroner's inquest it was proved that the cause of death had been spasms of the heart. A lengthy life of Lord George has been written by his friend and follower, Mr. B. Disraeli, in 8vo, 1851. (*Gentleman's Magazine;* Miss Martineau, *History of the Thirty Years' Peace;* B. Disraeli, *Life of Lord George Bentinck.*)

BENTON, LONG. [NORTHUMBERLAND.]

BENZILE. [CHEMISTRY, *S.* 1.]

BENZILIC ACID. [CHEMISTRY, *S.* 1.]

BENZOLONE. [CHEMISTRY, *S.* 2.]

BENZONE. [CHEMISTRY, *S.* 2.]

BENZULE. [CHEMISTRY, *S.* 1.]

BERANGER, PIERRE JEAN DE, was born in Paris, August 19, 1780, of humble parentage, and in his earliest years was brought up by his grandfather, a tailor. He witnessed the taking of the Bastille, in 1789, and was then removed to the care of an aunt, who kept an inn at Peronne. Here he first learnt to read. At fourteen he was apprenticed to a printer in Peronne. Somewhat later he attended a primary school founded at the same place. At sixteen he returned to his father at Paris, and having attended some theatrical representations, resolved to attempt a comedy, and produced 'Les Hermaphrodites.' At eighteen he projected the writing of an epic, to be called 'Clovis;' this he proposed as the task of the succeeding twelve years. He also produced verses on sacred subjects, some of which have been given in the edition of his works edited by M. Perrotin and published in 1834. These performances did not improve his fortunes; and, reduced to great distress, he thought of proceeding to Egypt, where Bonaparte then was, and whose first successes had excited extravagant visions of glory and prosperity among the French population. The return, however, of some members of the expedition dissipated Béranger's dream, and he remained in Paris. It was at this period, when suffering from his disappointed hopes, and even actual indigence, that he seems to have resolved to be gay if he could not be happy, and he produced his 'Roger Bontemps,' 'Le Grenier,' 'Les Gueux,' and 'Le Vieil Habit.' They were not immediately successful; but in 1803 he sent some of his poems to Lucien Bonaparte, who promised to ameliorate his situation. Lucien was suddenly called to Rome. Béranger thought himself forgotten; when a letter came from Lucien, assigning to Béranger his income as a member of the Institute. He next obtained some employment as an editor, and in 1809 was appointed a clerk in the secretary's department of the Academy. His songs were now becoming popular in every quarter. During the 'hundred days' of Bonaparte, Béranger refused the lucrative office of censor. In 1815, when he published his first collection of songs, which were popular throughout France, he was informed that it would occasion his dismission from the office he held in the Academy. He wavered not, and was retained; but in 1821, when the second collection was published, he was at once discharged. He wrote more and more poignant satires upon the government; he was prosecuted, and was sentenced to three months' imprisonment and a fine of 500 francs. In 1825 he published his third collection, and in 1828 his fourth. For this last publication he was again prosecuted, and was condemned to nine months' imprisonment and a fine of 10,000 francs. Confined more strictly in the prison of La Force, the undaunted poet continued his attacks on the faults and follies of the government, and these remarkable lyrics aided not a little in accelerating the fall of the Bourbons.

In 1830 the revolution of July would have acted favourably for Béranger's fortunes if he would have given up his beloved independence. He says, "I was treated with as one of the great powers;" "nearly all my friends have become ministers;" "unfortunately I have no love of sinecures, and all compulsory labour has become insupportable." Béranger was convinced that France was not fitted at this time for a republican government, and he supported the establishment of a limited monarchy. In 1833 he published his fifth and last collection of songs, containing some of his most striking pieces. After the revolution in 1848 he was elected in April of that year a representative of the Department of the Seine in the Constituent Assembly, by more than 200,000 votes; but in May he sent in his resignation. It was unanimously refused; but a week afterwards he renewed it, and it was accepted.

Béranger continued to write, but did not publish. He was known to have a large collection of songs, and he employed himself also with a 'Biographie' of himself and his contemporaries. He resided partly in Paris and partly in the country, living quietly in retirement, and enjoying the society of a few friends. He died in Paris, July 16, 1857, and was buried on the following day in the cemetery of Père la Chaise, at the expense of the French government. Soon after his death Madame Colet published 'Forty-five Letters by Béranger, and Details concerning his Life' (Quarante-Cinq Lettres,' &c.). In October, 1857, M. Lapointe published 'Memoirs of Béranger' (Mémoires,' &c.); in November appeared 'Last Songs of Béranger' ('Dernières Chansons,' &c.); and in December was published 'My Biography, by P. J. de Béranger' ('Ma Biographie,' &c.).

The songs of Béranger have deservedly attained a high reputation, not only in France but throughout Europe. One charm is their complete nationality. The delicate wit, the subtle satire, the indignant denunciation, the vivid and correct pictures, the frequent comicality of situation—are all truly and exclusively French; and so are the faults that are sprinkled rather too frequently through them. His command of language is marvellous, and in the most difficult rhythms the words always seem to drop naturally into their places; but this result, as he states in his 'Biographie,' was attained by him only with great labour.

The whole career of Béranger is very remarkable. He had become a real power in the state, under the first Napoleon. Although he felt that there was no hope for the national freedom of his country while that despotism endured, he had a sincere admiration of the emperor's genius. Consequently there were no personal attacks in his early songs; and when a little gentle raillery upon externals was ventured—as in 'Le Roi d'Yvetot' and 'Le Sénateur'—it was laughed at and applauded even at court. Béranger is considered by his countrymen as a religious poet: this is not the impression which an Englishman would receive. But he certainly does not shock by impiety, however he may offend by levity and want of reverence. The songs for which he was prosecuted were not attacks on religion, but on its false assumption. Fined and imprisoned under the Bourbons, he still remained the conqueror. Béranger has little resemblance to our own song-writers. He has none of the deep passionate love depicted by Burns. He never contemplates the happiness of

> "Loving and being loved by one;"

but—

> "Takes, forsakes, retakes Lisette"

in a fashion that jars on English feelings of delicacy. The passion he describes indeed is rather that which has become appropriated in English to the French word 'amour.' His contrast to our patriotic singer, Dibdin, is also striking. Dibdin holds out few incentives to the sailors he addressed beyond a sense of duty, prize-money, a picture of domestic happiness with their Nancy, and Greenwich Hospital. Such encouragements find no place with Béranger. The glory of France is the most prominent inducement to fight and to die. To our other lyrical poet, Moore, he has somewhat more resemblance.

BERCHEMIA, a genus of plants belonging to the natural order *Rhamnaceæ*. Two species, *B. volubilis* and *B. lineata*, are used in medicine.

BERESFORD, WILLIAM CARR, VISCOUNT, the natural son of the first Marquis of Waterford, was born on October 2, 1768. He entered the army early, and while serving in Nova Scotia lost the sight of an eye from the accidental shot of a brother officer in 1786. He served at Toulon, at Bastia, at Calvi, and in the West Indies under Abercromby, and in Egypt under Baird. In 1806, having attained the rank of brigadier-general, he commanded the land forces in the expedition against Buenos Ayres, and was taken prisoner, together with his corps, but he contrived to escape shortly afterwards. In 1807 he commanded the force which obtained possession of Madeira. In 1808 he arrived in Portugal with the English forces, and to him was confided the organisation of the Portuguese army, including the militia. This he effected so completely, that the Portuguese troops, throughout the Peninsular war, showed themselves worthy of fighting by the side of their British allies. On May 4, 1811, he invested the fortress at Badajoz, and on the 16th defeated Soult at Albuera. At the battle of Salamanca, in 1812, he was wounded. He then commanded a division under Wellington, and took a distinguished share in the battles of Vitoria and Bayonne. On the 10th of April 1814, he attacked and carried the heights before Toulouse with great skill and bravery. For his services he had been created a Portuguese field-marshal, Duke of Elvas, and Marquis of Santo Campo; and he was now created a British peer by the title of Baron Beresford. In the same year (1814) he was sent on a mission to Brazil: he returned in 1815; and after a short visit to Portugal, he repaired to Brazil again. On his return he resumed the command of the army of Portugal, at the request of the Portuguese government, but resigned it at the end of a few years, not approving of the efforts then being made to establish a constitutional government. On his return to England in 1823 he was created Viscount Beresford. From 1828 to 1830 he was master-general of the ordnance. He continued to take an active part in politics, being strongly attached to the Tory party; and in 1826, in consequence of assisting in forwarding English troops for the support of Don Miguel, he was deprived of his rank as Portuguese field-marshal. In 1832 he had married Louisa, his cousin, the daughter of the archbishop of Tuam, and the wealthy widow of Thomas Hope the banker, but left no issue. He died at Bedgebury Park, Kent, on January 8, 1854. At the time of his death he was governor of the Royal Military Academy at Woolwich, and governor of the island of Jersey.

BERGERA, a genus of plants belonging to the natural order *Aurantiaceæ*. *B. Königii* possesses stomachic and tonic properties, and an infusion of the leaves is used against vomiting. The green leaves are used raw in dysentery; the bark and roots are stimulant.

BERKELEYA, a genus of *Diatomaceæ*, named by Greville, in honour of the Rev. M. J. Berkeley, distinguished for his researches in cryptogamic botany. It belongs to the suborder *Naviculeæ*, and is characterised by having linear frustules included within tubular submembranaceous filaments, which are free at one extremity, but have the other immersed in a gelatinous tubercle. *B. fragilis* is found parasitic on *Zostera marina*, and some of the smaller marine *Algæ* on the British coasts. *B. Adriatica* has been found on the coasts of the Adriatic at Trieste.

BERMONDSEY. [SURREY.]

BERTHOLETIA. [MATERIA MEDICA, S. 2.]

BERZELIUS (or BERZEL), JONS JACOB, one of the most distinguished of modern chemists, was born August 20th, 1779, at Wäsersunda, a village near Linköping, in East Gothland. Beyond the fact that he received the elements of learning from his father, who was parish schoolmaster—a functionary of some consideration in Sweden—and who died while his son was yet a boy, we know nothing of his early years. At the age of seventeen the youth entered on the study of medicine at the university of Upsal, and attended the dull lectures on chemistry delivered by Afzelius and Ekeberg. So little care was at that time taken to render scientific instruction clear to the mind, that Berzelius had to discover and investigate facts and draw conclusions for himself, and soon became remarkable for his diligence and discernment. As an instance of the way in which he was initiated into chemical manipulation, he used laughingly to relate in after life:—"Afzelius first gave me sulphate of iron to calcine in a crucible, for the preparation of colcothar. 'Any one may do work of this kind,' I replied; 'and if this be the way you are to teach me, I may as well stay at home.' 'A little patience,' answered the professor, 'your next preparation shall be more difficult.' On the next occasion I got cream of tartar to burn, in order to make potass; which so disgusted me, that I vowed never to ask for any further employment." But he continued to attend notwithstanding his vow, and soon frequented the laboratory every day, although by the rules pupils were entitled to admission but once a week, his masters offering no opposition. Ekeberg was, however, vexed at times that the young student pursued his tasks in silence, asking no questions. "I preferred," said Berzelius, "to endeavour to instruct myself by reading, meditating, and experimenting, rather than question men without experience, who gave me replies, if not evasive, at least very little satisfactory on the subject of phenomena which they had never observed."

In 1798, after two years' study, he left Upsal, and engaged himself as assistant to the physician-superintendent of the mineral springs at Medevi, a watering-place much resorted to by the Swedes. Here with his habitual diligence he analysed the waters, and in conjunction with Ekeberg published a paper embodying the results. This was the first of the long series of papers that remain to illustrate his fame.

In 1804 Berzelius returned to Upsal, and took his degree of Doctor in Medicine; and soon after published his 'Physical Researches on the Effects of Galvanism on Organised Bodies,' a work which exhibits much of his sagacious insight and painstaking. Davy, who was born in the same year with the illustrious Swede, had made known his experiments; and Berzelius, taking up the subject, then a wonder to scientific men, materially widened his applications. His growing reputation gained for him, on his going to reside at Stockholm in 1805, the post of assistant to Sparrmann, professor of medicine and botany, who had sailed as naturalist in Cook's second voyage of discovery. The emoluments were so scanty that Berzelius had at times to practise medicine to eke out his resources. In 1806 he succeeded to the chair, and in the the same year, jointly with Hisinger, he commenced the 'Afhandlingar i Fysik, Kemi, och Mineralogie,' to which during the twelve years of its existence, he contributed forty-seven original papers. This periodical was at once translated into German, and subsequently into French, and generally prized for its trustworthy elucidation of chemical principles. This however was but a small part of what Berzelius undertook: he set to work to revise the labours of his predecessors, accepting no conclusion that did not admit of the clearest demonstration. His skill as an analyst is described as 'consummate,' and when Dalton and Davy put forth their views he, by innumerable analyses, established the laws which regulate chemical combinations, and reduced them to a form so simple as to give them a twofold value. "When these laws were once well ascertained," says an eminent foreign savant, "it became possible to control the results of analyses—even to foresee a great number of combinations then unknown—and to carry into every operation an accuracy previously thought altogether unattainable."

By his elaborate examination, beginning with the salts and going through the whole range of elements, including the products of organised existence, Berzelius anticipated Dalton in some of his conclusions, and afterwards found a perfect agreement between his results and those of the Manchester philosopher. His knowledge of the laws of definite combinations enabled him to elucidate the nature of minerals, and to show at the same time, by the composition of the minerals, the universality of the laws. He helped indeed to bring the atomic theory to perfection, and to introduce it into science. He framed moreover an electro-chemical theory, and published 'Lectures on Animal Chemistry,' a work filled with rare proofs of original research and clear perceptions on a branch of science then least understood. On the publication of these lectures the Swedish government made him a grant of two hundred dollars a year, to enable him the better to prosecute his labours. In 1807 he joined with seven leading members of the profession in establishing the Medical Society of Sweden, now a flourishing institution; and in the following year he was admitted a member of the Royal Academy of Sciences of Stockholm. In 1810, being then at the age of thirty-one, he was elected President of the Academy; a striking proof of the estimation in which he was held by his colleagues.

Berzelius visited England in 1812, and while here learned how prelections could be made really interesting as well as instructive by attending Dr. Marcet's lectures at Guy's Hospital. In conjunction with Dr. Marcet he wrote a paper entitled 'Experiments on the Alcohol of Sulphur, or Sulphuret of Carbon,' which was published in the 'Philosophical Transactions' for 1813; and in the same year he was elected a foreign member of the Royal Society.

On his return to Stockholm Berzelius at once changed his style of lecturing, and with the happiest results. His dry readings became living discourses, illustrated by experiments, of which he greatly multiplied the number suitable for public exhibition by his quick imagination. Men whose names have since become famous attended his teachings. In 1815 he was made Chevalier, and afterwards Commander of the order of Wasa; and in 1818 he was chosen perpetual Secretary of the Academy, which distinguished post he held for the rest of his life. In the same year, at the coronation of Charles John, he was ennobled with permission, contrary to custom, to retain his name. In 1821, at the instance of the Academy, he commenced that series of annual reports on the progress of chemistry and physics, which, while contributing materially to the advancement of those sciences, confirmed and heightened his own reputation. Speculative philosophers charged him with jealousy and envy, because of his intolerance of unsubstantial theories. No theory was ever accepted or started by him that was not supported by a solid basis of facts. If "too cautious," as was often said, he studied but the interests of science; and if jealous, it was for chemistry, and not for himself. Regarding himself as a vidette ever on duty, he warned and alarmed whenever the occasion required, and confident in integrity, delivered his opinions with unqualified freedom. So faithful a censor will not be easily replaced.

In the hands of Berzelius the blowpipe became a most important instrument in the analysis of inorganic substances. A translation of his treatise on the subject appeared in English in 1822—'On the Use of the Blowpipe in Chemical Analysis and the Examination of Minerals.' There was scarcely a question that he did not bring to the test of experiment, and reduce to its proper place in science, as may be seen in his great work 'Lehrbuch der Chemie,' which has gone through five editions, and as many translations. The last was published at Paris, in six volumes, octavo, in 1845-1850.

In 1832 Berzelius resigned the professorship which he had held for twenty-six years; but still kept on with his scientific labours. He married about this time, and on the day of his wedding the king wrote to confer on him the dignity of 'Freiherr,' or Baron, observing that, "Sweden and the world were the debtors of a man whose entire life had been devoted to works as useful to all, as they were glorious to his native country." Subsequently he had the further honour of receiving the Grand Cross of the Royal Swedish order of the Polar Star. The directors of the Swedish iron-works awarded him a pension, in acknowledgment of his eminent services to their branch of industry. And in 1836 the Royal Society of London showed their sense of his merits by giving him their Copley Medal.

So the life of Berzelius flowed on in a tranquil current. He enjoyed all the honours his native land could give, had the satisfaction of seeing his name enrolled among the members of nearly all the scientific societies of the world, more than 100, and of knowing that foreign governments recognised his worth. As he approached the age of fifty his sight began to fail, and his memory to lose somewhat of its power. Infirmities now increased on the philosopher, whose health had never been robust. He was seized with paralysis of the lower extremities; but retained the serenity of his mind till death approaching, as one has said, "with slow steps, as a messenger who regretted his errand," closed his career on the 1st of August, 1848. His death was felt as a national calamity, and the scientific societies of his native land wore mourning for two months in respect for his memory.

BESSEL, FRIEDRICH WILHELM, was born at Minden, on the 22nd of July 1784. His father was a civil officer (justizrath) under the Prussian government; his mother a clergyman's daughter; and there being a family of nine children to rear on but narrow means, the future astronomer received only an ordinary education. Among his earliest manifestations was a dislike of classical literature, and a love for arithmetic. His quickness in calculation led to his being articled at the age of fifteen as clerk in a mercantile house at Bremen. Here he showed himself diligent to fulfil the duty that lay immediately before him, whatever it might be; and this remained his especial characteristic. The hope of being offered the post of supercargo on a foreign voyage was then his stimulus; and to qualify himself for this responsible office he began to study French and Spanish, and Hamilton Moore's old work on navigation. Dissatisfied with the rules and processes laid down for nautical reckoning, he sought for better information in a popular treatise on astronomy, and finding therein the means for overcoming his difficulties, he pursued the study with eagerness, till ignorance of mathematics brought him to a stand. Regarding the check as a call for greater exertions, he betook himself to a course of mathematical reading, and so interested did he become in this new study, that all his spare hours, chiefly in the night, were devoted to it. There was no longer the same charm in commercial pursuits, or in the hope of a voyage. And now appeared a trait that marked his character through life—turning theory or knowledge to positive and practical uses. With a rude wooden sextant, made by a carpenter, and a common clock, he began to make time-observations; and having observed the occultation of a star by the moon, he got therefrom, to his great joy, an approximate latitude of Bremen. This was one of the successes that gladden the heart of the student, repay his toil, and animate him to renewed exertions.

From this time his progress in astronomical studies was surprisingly rapid. While still a clerk in a counting-house, he had formed designs of original inquiry, such as are expected only from veterans of science. Harriott's and Torporley's rough observations of the comet of 1607 had been found by Baron Zach, while searching the collection of Harriott's papers in the possession of the Earl of Egremont, and these being the first instrumental observations of that comet—since known as Halley's—their reduction was a desideratum of first-rate importance. Bessel, when in his 20th year, undertook the task, and executed it in so masterly a manner, that Olbers, to whom he communicated the results, foreseeing his future eminence, praised him in the warmest terms, and sought to enlist him in the astronomical ranks. The reductions—Bessel's first published work—appeared in Zach's 'Monatliche Correspondenz,' and was speedily followed by a theoretical paper of great merit, 'On the Calculation of the True Anomaly in Orbits nearly Parabolic,' the beginning of a long series of contributions to the German scientific periodicals. "So expert had he become in cometic calculations," says one of his biographers, "that Olbers, having placed in his hands, on the night of the 1st of November 1805, four observations of the comet of that year, he returned them to him the next morning, with the elements, whose calculation had occupied him only four hours."

Bessel faithfully served his term of seven years; but no sooner was he free than, abandoning all pursuit of a commercial life, he, recommended by Olbers, succeeded Harding as assistant to Schröter at Lilienthal in 1806. He was now an astronomer to all intents and purposes; and well did he justify the anticipations of his friends. Not many years elapsed before his name stood among the foremost of modern astronomers.

One of his first tasks at Lilienthal was a series of observations on the sixth, or Huyghenian satellite of Saturn, with a view to determine the mass of the planet and ring, on which he wrote an able and elaborate paper (published in the 'Königsberger Archiv für Naturwissenschaften'), discussing all the phenomena of attraction and the disturbing causes. It formed a subject for examination in after years, when more perfect instruments were available. He observed also the comet of 1807, by which, on the publication of the elements with an examination of the perturbations, in 1810, he gained the Lalande prize of the Academy of Sciences at Paris.

Bessel was one who cared little for accumulating observations without getting from them some direct practical result. He says of himself, in the preface to his 'Untersuchungen,' "that he at no time felt any especial predilection for one rather than another particular branch of astronomical occupation; but that one idea was continually present to his mind—that of always working up to an *immediate* and *definite* object." He held, that an observer who "failed to deduce actual results from observations, with a distinct view to the improvement of knowledge," neglected an essential condition of success and usefulness: and his whole life exemplified his conviction.

The king of Prussia having resolved to establish an observatory at Königsberg, Bessel was appointed director in 1810, and removing thither, he superintended the building and the mounting of the instruments, fulfilling at the same time the associated duties of professor of astronomy and mathematics in the university. The establishment, which was finished in 1813, remains no less a monument of his skill and earnestness than of the munificence that founded it amid the distractions of war. Observations were published in the same year, and have been continued ever since with incalculable benefit to practical astronomers.

Settled in a congenial home, Bessel married. His wife was daughter of Professor Hagen: he had by her one son and two daughters. And now, what he had done for the comet observations of 1607, he—also at Olbers' suggestion—undertook for Bradley's Greenwich observations, which, first published in 1805, had been but little regarded by the astronomers of the day. He had begun the task of digestion and reduction in 1807, and applying himself to it as his numerous avocations admitted, brought it to a close in 1818. The results of this long-continued labour have been for many years before the world in a folio volume, entitled 'Fundamenta Astronomiæ.' This work, published when the author was in his thirty-fourth year, is of such a nature that even grave philosophers can scarcely speak of it in sober terms; and it is especially interesting to Englishmen, being based on the twelve years' observations of Bradley. The book indeed cannot be over-praised. In the words of a scientific report—"Besides elaborate determinations of all the principal elements of the reduction, the errors of the instruments, the height of the pole, refraction, parallax, aberration, precession, proper motion, it contains a catalogue of the mean places of 3222 fixed stars, observed between 1750 and 1762, with the best instruments in existence at that time, and reduced to the epoch of 1755, with a precision and accuracy of which there was no previous example. It now furnishes astronomers with the best existing means of determining all those data which can only be deduced from a comparison of observations made at considerably distant intervals of time, and may be considered in fact as having laid the foundations of the principal improvements which have been made in astronomy since the date of its publication." Schumacher's noteworthy remark, "One may almost assert that one exact and able calculator is capable of doing better service to astronomical science than two new observatories," in this case found its verification.

Bessel's reputation was established. In 1822 he was elected a foreign member of the Astronomical Society of London, and three years later of the Royal Society; and the scientific societies on the Continent hastened to enrol him among their associates. The king of Denmark conferred on him the order of the Dannebrog; and from his own sovereign, who through life was his steady friend, he received the order of Civil Merit and of the Red Eagle, with the title of Privy Councillor; and the Berlin Academy awarded him their prize for his paper on the precession of the equinoxes.

Bessel's labours have been so numerous that anything more than a bare enumeration of them is scarcely possible. He improved the method of finding longitudes. He determined the length of the seconds' pendulum at his own observatory, and so perfectly, as to establish an epoch in the history of pendulum experiments. He showed that in all former observations an essential cause of error had been overlooked, namely, the mass of air dragged by the pendulum in its oscillations; and that the amount of consequent disturbance would have to be calculated for every pendulum. He investigated all possible causes of error in astronomical instruments, leaving nothing unaccounted for, till he surpassed all his contemporaries in his knowledge of the theory of instruments. He was employed to determine the Prussian standard of length; and in connecting the geodetical surveys of Russia with those of Prussia, and of the west and south of Europe; and displayed in these, as in his other labours, rare ingenuity in devising new methods and avoiding causes of error. At the same time he measured an arc of the meridian of his own observatory. Then, as was his habit, taking the whole subject into view, he investigated the surveys of the British government in India and elsewhere, and of the French from the Belgian frontier to the Mediterranean, shrinking from no toil that might aid in the accomplishment of his object. An error made in the French triangulation had been calculated and allowed for by four independent geometers; but Bessel, not satisfied with this, "actually recalculated the whole of the work by his own method, producing a result agreeing with the mean of the four determinations alluded to, within a fraction of a toise." In 1837 he began and carried on for three years a series of observations on the star 61 Cygni, to determine if possible the annual parallax of a fixed star—a task which had been the opprobrium of science. Thanks to his marvellous skill and delicacy of perception, he ascertained the fact; and though the amount of parallax is almost inconceivably small, only 31-100ths of a second, astronomers agree in considering it as demonstrated. By observations of other fixed stars, Sirius and Procyon, he "thought himself authorised to announce the want of uniformity in their proper motions as a positive astronomical fact." And he threw out a speculation as to the cause: namely, that the stars in question are double stars, of which one is not luminous; hence we see the disturbances, but not the disturber.

A more trustworthy guide than Bessel could not be followed: to his example the present excellence of astronomical science in Germany is due. He was a copious writer; the more remarkable, as his writings exhibit proofs of as much profound research, as of variety of attainments. His 'Tabulæ Regiomontanæ,' which may be regarded as a supplement to the 'Fundamenta,' &c., appeared in 1830. Nearly two hundred papers, neither short nor unimportant, in the 'Astronomische Nachrichten,' bear his signature; and others are to be found in the 'Abhandlungen' of the Berlin Academy and in scientific journals, some of which are named above. He published also two volumes of 'Astronomische Untersuchungen,' and, as is said, left a third in preparation.

Bessel visited England in 1842, and was received and honoured in a way accordant with his desert. There is reason to believe that on his return he intended to investigate the problem which, in the hands of Adams and Le Verrier led to the discovery of Neptune. The preliminary reductions were made; but grief over the loss of his son, a young man of great promise, who died in 1841, and the approaches of disease of a very painful nature upon the astronomer himself, stayed his inquiring spirit. His sufferings became severe, caused by a fungous growth in the abdomen. He died on the 7th March, 1846, at the age of sixty-two.

BETEL-NUT-PALM. [Areca.]

BETHAM, SIR WILLIAM, was born in 1779 at Stradbroke in Suffolk. His father was the Rev. William Betham, author of 'Genealogical Tables of the Sovereigns of the World,' folio, 1795, and of a 'Baronetage,' in 5 vols. 4to published in 1801-1805. Although young Betham appears to have inherited his father's tastes, he had to carve out his own career, having been placed by his father as apprentice to a printer in London. His first literary employment was in the revision of the 3rd and 4th volumes of Gough's edition of Camden's 'Britannia.'

In 1805 he went to Dublin as clerk to Sir Charles Fortescue, Ulster King of Arms. A few years later he became the deputy of Sir Charles; and he succeeded him as Ulster King of Arms in 1820. Mr. Betham was appointed Genealogist of the order of St. Patrick in July 1812, on which occasion he was knighted. He also received the appointment of Deputy Keeper of Records at Dublin; an office in itself of little emolument, but which placed under his control a large number of records, of which he availed himself to form an immense collection of historical and genealogical references extending to several hundred volumes, which has since served as an individual store-house in family, historical, and legal inquiries. Sir William also formed an index to the names of all persons mentioned in the wills deposited at the Prerogative Office, Dublin; a task which occupied a considerable portion of his time from 1807 to 1828, and extended to 40 large folio volumes. Sir William was likewise a diligent collector of old manuscripts connected with Irish history and antiquities: his collection was purchased by the Irish Academy in 1851.

Sir William Betham was elected in 1825 a member of the Irish Academy, and soon after became its foreign secretary, which office he held till 1840, when he resigned it in consequence of the council refusing admission in the 'Transactions' of the society to some of his philological speculations. He was a zealous but credulous antiquary, and some of his archæological and philological speculations were of a very singular and wholly untenable character. For a long series of years he devoted himself to the investigation of primeval Irish, or rather Celtic, antiquities, and he fancied that he had discovered traces of the connection of the Celtic races with several of the most remarkable nations of antiquity. His first separate antiquarian publication, 'Irish Antiquarian Researches, or Illustrations of Irish History,' 1826-7, contains many of his peculiar views; but they are more fully developed in his two principal works of this class, the titles of which will sufficiently indicate the character of his notions: the first of these was entitled 'The Gael and Cimbri; or an Inquiry into the Origin and History of the Irish, Scots, Britains, and Gauls, and of the Caledonians, Picts, Welsh, Cornish, and Bretons,' 8vo, 1834; but the full expansion of his opinions was not arrived at till some eight years later, when appeared his 'Etruria Celtica, Etruscan Literature and Antiquities Investigated; or the Language of that People compared and identified with the Iberno-Celtic, and both shown to be Phœnician,' 2 vols. 8vo, 1842. He also contributed numerous papers on Irish Antiquities to the 'Transactions of the Irish Academy,' which have their value unfortunately greatly lessened by his strange want of critical discernment. Sir William was elected a Fellow of the Society of Antiquaries, London, in 1825, but only two or three papers by him were printed in the 'Archæologia.'

In his own proper line of research Sir William was a far more trustworthy guide. Besides several genealogical memoirs, and a valuable work on 'Parliamentary and Feudal Dignities,' Sir William published in 1834 an able and learned treatise on 'The Origin and History of the Constitution of England, and of the Early Parliaments of Ireland.'

For many years before his death Sir William occupied a prominent place in the general and literary society of Dublin; and he was looked up to as a leader in most of the religious and charitable as well as the literary and scientific movements in the Irish metropolis. Kindly and courteous to all who sought his advice or assistance, and always ready to place his stores at the service of the historical or antiquarian inquirer, his death, though at a ripe old age, was generally regretted. He died at Dublin, October 23, 1853, aged seventy-four.

BETH'ANY, a village 2 miles E. from Jerusalem, on the road to Jericho, at the eastern base of the Mount of Olives, was the scene of the raising of Lazarus from the grave. It is now called El-Azariyeh (the Village of Lazarus). (Robinson, *Biblical Researches*; *Dictionary of Greek and Roman Geography*.)

BHOPAL. [BOPAUL.]

BICKERSTAFF, ISAAC, was born in Ireland probably about 1735. He was one of the pages of Lord Chesterfield, who became Lord-Lieutenant of Ireland in 1746. Afterwards he became an officer in the marines, in which service he continued until forced to quit under circumstances of a highly discreditable nature. He is known as the successful author of a number of light comedies and musical pieces, produced under Garrick's management, of which some yet retain possession of the stage. The principal are—'Love in a Village,' 1763; the 'Maid of the Mill,' 1765; 'Love in the City,' 1767 (since altered to the farce of 'The Romp'); 'The Hypocrite,' 1768; 'Lionel and Clarissa,' 1768; 'The Padlock,' 1768; 'The Captive,' 1769; 'He Would if he Could,' 1769. His last piece, 'The Sultan,' was produced in 1787. The music to many of these pieces was composed by Charles Dibdin. The time and manner of Bickerstaff's death are uncertain: all that is known is that he withdrew to the continent, and died in obscurity. (*Biographia Dramatica: Thespian Dictionary*.)

BICKERSTETH, REV. EDWARD, was born March 19, 1786, at Kirkby Lonsdale, Westmorland. He was the fourth son of Mr. Henry Bickersteth, a surgeon of that town, and the younger brother of the late Lord Langdale, Master of the Rolls. He received his early education at the grammar school of Kirkby Lonsdale, but was removed thence on receiving a clerkship in the post-office, London, at the age of fourteen. Here he remained for six years, when he was received into the office of Mr. Bleasdale, a London attorney, as an articled clerk. Having completed his term of five years, he entered into partnership with Mr. Bignold, a fellow clerk, whose sister he married, and commenced business as a solicitor at Norwich in 1812.

The business soon became a flourishing one, and Mr. Bickersteth's prospects appeared very favourable. But he had become deeply impressed with the importance of religious truths, and he soon took a prominent part in the various religious movements for which Norwich was becoming celebrated. The Norwich Church Missionary Society was founded by him, and he was active in promoting the operations of the Bible Society, and several other religious societies in that city. He also wrote and published, in 1814, 'A Help to the Study of the Scriptures,' which in its enlarged form has had an enormous circulation. His own strong religious feelings, aided perhaps by an acquaintance he had formed with Mr. Pratt, Mr. Budd, and some other leading clergymen of the 'evangelical' section of the church, led him to desire earnestly to devote himself to the ministerial office—a desire which those gentlemen strongly encouraged. Accordingly, Mr. Bickersteth was, December 10, 1815, ordained a deacon of the Church of England; the Bishop of Norwich having been induced to dispense in his case with the usual university training, in consequence of its being represented to him that the Church Missionary Society were anxious to obtain the services of Mr. Bickersteth to proceed on a special mission to inspect and re-organise the stations of the society in Africa, and to act afterwards as their secretary. A fortnight later the Bishop of Gloucester admitted him to full orders, and he almost immediately departed with his wife to Africa. He returned in the following autumn, having satisfactorily accomplished the purposes of his visit.

He continued in the zealous discharge of the duties of his secretaryship for the next fifteen years, organising new and visiting old branch associations, directing the studies of the missionaries, continually advocating the interests of the society in the pulpit and on the platform, as well as with his pen; and in the course of his frequent official journeys through all parts of the kingdom, acquiring a constantly increasing amount of influence and popularity in what is commonly designated the religious world. At the end of 1830 he resigned his office, and also his ministerial charge at Wheler Chapel, Spitalfields, upon accepting the rectory of Watton in Hertfordshire. At Watton, Mr. Bickersteth spent the remaining twenty years of his life. But his labours were by no means bounded by his parish. He was during the whole of that time in constant request as the advocate, by sermons and speeches, not only of the missionary, but of almost every other religious society connected with the church, or in which, as in the Bible Society, and the Evangelical Alliance (of which he was one of the founders), churchmen and dissenters associate. And he also produced during his residence at Watton a constant succession of religious publications, which were for the most part read in the circles to which they were chiefly addressed with the greatest avidity. Indeed it may be said that during most of these later years of his life Mr. Bickersteth was one of the most influential and generally popular clergymen of that section of his brethren among whom he was classed.

During this period he took a very decided part in all those measures which he regarded as having a direct bearing on the religious condition of the country. He was especially earnest in opposing the Maynooth grant, and in calling for its withdrawal; and he was equally zealous in denouncing the spread of what are known as Tractarian opinions in the Church of England; yet his opposition was free from all personal bitterness, and his influence was directed to softening the asperities of religious strife. In his later years he manifested a growing interest in the study of prophecy. The unfulfilled prophecies were made the frequent subject of his discourses, and he published several pamphlets and tracts and three or four elaborate treatises in elucidation of the prophetic writings.

His principal works besides the 'Scripture Help' already noticed, and a large number of sermons, tracts, &c., were:—'The Christian Student,' 'A Treatise on the Lord's Supper,' 'A Treatise on Prayer,' 'Family Expositions of the Epistles of St. John and St. Jude,' 'A Treatise on Baptism,' 'The Signs of the Times,' 'The Promised Glory of the Church of Christ,' 'The Restoration of the Jews,' 'A Practical Guide to the Prophecies,' &c. His collected works have been published in 16 vols. 8vo. Among his literary labours ought to be mentioned the Hymn-book which he compiled, and the 'Christian Family Library,' which he edited, and which extended to fifty volumes.

Mr. Bickersteth was in 1841 attacked by paralysis, the result of too prolonged mental exertion. He recovered from this, and resumed his labours. In 1846 he was, when proceeding to a meeting of the Evangelical Alliance, thrown from his chaise under a heavily laden cart, the wheels of which passed over him; but though dreadfully injured he was after a time restored to health and activity, and survived till February 24, 1850, when he died of congestion of the brain, aged sixty-three.

(Birks, *Memoir of the Rev. Edward Bickersteth.*)

BIELA, WILHELM, BARON VON, was born at Rosla, near Stolberg, in the Harz Mountains, in Prussia, his patrimonial estate, on March 19, 1782. When he was born, Stolberg was an independent state, and he entered young into the Austrian army. He had taken an early predilection for astronomy, as an amateur, and while serving with his regiment at Josephstadt in Bohemia, in 1826, he became distinguished by the first discovery of the comet since called after him. Retiring from the military service, he continued to take an interest in the science of astronomy, and corresponded with many of the most eminent men of science. He died on February 18, 1856, at Venice.

BILL OF LADING. The indorsement of a Bill of Lading now not only transfers the property in the goods therein mentioned, but also all the rights and liabilities *inter se* of the original parties thereto. It is also conclusive evidence as against the master of the shipment therein mentioned (18 & 19 Vict. c. 111).

BILL OF SALE. A Bill of Sale of *personal chattels* must be registered within twenty-one days after the making thereof in the judgment office of the Queen's Bench, otherwise it will, as against assignees in bankruptcy or insolvency, or creditors, be null and void (17 & 18 Vict. c. 36.)

BILLBERGIA, a genus of plants belonging to the natural order *Bromeliaceæ*, named after Billberg, a Swedish botanist. Several species are cultivated in our stoves. They are all natives of South America. One of the species, *B. tinctoria*, yields a colouring matter, which is used for dyeing in Mexico.

BILLERICAY. [Essex.]

BIMANA, the first order of the class *Mammalia*, which includes the single genus and species *Homo sapiens*—Man. [Man.]

BINNY. [Barbel.]

BISHOP, SIR HENRY ROWLEY, was born in London in 1780. He received his musical education under Signor Bianchi, who was then settled in London as composer at the Opera House. In 1806 Mr. Bishop obtained the appointment of composer of ballet music at the opera, a post he occupied for some time; but little more than the titles of the pieces written by him have been preserved. The first of his long series of English operas, 'The Circassian Bride,' was produced at Drury Lane Theatre on the 23rd of February, 1809, with great success; but on the following evening the theatre was destroyed by fire, and the score of his opera perished in the flames. For the next sixteen or seventeen years he wrote almost incessantly for Drury Lane and Covent Garden theatres, at the latter of which he for several years held the office of composer and musical director. During this period he is said to have produced upwards of seventy operas, ballets, and musical entertainments. Of these many are forgotten; but others are still repeated, and, on account of their flowing melodies and animated style, are, when tolerably played, always heard with genuine pleasure. Those which best illustrate his style are 'Guy Mannering,' the 'Slave,' the 'Miller and his Men,' 'Maid Marian,' 'Native Land,' the 'Virgin of the Sun,' the 'Knight of Snowdon,' the 'Englishman in India,' &c., in all of which there is true musical power. He also 'composed and adapted' Mozart's 'Barber of Seville,' 'Marriage of Figaro,' &c. But the incessant calls upon him begot a hasty careless manner, and he frequently, in the later years of his connection with the theatres, contented himself with crude rifacimentos of the scores of foreign composers; and his fame in consequence gradually declined. At length, aroused by the production of Weber's 'Oberon' at Covent Garden Theatre, in 1826, he composed 'Aladdin' in direct rivalry to that famous work, and brought it out at the same time at Drury Lane. But instead of trusting to his own genius, 'Aladdin' was a direct attempt in the German style, and it proved an entire failure. Mortified at his loss of popularity, he never again composed for the stage. Besides his theatrical pieces, he composed three or four shorter pieces for a series of oratorios, which he conducted about 1819-20. He arranged also several volumes of the 'National Melodies;' and he composed and arranged all Moore's 'Melodies' subsequent to Stevenson's secession from that publication.

Sir Henry Bishop was knighted in acknowledgment of his musical eminence by the Queen soon after her accession to he throne. He was one of the first directors of the Philharmonic Society, and conductor of the Concerts of Ancient Music. He was also Reid professor of music at Edinburgh; and in 1848 was elected professor of music at Oxford University. He died April 30, 1855, aged 75. Sir Henry had heavy domestic trials, and he was not prudent in money matters; so that his later years were clouded by much anxiety and suffering.

Bishop was one of the first English composers of modern times. Had he written less he would have written better; but as it is, though few if any of his operas are likely to retain a permanent place on the stage, and his elaborate imitative philharmonic cantatas have long been forgotten, much of his chamber and concert music—married as it so often is to immortal verse—will long continue to delight the public ear, and will indeed most likely be still popular when many far more pretentious pieces of foreign as well as home growth shall have passed away with their novelty. Many of his songs and glees have the truest inspiration of that class of music—flowing, vivid, graceful, and free from all affectation.

(*Dictionary of Musicians; Athenæum*, 1855; *Gentleman's Magazine*, 1855.)

BISHOP'S AUCKLAND. [Auckland, Bishop's.]

BITLIS, a town in Turkish Armenia, situated at the southern extremity of a long rocky ravine which separates the Kerku Mountains from the Nimrud-Dagh in a deep valley traversed by the Bitlis River, one of the head waters of the Tigris, at a distance of about 120 miles S.E. from Erzerum, and 12 miles S.W. from the western angle of Lake Wan. Three ravines each traversed by a stream open into the valley, one already mentioned from the north-west, another from the west, and a third from the east; and at their junction with the main valley the town is situated at an altitude of 5156 feet above the sea. In the centre of the town rises an abrupt rock 50 or 60 feet high, on the summit of which are the ruins of a castle, the residence of the former Begs of Bitlis. The only access to the castle is by a narrow steep passage, strongly defended by gates. The external wall which runs round the edge of the rock, and is 30 feet high above its level platform, is solidly built and loopholed, but within this inclosure there is nothing but a heap of ruins. At the eastern base of the castle rock are the bazaars, which are low, dark, ill-built, and dirty, but well stocked and generally much crowded, as Bitlis is one of the chief marts for the imports and exports of Armenia and Kurdistan. The bazaars are lighted only by perforations at intervals in the roof, which is terraced over and used as a highway for foot passengers. Near the bazaars and on the banks of the river are the slaughterhouses, haunted by mangy dogs, and reeking with offensive effluvia. The streets run along the streams and up the ravines, giving an irregular and straggling form to the town, which covers a considerable area, as the buildings are interspersed with numerous orchards and gardens, which smile in singular contrast with the bare limestone mountains that rise on every side to the height of about 2000 feet above the valley. The streams are crossed by single-arched bridges sufficiently numerous to afford a ready passage from one part of the town to another.

The houses are all built of stone and flat roofed. The best of them stand high up the declivities, and are ornamented with large arched windows, trellis-work, and porticoes. The stone used in building is a soft volcanic rock which abounds in the neighbourhood, especially in the north-west ravine; it is cut into square blocks which are cemented with mud; only a few of the houses are pointed with lime cement. There are two good khans for the accommodation of merchants three mosques with minarets, twelve tekíyehs, or convents of Howling Dervishes, and four Armenian churches. The population of the town consists of about 2000 Mohammedan, 700 Armenian, and 40 Jacobite families. The principal building in Bitlis is the fortified residence erected by Sherif Beg in 1836, on the level summit of a mountain spur that runs half way across the mouth of the eastern ravine, and is 5475 feet above the sea. It is a rude but extensive structure, consisting of a quadrangle two stories high, built round a court which contains a copious fountain. The ground-floor is used for stables and store-houses; the upper rooms are entered from an open gallery overlooking the court, and are used as sitting and receiving rooms, harem, &c. The windows are all on the outer walls of the building, and command extensive views. From this frowning castle which commands the town on the west and the eastern ravine, Sherif Beg held Bitlis and its territory (containing 80 villages, and forming about one-third of the pashalic of Mush) in defiance of the Sultan for several years. The position of this fortress as given in the 'Royal Geographical Journal,' vol. x., is 38° 23′ 54″ N. lat., 42° 4′ 45″ E. long.; on the map in Dr. Layard's 'Nineveh and Babylon,' the town is placed 8′ or 9′ farther east.

In point of trade Bitlis is an important place. The exports are chiefly galls, honey, wax, wool, and gum tragacanth from the mountains of Kurdistan and Armenia, carpets and cotton stuffs woven in the town and neighbourhood, and dyed here in most brilliant colours. The dyes of Bitlis are celebrated for their brilliancy; they are made from mountain herbs, and from indigo, yellow berries, and other materials which are imported. The raw cotton used in their manufactures is brought from the districts of Kharzan and Shirwan (which also supply madder), and some of it is imported from Khoi, in Persia. It is spun by hand; and several hundred thousand short heavy calico pieces are manufactured throughout the country, of which Bitlis is the centre, and sent here to be dyed. The favourite colours among the Kurds are a dull deep red, and a bright yellow mingled or striped with black. The carpets are of a rich soft texture, with patterns displaying considerable elegance and taste; they are much esteemed in Turkey. Manchester goods, including unbleached calicoes, shawls, and prints; gay-coloured silks and satins, some woollen clothes and coarse cutlery are comprised in the list of British goods sold in the bazaars. The manufactures of Damascus, Aleppo, and Diyar-Bekr are more extensively used.

Bitlis is said to be an ancient place. Until lately it was governed by Kurdish Begs, who were but little under the control of the Porte. Sherif Beg, the last of these lawless chiefs, was exiled to Constantinople in 1849, after the so-called subjugation of the Kurds by Reshid Pasha, and the town is now governed under the Pasha of Mush.

BIVALVE, a name applied to those forms of Shell-Fish which have two shells, or valves, in contradistinction to those which have one shell, and which are called *Univalve*. [MOLLUSCA.] Before the structure of the Invertebrate Animals was as well known as it is at the present day, the Barnacles and Sea Acorns, which have several external valves, or shells, were referred to the *Mollusca*, under the name of *Multivalves*.

BLACK JACK, the name given by miners to the Sulphuret of Zinc. [ZINC.]

BLADDER, DISEASES OF, [SURGERY, *S.* 2.]

BLAINVILLE, HENRY MARIE DUCROTAY DE, a distinguished zoologist, was born at Arques near Dieppe, September 12, 1778, of a noble and ancient family. He went first to the military school at Beaumont-en-Auge, being destined for the army; but left it suddenly in 1792, and, as is said, shipped on board a channel cruiser, and took part in sundry engagements with English vessels. Afterwards he entered the École de Genie at Paris, and was drawn for the conscription of 1798, but obtained exemption through a partial stiffness of the right arm caused by an accident. He remained at Paris without any definite plan of life, occupying himself in a desultory manner by attending lectures on the natural sciences, and by drawing and painting, in which he became very expert. He had reached the age of twenty-seven, when, having heard one of Cuvier's eloquent lectures at the Collège de France, he resolved on devoting himself to the science of comparative anatomy, and at once entered as student in the School of Medicine. Here he took his degree of Doctor of Medicine in 1808, after three years of study; and chose as the subject of his inaugural dissertation, the influence of the eighth pair of nerves in respiration, as demonstrated by his own experiments.

The science of anatomy now became De Blainville's sole pursuit. His remarkable skill as a draughtsman led to his merits being recognised by Cuvier, who employed him as practical anatomist and artist at a salary of 2000 francs a year; and the great zoologist was so impressed by his assistant's ability, that he intrusted to him the delivery of a part of his course of lectures on zoology at the college. It was De Blainville's ambition to become professor, and in 1812 he competed with other candidates for the chair of zoology and physiology at the Faculty of Sciences. Having won the honourable post, he defended his well-known thesis 'On the Natural Affinities of the Ornithorhynchus Paradoxus.'

A flattering political position, obtained through his influential family connections on the restoration of the Bourbons, was offered to De Blainville: but he resisted the allurements of public life for his favourite science. He came to England in 1816, and during a short stay, made diligent use of his opportunities for adding to his zoological knowledge, and carried away drawings of the rare *Mollusca* in the British Museum, and of anatomical specimens in the museum of the Royal College of Surgeons. Some of his papers, published in the 'Bulletin de la Société Philomatique,' bear testimony to the good use he made of his sojourn in this country.

In 1825 De Blainville was elected a member of the Academy of Sciences at Paris. On the retirement of Lamarck in 1830, he was appointed to the chair of the natural history of *Mollusca* and *Radiata* at the Jardin des Plantes; and on Cuvier's death in 1832, he was appointed to succeed that great anatomist as professor of comparative anatomy in the same establishment. Thus in twenty-eight years after his resolve on a life of scientific study, he found himself as the result of his persevering labours, in the chair of his master, and acknowledged head of one of the most important branches of science. In the same year he was elected a foreign member of the Royal Society, and subsequently of the Geological Society of London. He was also a member of other scientific societies on the continent.

De Blainville availed himself of his new position to commence what has since been recognised as his great work: 'Ostéographie, ou Déscription Iconographique comparée du Squelette et du Systéme Dentaire des Cinq Classes d'Animaux Vertébrés récents et fossiles,' &c. Twenty-three parts of this magnificent work had been published, and the author had corrected the twenty-fourth part (*Camelus*), when on the arrival at Rouen of a railway train in which he had taken a place, he was found in a state of apoplectic insensibility. This was the 1st of May 1850. On the previous day he had delivered his usual lecture; "exhibiting," says M. Prévost, "a freshness of ideas, and facility of expression, which bore no marks either of fatigue or apprehension. Some threatening symptoms had been experienced during the year past, but, with a force of character peculiar to him, he had sought to conceal them from all, even from himself." All attempts at resuscitation proved unavailing, and he died a few minutes after his removal from the carriage.

De Blainville's writings are to be found in the 'Dictionnaire d'Histoire Naturelle,' the 'Bulletin' above-mentioned, the 'Annales' and 'Mémoires du Muséum,' the 'Annales des Sciences Naturelles,' the 'Révue Zoologique,' and other scientific periodicals. Of separate works may be mentioned his 'Dissertation sur la place que la Famille des Ornithorinques et des Echidnés doit occuper dans la Série Naturelle,' 4to, Paris, 1812; 'Sur les Ichthyolites,' &c., 8vo, Paris, 1818; 'Malacozoaires et Poissons de la Faune Française,' 8vo, Paris, 1820-30; 'Principes d'Anatomie Comparée,' 2 vols. 8vo, Paris, 1822-23; 'Mémoire sur les Belemnites,' 4to, Paris, 1827; 'Cours de Physiologie générale et comparée,' 3 vols. 8vo, Paris, 1833; 'Manuel d'Actinologie et de Zoophytologie,' 8vo, Paris, 1834.

The fact that De Blainville's writings number nearly 200 in the whole, will best give a notion of his activity and devotion to science; they comprise researches in all branches of zoology. His 'Ostéographie' and 'Manuel de Malacologie,' are elaborate treatises which alone would employ the labour of a life. The former includes extinct as well as living animals, and is of rare importance to palæontologists.

De Blainville had a public funeral in Père-la-Chaise. Prévost, Chevreul, and Milne-Edwards each pronounced a discourse over his grave. A passage from the former presents a concise view of what he accomplished. "It was the great object of his life," says M. Prévost, "to establish in all his works, especially in his 'Osteology,' the doctrine that the whole series of organic beings was intimately related, the links of one great chain, ascending from the most simple of organisms to that which occupies the highest place; in other words, from the sponge to man. But while he endeavoured to refer all groups and every variety of animal form to one and the same plan, he never embraced the plausible hypothesis that each higher grade had been improved in the course of ages out of a lower one by transmutation; on the contrary, he saw in the whole animal creation one single operation, one great harmonious and divine idea, the various changes being neither due to chance nor to the influence of external circumstances, but being all the result of one and the same original conception."

(*Proceedings of the Royal Society; Ann. des Sci.;* Agassiz, *Bibl.;* Silliman, *Journal; Geol. Soc. Journal; L'Institut de France.*)

BLAKEA, a genus of plants belonging to the natural order *Melastomaceæ*, named by Dr. Patrick Browne in honour of Martin Blake. The species are trees or shrubs, with large showy red flowers. The calyx is girded with from four to six broad scales; the coralla with six petals; the fruit a 6-celled berry, crowned with the calyx. The leaves have from three to five nerves. *B. quinquenervis*, Aublet, *B. triplinervis*, Linnæus, is a native of Brazil, Guyana, and Trinidad. It produces a large yellow berry, which is eaten in the countries where it grows. *B. parasitica* is a native of Guyana and Maranham, having red flowers. It is a climbing shrubby plant, rooting itself in other trees. It yields a colouring matter, employed for dyeing red.

BLANCHARD, LAMAN, was born at Great Yarmouth, Norfolk, May 15, 1803. His father having removed to London, Laman was educated at St. Olave's school, Southwark. He commenced the business of life as reader in a printing office. From boyhood he had exhibited a great fondness for poetry, and considerable aptitude in verse making; and his first venture in authorship was a small volume of poetry entitled 'The Lyric Offering,' published in 1828. Before this, however, in 1827, he had received the appointment of secretary to the Zoological Society. This office he held till 1831, when he resigned it to become acting editor of the 'New Monthly Magazine.' From this time till his death his talents were wholly devoted to writing for the periodical press, to which he was one of the most varied and prolific contributors. His contributions consisted of poems, essays, tales, sketches, and brief pointed paragraphs;—whatever in fact was most required for the magazine or journal with which he was at the time connected: and all of them displayed a lively and genial fancy and a ready wit. Mr. Blanchard edited the 'True Sun' newspaper during the whole of its career; the 'Constitutional;' and for a while the 'Court Journal,' and the 'Courier.' For some time previous to his death he had assisted in conducting the 'Examiner.' His death occurred under very painful circumstances. His wife, to whom he was much attached, became very ill about a year before his decease, and her illness ended in insanity. She rallied for awhile, but relapsed and died. Under the prolonged anxiety attending her long illness and its fatal termination, his own health and spirits gave way. He was attacked by nervous paroxysms, and during or after one of these, put an end to his life, February 15, 1845. His death excited much sympathy, especially among his literary brethren, by whom he was greatly esteemed. His 'Essays and Sketches' have been collected and published, with a Memoir by Sir E. Bulwer Lytton.

BLESSINGTON. [WICKLOW.]

BLESSINGTON, MARGUERITE, COUNTESS OF, was born at Knockbrit, near Clonmel, Tipperary county, Ireland, on the 1st of September, 1789, and was the third daughter of Mr. Edmund Power, who was of respectable family, but broken fortune and reckless habits. She was married in her fifteenth year to a Captain Farmer, but the marriage was a very unhappy one, and Mrs. Farmer after a time quitted his house. He was killed by falling from a window in the King's Bench Prison, while in a state of intoxication, and within four months his widow was married to the Earl of Blessington, February 1818. After exhausting every means of enjoyment in England and Ireland, the earl and countess started in September 1822 on a continental tour, which, partly owing to the earl's property having become considerably encumbered, was prolonged till his death. At Paris they were joined by the Count Alfred d'Orsay, who in 1827 married a daughter of Lord Blessington by his first wife. It was an unhappy marriage, and a separation eventually took place; but Count d'Orsay continued after the death of Lord Blessington to reside with Lady Blessington during the remainder of her life. Lord Blessington died at Paris in May 1829. Lady Blessington on her return to London made her house the centre of a brilliant circle of persons of social and intellectual eminence. She quickly became one of the celebrities of London; and for nearly twenty years the *salons* first of Seamore-Place and afterwards of Gore House, disputed the palm with those of Holland House, as the resort of the learned, the witty, and the famous of the day. But Lady Blessington aspired to be something more than merely their hostess. She had in 1822 published a couple of volumes of 'Sketches,' and in 1832 she fairly entered upon her career of authorship by contributing to the 'New Monthly Magazine' a 'Journal of Conversations with Lord Byron.' She had become acquainted with Lord Byron when residing on the continent, and as she repeated his remarks with little reserve, the 'Journal' excited considerable interest, and was soon republished in a separate form. From this time Lady Blessington continued to write for the press with little intermission. She wrote a great many novels, of which 'The Repealers' was the first in point of time: and the 'Victim of Society,' the 'Two Friends,' and the 'Belle of a Season,' were the most popular. When portraying the habits of fashionable society she was on familiar ground, and could write with effect; when she treated of subjects of more general interest, she lost her power. The majority of her novels and tales are of little literary worth, and none perhaps are likely to have a very long vitality. One of her most pleasant books, after the 'Conversations with Lord Byron,' is her 'Idler in Italy,' published in two volumes in 1839. The 'Idler in France' and 'Desultory Thoughts and Reflections,' are of inferior value. Lady Blessington also contributed slight tales, sketches, and verses to the magazines and annuals; and for several years she edited 'Heath's Book of Beauty' and the 'Keepsake; she also for a few years edited another annual called the 'Gems of Beauty.' She likewise for a time contributed to the 'Daily News' and 'Sunday Times' newspapers.

To this literary industry Lady Blessington was incited by pecuniary necessity, brought about by her splendid style of living. But both her jointure and her literary earnings proved insufficient to meet her expenditure; and when the famine in Ireland cut off in a great measure the returns of the Blessington property, it became necessary in 1849 to dispose of the costly fittings and furniture of Gore House. Count d'Orsay had gone to Paris in the hope, as was understood, of obtaining a post under Louis Napoleon, with whom he had been on terms of much intimacy. Lady Blessington followed him in April 1849, and died at Paris almost suddenly on the 4th of June, 1849. Count d'Orsay died at Paris August 4, 1852.

(Madden, *the Literary Life and Correspondence of the Countess of Blessington.*)

BLETIA, a genus of plants belonging to the natural order *Orchidaceæ*. The corms of *Bletia verecunda* are said by Dr. P. Browne, to have a bitterish flavour, and when dry to be used with advantage as a stomachic.

BLOMFIELD, CHARLES JAMES, Bishop of London, was born in 1786, at Bury St. Edmunds, Suffolk, where his father was a schoolmaster. Having been first well-grounded in classics, he proceeded to Trinity College, Cambridge, and both there and in the university examinations he attained great distinction. He graduated in 1808 as third wrangler, and was senior medallist the same year; subsequently he was elected fellow of Trinity College. The first published specimen of his philological and critical abilities was an edition of the 'Prometheus' of Æschylus, which appeared in 1810; this was followed by the 'Seven against Thebes,' 1812; the 'Persians; the 'Choephoræ;' and the 'Agamemnon.' A valuable edition of Callimachus was published under his supervision in 1824. It is on these works that the fame of Bishop Blomfield as a classical scholar chiefly rests. But they are far from exhibiting the extent of his labours in the academic field. In 1812 he edited, in conjunction with Rennel, the 'Musæ Cantabrigienses;' and in conjunction with Monk the 'Posthumous Tracts' of Porson, a work which he followed, two years later, by editing alone the 'Adversaria Porsoni.' But besides these he is known to have written numerous critical papers on Greek literature, some of them of a rather trenchant character, in the quarterly reviews and classical journals; and he compiled in 1828 a Greek grammar for schools.

His first preferment in the church was in 1810 to the living of Warrington; and in the same year he received that of Dunton in Essex. In 1819 he became chaplain to Howley, Bishop of London, and very soon after he received the valuable rectory of St. Botolph, Bishopsgate, in the city of London, and was made Archdeacon of Colchester. From this time his career of active clerical influence may be dated. In 1824 he was raised to the episcopal bench as Bishop of Chester; and in 1828 on his friend and patron Bishop Howley being translated to the see of Canterbury, Bishop Blomfield was chosen to succeed him as Bishop of London. His Lordship ever afterwards took perhaps the most active and influential, if not always the most prominent part, in the government of the established church, and a leading position in the discussion of all ecclesiastical or semi-ecclesiastical subjects in the House of Lords. His conduct in the many important matters connected with the doctrines and ceremonial observances and innovations which have vexed or interested the Church of England during the many years he held his important post, was much canvassed. But besides his watchful supervision of the general interests of the Church, Bishop Blomfield was a careful overseer of the clergy of his diocese, and prompt to support any proposition which appeared likely to improve the condition of the labouring classes in the metropolis. Nor in the briefest notice of Bishop Blomfield ought the amazing success of his efforts for increasing the number of churches to pass unmentioned. While Bishop of Chester he zealously set on foot efforts to erect new churches in places insufficiently supplied; but it is in his London diocese that success most abundantly crowned his labours. During the time that he held the see there were built in his diocese a number of churches beyond all comparison greater than in the presidency of any other bishop since the Reformation; yet one of his most recent public acts was to make an earnest appeal, seconded by a large subscription, to the affluent and liberal to endeavour by a vigorous effort to raise funds sufficient, if possible, to construct as many additional churches as the Census Report of the Registrar-General shows are still needed to meet the wants of the vast and rapidly increasing population of the metropolis.

The theological writings of Bishop Blomfield consist of 'Lectures on the Acts of the Apostles,' and of numerous Sermons and Charges.

Bishop Blomfield in 1856 resigned his bishopric, and was succeeded by Dr. Tait. He died August 5, 1857, at Fulham, near London.

BLOODSTONE, also called *Heliotrope*, is a deep green stone—a jaspery variety of quartz. It has obtained its name from being spotted with red so as to resemble drops of blood. In addition to silica, it contains oxide of iron and clay, which are mechanically introduced, and in this way the red spots are produced. In the royal collection at Paris there is a bust of Christ in this stone, so managed that the red spots represent drops of blood, (Dana, *Mineralogy*.)

BLOOD-VESSELS. The blood from which the tissues of the body obtain the material of their nourishment is conveyed from one part of the body to another by means of branched tubes which are named Blood-Vessels. It is carried along these vessels by the impulse given by the action of the Heart. [HEART.] The vessels which carry the blood from the heart are called Arteries. [ARTERY.] Those which return the blood to the heart are named Veins. [VEIN.] Whilst a very generally diffused net-work of Blood-Vessels exist, connecting the arteries and veins, which are called Capillaries. [CAPILLARY VESSELS.]

The Blood-Vessels, whatever may be their ultimate destination, seem to originate in the same manner. Observations on this subject have been made by Schwann and Kölliker in Germany, and by Professor Paget in this country. The observations of the two former were made on the development of the vessels in the germinal membrane of the egg, and on the capillary blood-vessels of the tail of the larva of a frog. Mr. Paget's observations were made on the tissues of the fœtal sheep. According to these observers it appears that these vessels originate from nucleated cells, similar to those which at first constitute the different parts of the embryo. The cell-wall or external envelope of these cells shoots out into slender pointed processes, such as is seen in the forms of stellate vegetable tissue. The projections from neighbouring cells encounter each other, and becoming organically united, the intervening walls between the two projections are absorbed, and thus a continuous tube is produced. In cases where new vessels are produced in the neighbourhood of old ones, the stellate cells are formed in the new part, and projections are formed in the old capillary vessels, which unite with the new ones, and thus the circulation is re-established. The projections when first united are solid and very slender, but eventually the intervening substance disappears and the vessels attain a uniform calibre. In growing parts where the web of vessels is kept up, new ones are constantly being added by the development of stellate cells in the interstices of the previous web. Whilst the capillaries early attain the development at which they remain, those vessels which are to become arteries or veins on either side of the capillary vessels go on increasing in size till they acquire the special membranes or coats which distinguish these parts of the circulating system. This explanation seems however only applicable to the smaller veins and arteries, as the observations of Kölliker would seem to show that the larger Blood-Vessels may take their origin in the same manner as the heart, in which organ there is first an agglomeration of cells, the interior ones of which become soft, and at last disappear, whilst the outside ones become firmer and constitute the outer walls. On this subject further observations are wanting.

(Sharpey, *Quain's Elements of Anatomy*; Schwann, *Microscopical Researches into the Accordance in the Structure and Growth of Animals and Plants*, translated by H. Smith; Kölliker, *Handbuch der Gewebelehre der Menschen*: Paget, *Supplement to Müller's Physiology*, by Baley and Kirkes.)

BŒHMERIA, a genus of plants belonging to the natural order *Urticaceæ*. The species were formerly comprehended under the genus *Urtica*. One of the species *B. nivea*, formerly *Urtica nivea*, is the Rheea of Asam, and yields fibres of remarkable fineness and tenacity. It appears from the investigations of Dr. Falconer, that the plant which yields the celebrated grass-cloth of China is identical with the Asam plant. Several specimens of these fibres manufactured into light articles of dress were exhibited in the Indian collection at the Great Exhibition of 1851. The *B. nivea* is a herbaceous plant, with broad ovate leaves, which are downy and white beneath, hence its specific name. It bears no sting.

BOERHAAVIA, a genus of plants named after the celebrated Boerhaave, belonging to the natural order *Nyctaginaceæ*. The species of *Boerhaavia* have generally emetic and purgative properties, and have been employed medicinally both by the natives of Peru and the East Indies, where the species grow. *B. tuberosa* is stated by Lindley to be the Yerba de la Purgacion of Peru, and that it is employed as a culinary vegetable. The root of *B. decumbens* is called Hog-Meat in Jamaica, and on account of its emetic properties it is sometimes called Ipecacuanha in Guyana. Sir Robert Schomburghk states that it is astringent, and is useful in dysentery. *B. decumbens* and *B. hirsuta* are also said to possess medicinal properties. (Lindley, *Vegetable Kingdom*.)

BOG-IRON-ORE, a loose earthy ore of iron, consisting of Peroxide of Iron and water. It is of a brownish-black colour, and occurs in low boggy grounds.

BOGMARUS, a genus of Fishes, to which the Vaagmaer, or Deal-Fish, is referred by Schneider under the specific title of *B. Islandicus*. [TRACHYPTERUS, *S.* 2.]

BOLDOA, a genus of plants belonging to the natural order *Monimiaceæ*. *B. fragrans* is the Boldu of Chili. It produces an aromatic succulent fruit, which is eaten by the natives. The wood is very fragrant, and makes a charcoal which is preferred by the smiths of Chili to that from any other wood. The leaves are also very fragrant. The bark is employed in tanning.

BOISSONADE, JEAN-FRANÇOIS, was born in Paris, August 12, 1774. Towards the end of the year 1792 Boissonade entered into the public service under the ministry of General Dumouriez; he was expelled from the administration in 1795, but was restored in 1801 by Lucien Bonaparte, who was then minister of the interior, and who made him secretary-general of the prefecture of the Haute-Marne. When Lucien retired from the public service, Boissonade retired also; and thenceforward devoted himself to literature, which had indeed previously occupied nearly all his leisure hours. He had from the year 1802 contributed numerous articles to the periodicals of the day. In 1809 he was appointed professor of the Greek language and literature in the Académie de Paris, but assumed only the title of assistant-professor, resigning the title of professor to Larcher, who retained it till his death in 1812. Boissonade then succeeded him, and also supplied his place in the Académie des Inscriptions et Belles-Lettres. On the death of J. B. Gail in 1828, Boissonade was appointed professor of Greek in the Collége de France. Other situations of honour and emolument were afterwards offered to him, but he declined to accept any of them.

M. Boissonade occupied a considerable portion of his time in the critical examination of Greek writers previously unedited, and published a very large number of works and fragments of works by Philostratus, Proclus, Tiberius the Rhetorician, Holstentius, Herodianus, Eunapius, Aristænetus, and several others.

In the period from 1823 to 1826 Boissonade published in 24 vols. 32mo, a 'Sylloge Poetarum Græcorum,' and in consequence of the discovery in 1839, in a monastery on Mount Athos, in Greece, of a manuscript which contained a large number of the lost Fables of Babrius, Boissonade published 'Babrii Fabulæ Iambicæ,' 8vo, Paris, 1844. [BABRIUS.]

Boissonade contributed to the edition of 'Athenæus' by

Schweighæuser, to the 'Euripides' of Matthiæ, and to the edition of Stephens's 'Thesaurus Græcæ Linguæ,' which was printed and published in London by Valpy. He also wrote several articles for Valpy's 'Classical Journal,' and he gave his assistance to the Paris edition of Stephens's 'Thesaurus,' printed by Didot. M. Boissonade was an indefatigable labourer not only in Greek but also in modern literature, having, for instance, published collections of the unedited letters of Voltaire, of the works of Parny, and having furnished a large number of the lives in the 'Biographie Universelle.' He died Sept. 12, 1857.

(*Nouvelle Biographie Générale.*)

BOLINGBROKE. [LINCOLNSHIRE.]

BOLITO'PHAGUS (Fabricius), ***Eledona*** of Latreille, Leach, and Millard, and *Opatrum* of some other authors, a genus of Coleopterous Insects, of the section ***Heteromera*** and family *Tenebrionidæ*. The principal generic characters are as follows:—Head short, partially hidden by the thorax, in the males sometimes armed with a horn or tubercle; antennæ very short and thick, the three or four apical joints much broader than the rest; maxillary palpi rather large and distinct, the terminal joint truncated, its length equalling that of the two preceding joints; labial palpi small; thorax coarsely punctured or rugose, the lateral margins more or less toothed; elytra deeply striated; legs short and thick, the anterior tibiæ compressed.

There are about six species of this genus known; they live in *Boleti*, and are of a small size, a short ovate form, and their prevailing colours are brown-black. In this country but one species has as yet been discovered, ***B. Agaricola*** or ***Agaricicola***. It is of a brown colour, and about one-twelfth of an inch long. It is rather local, but where it does occur it is found in tolerable abundance.

BOLORETINE. [CHEMISTRY, *S.* 2.]

BOLTONITE, a native anhydrous Silicate of Magnesia. It occurs massive with a granular structure, or in yellowish or bluish-gray grains. The cleavage is in one direction; the lustre vitreous; transparent to translucent. It is found disseminated through limestone in the United States of America, at Bolton, Roxborough, and Nittleton, Massachusetts: and Ridgfield and Reading, Connecticut.

BONA NOTABILIA. [EXECUTORS.] The doctrine of *Bona Notabilia* has been abolished with the Courts whose jurisdiction depended on it, there being now but one Court of Probate for all England. [PROBATE, *S.* 2.]

BONAPARTE, CHARLES LUCIEN JULES LAURENCE, Prince of Canino, eldest son of Lucien Bonaparte, was born at Paris, May 24, 1803. He received a careful education, and always exhibited a much greater attachment to literary and scientific than political pursuits. As a naturalist the Prince of Canino acquired great distinction. In ornithology especially, he is generally regarded as one of the chief modern authorities; and he was elected a member of nearly all the principal learned societies of Europe and America. For some years the Prince resided in the United States, and it was by his writings on the Birds of America that he first made himself known to the scientific world. His chief publications are a continuation of Wilson's 'Ornithology of America,' in four folio volumes; and the 'Iconografia della Fauna Italica,' a splendidly illustrated work in three volumes folio. But besides these he published numerous essays and memoirs on particular portions of American ornithology, and on other branches of natural history in the scientific journals of the United States and Europe. The Prince was always the zealous friend and patron of the votaries of science, and for many years he was the chief promoter of the annual congresses of the scientific men of Italy. He died July 30, 1857, in Paris.

Prince Charles Bonaparte married at Brussels, June 29th, 1822, Zenaïde-Charlotte, daughter of his uncle Joseph Bonaparte, by whom he had ten children, of whom three sons and five daughters are living.

BONAPARTE, LOUIS NAPOLEON, the fourth son of Charles Bonaparte, and father of Napoleon III., was born at Ajaccio in Corsica, September 21, 1778. At an early age he entered the French army, and accompanied his brother Napoleon to Italy and Egypt. In Italy he distinguished himself at the passage of the bridge of Arcola, braving the fire of the enemy, and shielding the body of his brother and commander. When Napoleon became first consul, he was sent on a mission to St. Petersburg; but on arriving at Berlin he learned the news of the death of the Emperor Paul. He returned to Paris after remaining at Berlin about a year, and became a general of brigade, a counsellor of state, and afterwards a general of division. In 1802 he married Hortense Eugenie de Beauharnais, the daughter of the Empress Josephine.

When Napoleon became Emperor, Louis Bonaparte was promoted to higher honours, and was made governor of Piedmont, and afterwards commanded the army of the north of Holland. After the Batavian republic had been converted into a kingdom, the states of Holland in June 1806 sent an embassy to Napoleon, requesting that Louis might be their king, which was granted, and he immediately assumed the title of King of Holland. He strenuously exerted himself to better the condition of his people, and distinguished himself on several occasions by his personal humanity. His love for his people occasioned him to refuse without hesitation the offer made him by his brother of the crown of Spain; but his opposition to Napoleon's plans, which he thought were prejudicial to their welfare, gave great dissatisfaction at Paris. His wife was a most attached adherent of Napoleon's, and her inability to control her husband, the death of her eldest son in 1807, and the state of her health, induced her to repair to Paris, where a third son was born. She was afterwards sent by Napoleon in 1809 to induce Louis to comply with his wishes, but Louis refused. She then returned to Paris, where she resided in state as Queen of Holland, and Napoleon sent Oudinot with 20,000 men against Louis, who thereupon abdicated in favour of his son, which abdication Napoleon rejected; and on July 9, 1810, Holland was united to the French Empire. Louis retired to Gratz in Styria, where he lived three years under the title of Count de St. Leu, and his wife became wholly separated from him, though not divorced.

In 1813, when the allied armies appeared about to fall upon France, Louis offered his services to the Emperor, by whom they were accepted, and he proceeded to Switzerland, but he was not employed. On the downfall of Napoleon, when the Dutch threw off the French yoke, Louis addressed a letter to the provisional government from Soleure, asserting his claims to the throne, but they were rejected. He then commenced a suit at Paris for the restitution of his two sons, then living under the care of their mother, who had obtained a grant of the domain of St. Leu, with the title of Duchess, through the interest of the Emperor Alexander. The return of Napoleon put a stop to the suit, and the Duchess of St. Leu did the honours of Napoleon's court, and used her interest in favour of the unfortunate of all parties. After the battle of Waterloo she went to reside in Switzerland with her sons. Louis retired to the Papal States, where others of his family had assembled, and devoted himself chiefly to literature. He published 'Marie, ou Les Hollandaises;' 'Documens Historiques sur la Hollande,' 5 vols. 8vo, 1820, both of which have been translated into English; also, 'Mémoires sur la Versification;' an opera, a tragedy, a collection of poems, and a reply to Sir Walter Scott on his 'History of Napoleon.' He died at Leghorn, June 15, 1846; and at his special desire, which after some delay was acceded to, his body was buried at St. Leu in France, with those of his father and his first son, September 29, 1847.

BONE-BEDS. Accumulations of the bones of extinct animals, more especially of fish and Saurian reptiles, are not uncommon in various strata, and have had this name given them by geologists. They generally occur at the termination of one formation and the commencement of another. These Bone-Beds are local, and are not in any case very extensive. The thickest and most widely-distributed is that of the Lias, which seems to mark the commencement of the New Red-Sandstone epoch. The most remarkable Bone-Beds are the following:—

Bone-Bed at the base of the Lower Greensand at its junction with the Wealden; at the base of the Inferior Oolite, at its junction with the Lias; at the base of the Lias, at its junction with the New Red-Marl; at the base of the Mountain Limestone, at its junction with the Old Red-Sandstone; at the base of the Old Red-Sandstone, at its junction with the Ludlow Rock of the Silurian System.

(Brodie, ***On the Basement-Beds of the Inferior Oolite: Proc. Geol. Soc.***)

BONGARDIA, a genus of plants belonging to the natural order *Berberidieæ*, or *Berberidaceæ*. [BERBERIDIEÆ.]

BONHILL, a town in the parish of Bonhill and district of Levenax or Lennox, Dumbartonshire, Scotland. The parish is divided in its length into almost equal parts by the south end of Loch Lomond, and the river formed by it, the Leven, from which the district derives its name, and which falls into the Clyde at Dumbarton. The population of the town of Bonhill in 1851 was 2327.

The town is situated on both banks of the Leven, about five miles above Dumbarton. A mile nearer this town, and on the right bank of the stream, is the thriving village of Alexandria, with a population of 3781.

The inhabitants are chiefly engaged in print-works and bleachfields on the banks of the Leven, the water of which, from its softness and purity, is peculiarly fitted for the processes of printing and bleaching. Coals, lime, and other articles required in manufactures are brought up the river in shallow broad-bottomed lighters. The extensive works on the river are generally the property of mercantile houses in Glasgow. The Leven is celebrated for its fine salmon and trout.

Besides the parish church of Bonhill there is a chapel-of-ease at Alexandria. At both places are chapels for Free Church and United Presbyterian Dissenters. There are also two chapels in Alexandria for Independents.

BONITO, the name of fishes belonging to the family *Scomberidæ*. They resemble the Tunny. The Bonito is the *Thynnus pelamys*, Cuv.; the Belted Bonito, *Pelamys Sarda*, Cuv.; the Plain Bonito, *Auxis vulgaris*, Cuv. [THYNNUS, *S.* 1.]

BOOTLE. [CUMBERLAND.]

BOOTTIA, a genus of plants belonging to the natural order *Hydrocharidaceæ*, the species of which are eaten as pot-herbs.

BORAGE. [BORAGO, *S.* 1.]

BORY DE SAINT-VINCENT, JEAN-BAPTISTE-GEORGE-MARIE, was born in 1780, at Agen, in the French department of Lot-et-Garonne. As early as his fifteenth year he had addressed some communications to the Annals of the Society of Natural History of Bordeaux. In 1799 he accompanied Captain Baudin, as a naturalist, in the scientific expedition which was sent out to Australia by the French government. In the course of the voyage, however, a disagreement took place between the captain and several of the officers and scientific men who accompanied him, in consequence of which Bory de Saint-Vincent and others abandoned the expedition at Mauritius, then named the Île de France. He was employed by the governor as one of the état-major of the colony, and provided with whatever was requisite for making a survey of the adjacent islands. His attention was particularly directed to the island of Bourbon, then named the Île de la Réunion, of which he constructed a good map. On his voyage back to France, he touched at and examined several of the islands in the African seas, especially that of St. Helena, of which also he made a map. After his return to France he published his 'Essai sur les Îles Fortunées de l'Antique Atlantide, ou Précis de l'Histoire Générale de l'Archipel des Canaries,' 4to, Paris, 1803, and his 'Voyage dans les Quatre Principales Îles des Mers d'Afrique,' 3 vols. 8vo, with Atlas, in 4to, Paris, 1804.

Bory de Saint-Vincent was afterwards promoted to the rank of captain on the staff of Marshal Davoust, and was present at the battles of Ulm and Austerlitz. When Marshal Ney was sent to Spain in 1808, Bory de Saint-Vincent accompanied him as one of his staff, and was promoted to the rank of major. He was afterwards attached to the staff of Marshal Soult, and was present with him at the final battle of Toulouse. He was included in the lists of proscription of July 24, 1815, and resided at Aix la-Chapelle, Maestricht, Magdeburg, and Brussels. While at Maestricht he examined the vast quarries which extend under the mountain called Petersberg, and published an account of them under the title of 'Un Voyage Souterrain,' 8vo, 1823. At Brussels he was engaged with others in the 'Annales Générales des Sciences Physiques,' 8 vols. 8vo. He returned to France in 1820.

In 1829 Bory de Saint-Vincent was placed at the head of the scientific expedition sent out by the French government to the Morea and the Cyclades, the results of which were published in the 'Expédition Scientifique de Morée,' 4to, with Atlas in fol., Paris, 1832. In this work, besides the assistance given to other departments, he furnished the entire section of the botany ('Partie Botanique'). His contributions to the periodical publications of Paris were very numerous, mostly on subjects of natural history. In 1838 he published a 'Resumé de la Géographie de la Peninsule,' 12mo, with maps. In 1839 he was appointed to the management of the scientific commission sent out by the French government to Algiers. He accompanied the expedition, and after the completion of the investigations returned to Paris. He died December 23, 1846.

(*Conversations-Lexikon; Nouvelle Biographie Générale.*)

BOSIO, FRANÇOIS JOSEPH, BARON, an eminent French sculptor, was born at Monaco, March 19, 1769. He went at an early age to France, where, under Pajou, he received his professional education. He acquired great celebrity under the empire, and was much patronised by the Empress Josephine as well as by Bonaparte. For the Emperor he executed busts of himself, of Josephine, his sister Pauline, the young King of Rome, &c. For Josephine he executed a fine marble statue 'l'Amour lançant des Traits.' The well-known bassi-rilievi of the column on the Place Vendôme are the work of Bosio. The restoration of the Bourbons did not interfere with Bosio's course of prosperity. The restored dynasty found employment for his chisel, and Bosio was equally ready to serve them. He was commissioned in 1817 to execute the equestrian statue of 'Louis XIV. triomphant' for the Place des Victoires. He also exhibited in the same year a marble statue of the Duc d'Enghien, and subsequently busts of Louis XVIII., the Dauphin, and Charles X. Under Louis Philippe his courtly chisel produced one of his best works, a bust of the Queen Marie Amélie. During all this period he was much engaged in the execution of various monuments, statues for public buildings, &c. Among the more important of his classical and poetic works may be named his 'l'Amour séduisant l'Innocence;' 'Hercule combattant Achélous metamorphosé en Serpent;' 'l'Histoire et les Arts consacrant les Gloires de la France,' &c. Bosio, despite the high position he occupied during his prosperous career, is not likely to take permanent rank among the great sculptors of France. He was a skilful workman, and had much facility in designing, but his works evince little of the higher order of inventive or imaginative power. Bosio was created a baron by Charles X.; he was also a member of the Institute. He died July 29, 1845.

BOTANY. The study of Botany may be divided and pursued under the following heads:—

1. The Chemistry of Plants, including a knowledge of the physical and chemical properties of the elements which enter into the composition of plants. [SECRETIONS, VEGETABLE.]

2. The Histology of Plants, including the facts connected with the origin of the vegetable cell, the various functions it performs, and its life in connection with others in the formation of organs. [CELLS, *S.* 2, HISTOLOGY, *S.* 2.; TISSUES, VEGETABLE.]

3. The Morphology of Plants, embracing the history of the origin and growth of the individual organs of plants, and the relation of all forms of organs to one another, and the laws which regulate the changes which the same organ undergoes in the same and in different families of plants. [STAMENS; PISTIL, *S.* 2; SEED; FLOWER; FRUIT; OVULE.]

4. The Organology of Plants, including the general phenomena of the entire life of the plant, and the consideration of the relations which animals bear to plants, and the way in which they take part in the great changes going on in the surface of the earth. [STEM; ROOT; LEAF.]

5. Systematic Botany, embracing the principles of classification and the arrangement of plants in groups, according to their relations to each other. This department of Botany has been only gradually developed. Under the heads of EXOGENS, ENDOGENS, and ACROGENS [POLYPODIACEÆ], will be found the subdivisions proposed by the most recent writers on systematic botany. In order however to facilitate the student in discovering the order to which any plant he may possess belongs, we give here an analysis of the orders contained in the 'Penny Cyclopædia' and its Supplements, upon the plan followed by Dr. Lindley in his 'Vegetable Kingdom.'

Class, EXOGENS.

Sub-Class, POLYPETALÆ. (Petals not united).

I. Stamens more than 20 (Polyandrous).

A. Ovary wholly or partly inferior
  a. Stipules present
    1. Carpels more or less distinct or solitary . . : *Pomaceæ.* (*Rosaceæ.*)
    2. Carpels combined

Placentas central
Leaves opposite . . *Rhizophoraceæ.*
Leaves alternate . . *Lecythidaceæ.*
Placentas on the side . . *Homaliaceæ.*
b. Stipules absent
1. Carpels more or less distinct . *Anonaceæ.*
2. Carpels united
Placentas spread about . *Nymphæaceæ.*
Placentas on sides
Petals definite, distinct . *Loasaceæ.*
Petals indefinite, confused *Cactaceæ.*
Placentas in the centre
Leaves dotted
Ovary 1-celled . . *Chamælauciaceæ.*
Ovary more than 1-celled *Myrtaceæ.*
Leaves dotless
Petals numerous . . *Mesembryaceæ.*
Petals few
Petals narrow . . } *Alangiaceæ.* (*Nyssaceæ.*)
Petals round
Style 1 . . } *Barringtoniaceæ* (*Myrtaceæ.*)
Styles separate . *Philadelphaceæ.*
B. Ovary superior
a. Stipules present
1. Carpels more or less distinct or solitary
Stamens hypogynous
Carpel solitary . . *Leguminosæ.*
Carpels 00 . . . . *Magnoliaceæ.*
Stamens perigynous
Styles coming from apex of carpels
Carpel 1 . . . } *Drupaceæ.* (*Rosaceæ.*)
Carpels more than 1 . *Rosaceæ.*
Styles coming from base of carpels . . . } *Chrysobalanaceæ.*
2. Carpels united; placentas more than 1
Placentas on the side (parietal)
Leaves dotted, dots round *Flacourtiaceæ.*
Leaves dotted, dots linear and round, mixed . } *Samydaceæ.*
Placentas in the centre
Calyx imbricated
Flowers unisexual . . *Euphorbiaceæ.*
Flowers hermaphrodite
Ovary 1-celled; sepals 2 *Portulacaceæ.*
Ovary 2 or more celled
Calyx double . *Chlænaceæ.*
Calyx single . . *Cistaceæ.*
Calyx valvate
Stamens monadelphous; anthers 2-celled
Stamens columnar . *Sterculiaceæ.*
Stamens not columnar *Byttneriaceæ*
Stamens monadelphous; anthers 1-celled . . } *Malvaceæ.*
Stamens monadelphous; calyx irregular . . } *Dipteraceæ.*
Stamens distinct . . *Tiliaceæ.*
b. Stipules absent
1. Carpels more or less distinct or solitary
Carpels immersed in a disk . *Nelumbiaceæ.*
Carpels not immersed
Stamens perigynous . . *Rosaceæ.*
Stamens hypogynous
Embryo in a vitellus . . *Cabombaceæ.*
Embryo naked, very minute Seeds with an aril . } *Dilleniaceæ.*
Exarillate; albumen fleshy
Flowers hermaphrodite *Ranunculaceæ.*
Flowers unisexual . . *Schizandraceæ.*
Exarillate; albumen ruminated . . . } *Anonaceæ.*
Embryo nearly as long as seed
Calyx much imbricated
Fruit a legume . . *Leguminosæ.*
Fruit not a legume
Seeds smooth . . *Hypericaceæ.*
Seeds hairy . . *Reaumuriaceæ.*
Calyx little imbricated
Fruit not a legume . *Anacardiaceæ.*
Fruit a legume . . *Leguminosæ.*

2. Carpels united; placentas more than 1
Placentas parietal, in lines
Anthers versatile; juice watery *Capparidaceæ.*
Anthers innate; juice milky . *Papaveraceæ.*
Placentas parietal, spread over the lining of the fruit . . } *Flacourtiaceæ.*
Placentas spread over dissepiments *Nymphæaceæ.*
Placentas central
Stigma broad and petaloid . *Sarraceniaceæ.*
Stigma simple
Ovary 1-celled . . . *Portulacaceæ.*
Ovary many-celled
Calyx much imbricated
Leaves compound . *Rhizobolaceæ.*
Leaves simple
Petals equal to sepals
Seeds few . . *Clusiaceæ.*
Seeds numerous; petals flat . } *Marcgraaviaceæ.*
Seeds numerous; petals crumpled } *Cistaceæ.*
Calyx little or not at all imbricated
Stamens perigynous; calyx tubular . . } *Lythraceæ.*
Stamens hypogynous; calyx many-leaved . . . } *Humiriaceæ.*

II. Stamens fewer than 20 (Oligandrous).

A. Ovary wholly or partly inferior
a. Stipules present
Placentas parietal . . . *Homaliaceæ.*
Placentas in the centre
Flowers unisexual . . . *Begoniaceæ.*
Flowers hermaphrodite
Stamens opposite petals . *Rhamnaceæ.*
Stamens alternate with petals
Leaves opposite . . . *Rhizophoraceæ.*
Leaves alternate . . . *Hamamelidaceæ.*
b. Stipules absent
Placentas parietal
Flowers unisexual . . . *Cucurbitaceæ.*
Flowers hermaphrodite . . *Grossulaceæ.*
Placentas in the centre
Flowers in umbels; styles 2 . *Umbelliferæ.*
Flowers in umbels; styles 3 . *Araliaceæ.*
Flowers not in umbels
Carpels solitary
Petals strap-shaped; stamens distinct . . } *Alangiaceæ.* (*Nyssaceæ.*)
Petals very narrow; stamens growing on them . . } *Loranthaceæ.*
Petals oblong; leaves hispid
Cotyledons convolute . *Combretaceæ.*
Cotyledons flat . . . *Haloragaceæ.*
Petals oblong; leaves balsamic *Anacardiaceæ.*
Carpels divaricating
Leaves alternate: herbs . *Saxifragaceæ.*
Leaves opposite: shrubs . *Hydrangeaceæ.*
Carpels parallel, combined
Calyx valvate; petals opposite stamens . . . } *Rhamnaceæ.*
Calyx valvate; petals alternate with stamens
Albumen none . . *Onagraceæ.*
Albumen copious . *Cornaceæ.*
Calyx not valvate
Stamens doubled . . *Melastomaceæ.*
Stamens curved
Leaves dotted . . *Myrtaceæ.*
Leaves not dotted
Parts of flower 4
Ovules ascending. *Onagraceæ.*
Ovules pendulous. *Haloragaceæ.*
Parts of flower not 4; seeds many
Leafy . . . *Escallonaceæ.*
Scaly . . . *Monotropaceæ.*
Parts of flower not 4; seeds few . . } *Bruniaceæ.*
B. vary wholly superior
a. Leaves stipulate

- 1. Carpels distinct or solitary
  - Anthers with recurved valves. *Berberidaceæ.*
  - Anthers with longitudinal valves
    - Style from the base of the carpel . . . . *Chrysobalanaceæ.*
    - Style from apex of carpel; fruit a legume . . *Leguminosæ.*
    - Style from apex of carpel; fruit a drupe or capsule . *Rosaceæ.*
- 2. Carpels wholly combined
  - Placentas parietal
    - Flowers with appendages . *Passifloraceæ.*
    - Flowers without appendages
      - Leaves with round and oblong transparent dots *Sanydaceæ.*
      - Leaves dotless, circinate when young . *Droseraceæ.*
      - Leaves dotless, straight when young; fruit capsular . . . . *Violaceæ.*
      - Leaves dotless, straight when young; fruit siliquose. . . . *Moringaceæ.*
  - Placentas central
    - Styles distinct
      - Calyx in a broken whorl. *Elatinaceæ.*
      - Calyx in a complete whorl
        - Flowers unisexual . *Euphorbiaceæ.*
        - Flowers hermaphrodite
          - Petals minute . *Illecebraceæ.*
          - Petals large; stamens hypogynous; *Malpighiaceæ.*
          - Petals large; stamens perigynous; leaves opposite . *Cunoniaceæ.*
          - Petals large; stamens perigynous: leaves alternate . *Saxifragaceæ.*
        - Calyx valvate . . *Tiliaceæ.*
    - Styles more or less combined, gynobasic
      - Gynobase fleshy . . *Ochnaceæ.*
      - Gynobase dry; leaves opposite . . . *Zygophyllaceæ.*
      - Gynobase dry; leaves alternate
        - Fruit beaked . . *Geraniaceæ.*
        - Fruit not beaked . *Oxalidaceæ.*
    - Styles more or less combined, not gynobasic
      - Calyx in a broken whorl
        - Flowers spurred . . *Vochyaceæ.*
        - Flowers not spurred, calyculate . . *Chlænaceæ.*
        - Flowers not spurred, naked . . . *Sapindaceæ.*
      - Calyx in a complete whorl
        - Leaves compound; sepals more than 2 . *Staphyleaceæ.*
        - Leaves simple; sepals about 2 . . *Malpighiaceæ.*
        - Leaves simple; sepals 2. *Portulacaceæ.*
      - Calyx valvate or open
        - Stamens columnar . *Sterculiaceæ.*
        - Stamens not columnar
          - Stamens opposite petals
            - Perigynous . . *Rhamnaceæ.*
            - Hypogynous . . *Vitaceæ.*
          - Stamens alternate with petals
            - Anthers porous . *Tiliaceæ.*
            - Anthers slit; petals split . . *Chailletiaceæ.*
            - Anthers slit; petals undivided . *Amyridaceæ.*

b Stipules absent

- 1. Carpels distinct or solitary
  - Anther-valves recurved . *Berberidaceæ.*
  - Anther-valves longitudinal
    - Fruit a legume; radicle next hilum . . . . . . *Leguminosæ.*
    - Fruit a legume; radicle away from hilum . . . . *Connaraceæ.*
    - Fruit not leguminous
      - Carpels with 1 scale . . *Crassulaceæ.*
      - Carpels with 2 scales . . *Francoaceæ.*
      - Carpels without scales
        - Albumen abundant; embryo minute
          - Flowers unisexual . . *Lardizabalaceæ.*
          - Flowers hermaphrodite
            - Embryo in vitellus . *Cabombaceæ.*
            - Embryo naked
              - Albumen solid. . *Ranunculaceæ.*
              - Albumen ruminate . *Anonaceæ.*
        - Albumen small or none
          - Carpels several
            - Enclosed . . . *Calycanthaceæ.*
            - Naked . . . *Menispermaceæ.*
          - Carpels solitary
            - Leaves dotted . . *Amyridaceæ.*
            - Leaves dotless . . *Anacardiaceæ.*
- 2. Carpels divided into a solid pistil
  - Placentas parietal
    - Stamens tetradynamous . . *Cruciferæ.*
    - Stamens not tetradynamous
      - Flowers with sterile stamens
        - Stamens and pistils on distinct flowers
          - Pistil-flower crowned *Pangiaceæ.*
          - Pistil-flower not crowned . . *Papayaceæ.*
        - Stamens and pistils together; placentæ lining the fruit . . *Flacourtiaceæ.*
        - Stamens and pistils together; placentæ in rows . . . . *Malesherbiaceæ.*
      - Flowers without sterile stamens
        - Disk of flower large; stamens indefinite . *Capparidaceæ.*
        - Disk of flower large; stamens definite . . *Resedaceæ.*
        - Disk of flower small or none
          - Albumen large . . *Papaveraceæ.*
          - Albumen small
            - Calyx 5-leaved . *Turneraceæ.*
            - Calyx tubular . *Frankeniaceæ.*
  - Placentas covering dissepiments . *Nymphæaceæ.*
  - Placentas central
    - Styles distinct
      - Calyx valvate . . . *Vivianaceæ.*
      - Calyx in a broken whorl
        - Seeds hairy . . . *Reaumuriaceæ.*
        - Seeds smooth; stamens polyadelphous . . *Hypericaceæ.*
        - Seeds smooth; stamens monadelphous, or free *Linaceæ.*
      - Calyx in a complete whorl
        - Carpels with a scale . *Crassulaceæ.*
        - Carpels without scales
          - Carpels divaricating . *Saxifragaceæ.*
          - Carpels not divaricating *Caryophyllaceæ.*
    - Styles united, gynobasic
      - Stamens arising from scales . *Simarubaceæ.*
      - Stamens not arising from scales
        - Styles combined; flowers hermaphrodite . . *Rutaceæ.*
        - Styles combined; flowers unisexual . . *Xanthoxylaceæ.*
        - Styles divided; flowers irregular . . . *Balsaminaceæ.*
    - Styles united, not gynobasic
      - Calyx in a broken whorl
        - Flowers symmetrical . *Clusiaceæ.*
        - Flowers unsymmetrical
          - Flowers regular
            - Petals without appendages . *Aceraceæ.*
            - Petals with appendages . *Sapindaceæ.*
          - Flowers papilionaceous *Polygalaceæ.*
      - Calyx in a complete whorl

- Carpels 4 or more; anthers porous
  - Embryo in the axis *Ericaceæ.*
  - Embryo at the base *Pyrolaceæ.*
- Carpels 4 or more; anthers slit
  - Seeds winged
    - Leafy . . *Cedrelaceæ.*
    - Scaly . . . *Monotropaceæ.*
  - Seeds wingless
    - Stamens united . *Meliaceæ.*
    - Stamens free
      - Leaves dotted *Aurantiaceæ.*
      - Leaves dotless
        - Leafy . *Brexiaceæ.*
        - Scaly . *Monotropaceæ.*
- Carpels fewer than 4
  - Flowers unisexual . *Empetraceæ.*
  - Flowers hermaphrodite
    - Sepals 2 . . *Portulacaceæ.*
    - Sepals above 2
      - Stamens hypogynous
        - Seeds comose . *Tamaricaceæ.*
        - Seeds naked
          - Ovules ascending *Pittosporaceæ.*
          - Ovules pendulous . *Cyrillaceæ.*
      - Stamens perigynous
        - Ovules ascending. *Celastraceæ.*
        - Ovules suspended . *Bruniaceæ.*
- Calyx valvate or open
  - Anthers porous . . *Tremandraceæ.*
  - Anthers slit
    - Stamens opposite petals *Rhamnaceæ.*
    - Stamens alternate to petals
      - Leaves pinnate . *Amyridaceæ.*
      - Leaves simple; calyx tubular; stamens hypogynous . . *Olacaceæ.*
      - Leaves simple; calyx tubular; stamens perigynous . . *Lythraceæ.*

Sub-Class, Monopetalæ. (Petals united into a Tube.)

I. Ovary superior.

- A. Flowers regular
  - *a.* 3- 4- 5-lobed
    - Leaves dotted . . . . . *Rutaceæ.*
    - Leaves dotless
      - Inflorescence gyrate . . *Boraginaceæ.*
      - Inflorescence straight
        - Corolla plaited in æstivation *Nolanaceæ.*
        - Corolla flat in æstivation . *Stackhousiaceæ.*
  - *b.* Ovary not lobed
    - Carpels 4 or 5, or none
      - Anthers porous
        - Seeds winged . . . *Pyrolaceæ.*
        - Seeds wingless
          - Anthers biporous . . *Ericaceæ.*
          - Anthers uniporous . . *Epacridaceæ.*
      - Anthers slit
        - Stamens opposite petals
          - Shrubs . . . . . *Myrsinaceæ.*
          - Herbs . . . . . *Primulaceæ.*
        - Stamens not opposite petals
          - Seeds numerous
            - Carpels distinct . . *Crassulaceæ.*
            - Carpels combined . . *Monotropaceæ.*
          - Seeds few
            - Carpels distinct . . *Anonaceæ.*
            - Carpels combined
              - Ovules erect
                - Æstivation imbricate *Sapotaceæ.*
                - Æstivation plicate . *Convolvulaceæ.*
              - Ovules pendulous
                - Number of stamens same as petals. . *Aquifoliaceæ.*
                - Number of stamens double petals . . *Ebenaceæ.*
    - Carpels usually 3
      - Inflorescence gyrate . . . . *Hydrophyllaceæ.*
      - Inflorescence straight
        - Flowers unisexual . . . *Papayaceæ.*
        - Flowers hermaphrodite
          - An hypogynous disk . . *Polemoniaceæ.*
          - No hypogynous disk . . *Diapensiaceæ.*
    - Carpels 2
      - Stamens 2
        - Corolla valvate . . . . *Oleaceæ.*
        - Corolla imbricate . . . *Jasminaceæ.*
      - Stamens 4
        - Inflorescence gyrate
          - Fruit 1-celled . . . *Hydrophylla*
          - Fruit 2-celled
            - Style bifid . . . . *Ehretiaceæ.*
            - Style dichotomous . . *Cordiaceæ.*
        - Inflorescence straight
          - Calyx in a broken whorl
            - Leafy . . . . . . *Convolvulaceæ.*
            - Scaly . . . . . *Cuscutaceæ.*
          - Calyx in a complete whorl
            - Flowers symmetrical
              - Carpels ︵︶ . . . *Solanaceæ.*
              - Carpels ()
                - Anthers and stigma united . *Asclepiadaceæ*
                - Anthers and stigma separate
                  - Corolla imbricate . *Gentianaceæ.*
                  - Corolla valvate *Loganiaceæ.*
                  - Corolla contorted . *Apocynaceæ.*
            - Flowers unsymmetrical
              - Stipules . . . . *Loganiaceæ.*
              - No stipules . . . *Stilbaceæ.*
    - Carpel single
      - Stigma simple
        - Style 1
          - Fruit spuriously 2-celled . *Plantaginaceæ.*
          - Fruit 1-celled; seed 1 . *Salvadoraceæ.*
        - Styles 5 . . . . . *Plumbaginaceæ.*
      - Stigma indusiate . . . . *Brunoniaceæ.*
- B. Flowers irregular
  - *a.* Ovary 4-lobed . . . . *Lamiaceæ.* (*Labiatæ.*)
  - *b.* Ovary undivided
    - Carpel solitary . . . . . *Selaginaceæ.*
    - Carpels 2
      - Fruits capsular or succulent
        - Placentas parietal
          - Seeds amygdaloid
            - Fruit succulent, many-seeded. *Crescentiaceæ.*
            - Fruit bony, few-seeded . *Pedaliaceæ.*
          - Seeds not amygdaloid
            - Leafy
              - Seeds winged . . *Bignoniaceæ.*
              - Seeds wingless . *Gesneraceæ.*
            - Scaly . . . . *Orobanchaceæ.*
        - Placentas in centre
          - Albumen large . . *Scrophulariaceæ.*
          - Albumen none
            - Seeds winged . . *Bignoniaceæ.*
            - Seeds wingless . *Acanthaceæ.*
        - Placentas free, central . . *Lentibulariaceæ.*
      - Fruit nucamentaceous, 2-celled
        - Anthers 1-celled . . *Selaginaceæ.*
        - Anthers 2-celled . . . *Stilbaceæ.*
      - Fruit nucamentaceous, 4-celled
        - Radicle inferior . . . *Verbenaceæ.*
        - Radicle superior . . . *Myoporaceæ.*

II. Ovary inferior.

- A. Carpel single
  - Anthers united

Ovule pendulous	*Calyceraceæ.*
Ovule erect	*Compositæ.*
Anthers free	
Carpel 1	*Dipsaceæ.*
Carpels 3, 2 abortive	*Valerianaceæ.*
B. Carpels more than 1	
Anthers united	*Lobeliaceæ.*
Anthers free	
Stamens 2	*Columelliaceæ.*
Stamens more than 2	
Anthers porous	*Vacciniaceæ.*
Anthers slit	
Stigma naked	
Stamens 4, 5	*Campanulaceæ.*
Stamens numerous	*Belvisiaceæ.*
Anthers and stigmas united	*Stylidiaceæ.*
Stigma indusiate	*Goodeniaceæ.*
Stigma simple	
Stipules	*Cinchonaceæ.*
Without stipules	
Leaves opposite	
Stem square	*Galiaceæ.*
Stem round	*Caprifoliaceæ.*

Sub-Class, Apetalæ, or Incompletæ. (Without Petals, sometimes without Calyx.)

I. Without a Calyx (Achlamydeæ).

A. Stipules present	
Ovules numerous	*Balsamifluæ.*
Seeds winged	*Salicaceæ.*
Seeds comose	
Ovules solitary or very few	
Flowers with stamens and pistils	
Stamens unilateral	*Chloranthaceæ.*
Stamens whorled	*Saururaceæ.*
Flowers unisexual	
Carpel solitary; ovules erect	*Myricaceæ.*
Carpel solitary; ovules pendulous	*Platanaceæ.*
Carpels tricoccous	*Euphorbiaceæ.*
B. Stipules absent	
Ovules very numerous	*Podostemaceæ.*
Ovules single or few	
Flowers hermaphrodite	
Embryo in vitellus	*Piperaceæ.*
Embryo without vitellus	*Oleaceæ.*
Flowers unisexual	
Flowers naked; carpel single	*Myricaceæ.*
Flowers naked; carpel double	*Callitrichaceæ.*
Flowers covered; anther-valves recurved	*Atherospermaceæ.* (*Calycanthaceæ.*)
Flowers covered; anther-valves slit	*Monimiaceæ.*

II. Calyx present (Monochlamydæ).

A. Ovary inferior	
a. Stipules present	
Flowers with stamens and pistils	*Aristolochiaceæ.*
Flowers unisexual; fruit in a cup	*Corylaceæ.*
Flowers unisexual; fruit naked	
Many-seeded	*Begoniaceæ.*
1-seeded	*Artocarpaceæ.*
b. Stipules absent	
Flowers unisexual, in catkins	
Leaves simple, alternate	*Myricaceæ.*
Leaves simple, opposite	*Garryaceæ.*
Leaves compound	*Juglandaceæ.*
Flowers unisexual, not in catkins	
Seeds in a pulp	*Cucurbitaceæ.*
Seeds dry	
Numerous	*Datiscaceæ.*
Solitary	*Helwingiaceæ.*
Flowers hermaphrodite	
Leaves dotted	*Myrtaceæ.*
Leaves not dotted	
Ovary 3-6-celled	*Aristolochiaceæ.*
Ovary 1-celled	
Embryo straight; cotyledons convoluted	*Combretaceæ.*
Embryo straight; cotyledons flat	
Albumen absent	*Haloragaceæ.*
Albumen fleshy	*Santalaceæ.*
Embryo curved	*Chenopodiaceæ.*
Ovary 1-celled; anthers many-celled	*Loranthaceæ.*
Ovary more than 1, but not 3 or 6-celled	
Embryo straight	*Haloragaceæ.*
Embryo curved	*Tetragoniaceæ.*
B. Ovary superior	
a. Stipules absent	
Flowers hermaphrodite	
Sepals 2	*Portulacaceæ.*
Sepals more than 2	
Carpels several, united	
Placentas parietal, in lines	*Papaveraceæ.*
Placentas parietal, diffused	*Flacourtiaceæ.*
Placentas in centre	
Ovules few	
Calyx short, with a gynobase	*Rutaceæ.*
Calyx short, no gynobase	
Embryo curved	*Phytolaccaceæ.*
Embryo straight	*Celastraceæ.*
Calyx tubular	*Penæaceæ.*
Ovules numerous	
Carpels 2, divaricating	*Saxifragaceæ.*
Carpels not divaricating; stamens hypogynous	
Leaves opposite	*Caryophyllaceæ.*
Leaves alternate	*Podostemaceæ.*
Carpels not divaricating; stamens perigynous	
Fruit 1-celled	*Primulaceæ.*
Fruit many-celled	*Lythraceæ.*
Carpels solitary or separate	
Carpels several	*Ranunculaceæ.*
Carpel single	
Anther-valves recurved, leafy	*Lauraceæ.*
Anther-valves recurved, scaly	*Cassythaceæ.*
Anther-valves slit	
Fruit a legume	*Leguminosæ.*
Fruit not a legume	
Calyx long or tubular	
Base hardened	*Nyctaginaceæ.*
Tube hardened	*Scleranthaceæ.*
Not hardened	
Stamens embedded in sepals	*Proteaceæ.*
Stamens not so	
Ovules erect	*Elæagnaceæ.*
Ovules pendulous	
Fruit 2-valved	*Aquilariaceæ.*
Fruit indehiscent	*Thymelaceæ.*
Calyx short	
Leaves with scales	*Elæagnaceæ.*
Leaves dotted	*Amyridaceæ.*
Leaves smooth	
Flowers in involucels	*Polygonaceæ.*
Flowers naked	
Calyx dry	*Amarantaceæ.*
Calyx herbaceous	
Stamens hypogynous	*Chenopodiaceæ.*
Stamens perigynous	*Basellaceæ.* (*Chenopodiaceæ.*)
Flowers unisexual	
Carpels several, united	
Ovules numerous	
Stamens columnar	*Nepenthaceæ.*
Ovules few	
Leaves alternate	
Dotted	*Xanthoxylaceæ.*
Not dotted	*Euphorbiaceæ.*
Carpel solitary	
Calyx tubular	*Myristicaceæ.*
Calyx open	
Carpels several	*Menispermaceæ.*
Carpel solitary	

- Embryo straight . . *Casuarinaceæ.*
- Embryo curved . . *Chenopodiaceæ.*
- *b.* Stipules present
  - Flowers hermaphrodite
    - Sepals 2 . . . . *Portulacaceæ.*
    - Sepals more than 2
      - Carpels several, united
        - Stamens hypogynous
          - Placentas parietal . *Flacourtiaceæ.*
          - Placentas central
            - Calyx valvate; stamens monadelphous
              - Partly sterile . *Byttneriaceæ.*
              - All fertile . . *Sterculiaceæ.*
            - Calyx valvate; stamens distinct . } *Tiliaceæ.*
            - Calyx imbricated
              - Fruit beaked . *Geraniaceæ.*
              - Not beaked . *Malpighiaceæ.*
        - Stamens perigynous
          - Placentas parietal . . *Passifloraceæ.*
          - Placentas central
            - Leaves opposite . *Cunoniaceæ.*
            - Leaves alternate
              - Stamens alternate to sepals . . } *Rhamnaceæ.*
                - Calyx membranous . } *Ulmaceæ.*
      - Carpels solitary or separate
        - Calyx membranous . . *Illecebraceæ.*
        - Calyx herbaceous
          - Styles basal . . *Chrysobalanaceæ.*
          - Styles terminal, 1 to an ovary
            - Fruit a legume . *Leguminosæ.*
            - Fruit not a legume *Sanguisorbaceæ.*
          - Styles terminal, 3 to an ovary
            - Stipules ochreate . *Polygonaceæ.*
            - Stipules simple . *Phytolaccaceæ.*
  - Flowers unisexual
    - Carpels several, united
      - Flowers in catkins
        - Aril present . . . *Scepaceæ.*
        - No aril . . . *Betulaceæ.*
          - Seeds numerous . . *Lacistemaceæ.*
      - Flowers not in catkins . *Euphorbiaceæ.*
    - Carpel solitary
      - Cells of anthers perpendicular to filament . . } *Stilaginaceæ.*
      - Cells of anthers parallel to filament.
        - Embryo straight
          - Albumen present . *Urticaceæ.*
          - No albumen . . *Artocarpaceæ.*
        - Embryo hooked
          - Albumen present . *Moraceæ.*
          - Albumen none . *Cannabinaceæ.*

Sub-Class, DICTYOGENS (Lindley).

- Ovary inferior . . . . *Dioscoreaceæ.*
- Ovary superior
  - Carpels distinct . . . . *Triuridaceæ.*
  - Carpels united
  - Placentas central
    - Flowers 6-petalled . . *Smilaceæ.*
    - Flowers 3-petalled . . . *Trilliaceæ.*
  - Placentas below . . . *Roxburghiaceæ.*
- Placentas on the sides . . . *Philesiaceæ.*

Sub-Class, GYMNOGENS (Lindley).

- Stem jointed . . . . *Gnetaceæ.*
- Stem continuous
  - Leaves pinnate . . . . *Cycadaceæ.*
  - Leaves simple
    - Ovules in cones . . . { *Pinaceæ.* (*Coniferæ.*)
    - Ovules solitary . . . *Taxaceæ.*

Class, ENDOGENS.

1. Flowers complete (having distinct Floral Envelopes).

- A. Ovary inferior
  - Flowers gynandrous . . . *Orchidaceæ.*
  - Flowers not gynandrous
    - Veins of leaves diverging from the midrib
      - Anther 1, with 1 cell . . *Marantaceæ.*
      - Anther 1, with 2 cells . . *Zingiberaceæ.*
      - Anthers 5 or 6 . . . *Musaceæ.*
    - Veins of leaves parallel with midribs
      - Stamens 3
        - Anthers turned outwards . *Iridaceæ.*
        - Anthers turned inwards . *Burmanniaceæ.*
      - Stamens 6
        - Leaves flat
          - Fruit 3-celled; sepals corolla-like.
            - Radicle remote from hilum *Hypoxidaceæ.*
            - Radicle next hilum . *Amaryllidaceæ.*
          - Fruit 3-celled; sepals calycine . . . *Bromeliaceæ.*
          - Fruit 1-celled . . . *Taccaceæ.*
        - Leaves equitant . . *Hæmodoraceæ.*
      - Stamens more than 6 . *Hydrocharace*
- B. Ovary superior
  - Sepals calyx-like or glumaceous
    - Carpels separate, more or less
      - Placentas diffused . . *Butomaceæ.*
      - Placentas narrow . . . *Alismaceæ.*
    - Carpels in a solid pistil
      - Petals distinct from calyx
        - Placentas central . . *Commelinaceæ.*
        - Placentas parietal . . *Mayaceæ.*
      - Petals not distinct from calyx
        - Flowers scattered . . *Juncaceæ.*
        - Flowers spadicose . . . *Orontiaceæ.*
  - Sepals corolla-like
    - Carpels more or less separate
      - Seed solitary . . . *Palmaceæ.*
      - Seeds numerous
        - Anthers turned outwards . *Melanthaceæ.*
        - Anthers turned inwards
          - Parts of flower 6 . . *Butomaceæ.*
          - Parts of flower 2 *Philydraceæ.*
    - Carpels combined
      - Petals rolled inwards . . *Pontederaceæ*
      - Petals not rolled inwards
        - Flowers with appendages . *Gilliesiaceæ.*
        - Flowers without appendages . *Liliaceæ.*

II. Flowers incomplete (Floral Envelopes not distinct

- A. Flowers in glumes
  - Stems hollow . . . *Graminaceæ.*
  - Stems solid
    - Carpel solitary; seed erect . *Cyperaceæ.*
    - Carpel solitary; seed pendulous . *Restiaceæ.*
    - Carpels several, distinct
      - Glumes only . . . *Desvauxiaceæ.*
      - Cup within glumes . . . *Eriocaulaceæ.*
    - Carpels several, combined
      - Placentas parietal . . . *Xyridaceæ.*
      - Placentas central . . . . *Restiaceæ.*
- B. Flowers, or with a few verticillate leaves
  - *a.* Flowers on a spadix
    - Fruit a drupe . . . . *Pandanaceæ.*
    - Fruit berried; leaves in bud, convolute . . . . *Araceæ.*
    - Fruit dry; anthers clavate, on weak filaments . . . } *Typhaceæ.*
  - *b.* Flowers not on a spadix
    - Aquatic, with pendulous ovules
      - Pollen globose . . . . *Naiadaceæ.*
      - Pollen confervoid . . . *Zosteraceæ.*
    - Terrestrial; ovules erect . . *Juncaginaceæ*
    - Aquatic; ovules erect . . *Pistiaceæ.*

Sub-Class RHIZOGENS (Rhizanthæ).

- Ovules indefinite
  - Anthers opening by slits . . . *Cytinaceæ.*
  - Anthers bursting by pores . . . *Rafflesiaceæ.*
- Ovules solitary . . . . . *Balanophoraceæ.*

Class, ACROGENS.

I. With Stems.

- A. No distinct axis of growth
  - Spores without elaters . . . *Ricciaceæ.*
  - Spores with elaters

Spore-case with valves	*Jungermanniaceæ.*
Spore-case valveless	*Marchantiaceæ.*
β. A distinct axis of growth	
Spores with elaters	
Spore-case with valves	*Jungermanniaceæ.*
Spore-case in cones	*Equisetaceæ.*
Spores without elaters	
Spore-case on fronds	
Ringed	*Polypodiaceæ.*
Ringless	*Danæaceæ.*
Spore-case on edge of frond	*Ophioglossaceæ.*
Spore-case in an involucre	*Marsileaceæ.*
Spore-case naked	
Sessile in the axil of frond	*Lycopodiaceæ.*
Stalked	
Valves	*Andræaceæ.* (*Musci.*)
Without valves	*Bryaceæ* (*Musci.*)

II. Without Stems.

Mycelium present	
Spores in fours	
Hymenium naked	*Agaricaceæ.* (*Fungi*)
Hymenium inclosed	*Lycoperdaceæ.*
Spore-case single	
Sporules naked	
Thallus obsolete	*Uredinaceæ.*
Thallus floccose	*Botrytaceæ.*
Sporules inclosed	
In asci	*Helvellaceæ.*
In a veil	*Mucoraceæ.*
Mycelium absent	
Aquatic	
Crystalline	*Diatomaceæ.*
Cellular or membranous	
Fresh-water chiefly	
Multiplied by zoospores	*Confervaceæ.*
Multiplied by spiral nucules	*Characeæ.*
Salt water	
Multiplied by simple spores	*Fucaceæ.*
Multiplied by tetraspores.	*Ceramiaceæ.*
Terrestrial	
Spores naked	*Graphidaceæ.*
Spores in asci	
Thallus gelatinous	*Collemaceæ.*
Thallus pulverulent	*Parmeliaceæ.*

It will be seen that many of the orders are repeated in this analysis under different divisions; and this arises from the fact that this analysis is artificial, and only expresses the general characters of each order. Besides this, in the strongest orders, exceptions to some very general points of structure frequently occur. Thus we have apetalous and irregular-flowered plants in the polypetalous regular-flowered order *Ranunculaceæ*. With a little practice such an analysis as the foregoing will enable any one acquainted with the structure of plants to refer any particular plant to its right order, and on turning to the order in the alphabetical part of this work he will find a detailed account of its structure and properties.

BOTAURUS. [BITTERN.]

BOTTLE-GOURD. [LAGENARIA, *S.* 1.]

BOULDERS. Of the materials of which superficial deposits of the debris of ancient rocks are composed, some are of large size, and have been called Boulders or Erratic Blocks. The portions of smaller size are called Gravel. Boulders are generally found not far from the rocks from which they have been broken, whilst gravel is carried to a great distance. Instances, however, are not wanting in which boulders have been transported an immense distance. They have been transported from Norway and Sweden to the plains of Germany, and from the mountains of Scotland and Cumberland to the centre and south of England. So large are some of these boulders, and the obstacles such as intervening hills, valleys, and seas so great, that the mode of their transportation can be accounted for in no other way than by supposing that they have been floated across them in masses of ice, which as they have melted have dropped them in the places where they are now found when those places were at the bottom of a sea. The largest boulders seem to have drifted in all cases from northern and southern points towards the warmer districts in the temperate and tropical parts of the earth.

BOURMONT, LOUIS AUGUSTE VICTOR DE CHAISNE, MARSHAL COUNT DE, was born at Paris, or, according to other accounts, at the castle of Bourmount, in Anjou, in the year 1773. Having entered the army in 1788, at the age of fifteen, he served as an officer in the Royal French Guards until 1790, when he emigrated, and joined the army of the Prince de Condé. His sanguine disposition and earnest character recommended him so strongly to the emigrant leader, that he was immediately employed in fomenting the insurrection of the western provinces. In October 1793, he was despatched by the Prince to the head-quarters of the Viscount de Scépeaux, under whose orders he commanded one of the corps of the Vendean troops, and was promoted to the rank of major-general. At this time he was only in his 21st year.

In December 1793 he was sent to England to endeavour to prevail on the British government to assist the Bourbon cause, but his mission proved abortive. He had the satisfaction, however, of seeing the Count d'Artois, afterwards Charles X., who received him in the most cordial manner, knighted him, and authorised him to confer the same honour on other loyal gentlemen adhering to the monarchical interests, and more particularly on the Viscount de Scépeaux. He paid a second visit to England in 1796, exhibiting the greatest zeal in animating the French emigrants against the republic, and in collecting all the elements of civil war. Soon after he returned to France to share the perils of a new insurrection of the Vendeans, and commanded a division of the Chouans in 1799. On the 16th of October of the same year he forced his way into Le-Mans, the chief place in the department of Sarthe, committing, it is asserted, great cruelties, pillaging the inhabitants of nearly a million of francs, burning the post-office, the public records, and the library in the Hôtel-de-Ville.

About the period of the 18th Brumaire, when M. de Chatillon and other insurgent leaders found it necessary to submit to the consular government, the Count de Bourmont followed their example. He strove to induce Georges Cadoudal to do the same: but that inflexible chief, far from complying, evinced his disgust at the proposal in 1801, by ordering Bourmont's brother-in-law to be shot. The active mind of the young soldier indisposed him to a life of ease; he therefore offered his services to Bonaparte, and appears to have exhibited more eagerness than discretion in so doing. The ever-vigilant Fouché suspected his zeal; he caused the Count to be strictly watched. and, having discovered what he considered sufficient proof of intended treachery, he sent him a prisoner to the Temple, Paris, in 1803. From this prison he was transferred to the citadel of Dijon, and thence to that of Besançon. Having escaped from this last place of confinement, he went to Portugal, where he remained five years. The French army having become masters of that country in 1810, Bourmont made interest with the victorious general, was included in the capitulation, and returned to France with the army. He now submitted fully to the imperial government of Napoleon, and was offered the brevet of colonel, which he accepted. It must be observed, however, that in the vindication of his career, published in 1840 by his son, it is stated that when the Count made his submission he was at Nantes in France, and that he was allowed his liberty on condition of taking service in the army of Napoleon. His son goes so far as to assert that, in 1800, the First Consul offered him the post of lieutenant-general, which he declined.

From 1810 to 1814, Bourmont continued faithful to his new master; distinguished himself in several battles, especially at that of Nogent; and received no less than ten wounds, four of which were sabre cuts on the head. For this conduct he was rewarded with the rank of brigadier-general in 1813, and made a lieutenant-general the following year. When the fall of Napoleon tested the character of so many generals and marshals, Bourmont only followed the example of an almost universal defection. He did not betray Louis XVIII. in the spring of 1815; but offered him the use of his sword on the very eve of his departure from the Tuileries. After the flight of the King, he did not refuse to take service a second time under the powerful man, a single word from whom would have consigned his family to ruin. But he could not brook the despotism manifested in the Acte Additionnel, and tendered his resignation to the Emperor in consequence of it. Receiving no answer, he left the French army on the 15th June, 1815, after fully communicating his design to his successor, General Hulat, to whom he likewise explained every requisite detail of the service. Marshal Gerard, under whom he commanded a division during the campaign, and General Hulat, have, since then, exonerated Count de Bourmont from all imputation of treachery; whilst Napoleon, in his account of the battle of Waterloo, does not even accuse him.

After his second restoration, Louis XVIII. gave Count de Bourmont the command of a division, in the infantry of his Guards; and in this rank he served in the campaign of 1823, under the Duke of Angoulême in Spain; and on the return of the Duke to France, he appointed Bourmont to the command of the army of occupation. In 1829 the portfolio of the ministry of war was offered to him by Prince Polignac; but the Count declined the offer several times, recommended other generals in preference to himself, and was only persuaded to take office by the earnest request of the King. In 1830 the great expedition to Algiers was resolved upon, and the command of an army of 37,000 troops was conferred upon Bourmont. We have not space to follow his Algerine career. But it must be noted as somewhat remarkable that the man, who, in a few weeks, obtained for France this large and valuable colony,—the principal conquest she has retained during the present century,—should have been the object of so much aversion. The revolution of July added further bitterness to that dislike, and after Bourmont had been superseded in his command on the 2nd of September, by General Clauzel, a charge was brought against the deposed leader of having appropriated to his own use the treasures found in one of the captured towns. One of his sons had fallen in the campaign, and the custom-house officer at Marseille, after the landing of Bourmont, carried his zeal to such an excess, as to examine the corpse in search for the hidden gold. The Count bore this outrage patiently, but the Countess de Bourmont received so great a shock, that she never rallied afterwards.

From the year 1830 Marshal de Bourmont lived in exile; residing at various times in England, Holland, Germany, and other countries. He was at length allowed to return to France by Louis Philippe, and in 1840 he took up his abode with his family at the castle of Bourmont. Here he continued to reside in the greatest retirement until the day of his death, which occurred on the 27th of October 1846, at the age of 73. In France Bourmont is, of all the republican and imperial generals upon whom the charge of treason has been affixed, the most unpopular. Neither Moreau nor Pichegru, neither Bernadotte nor Marmont, has been so furiously pursued with the public odium. Grouchy himself is only his second in obloquy. After a careful examination of their real conduct, and due allowance being made for the circumstances of the time, it would not require an unusual stress of charity to remove much of the opprobium which now attaches to many of these great military names. But the time to do it effectually is not yet come; and public opinion must be respected even where most it appears to err.

(*Biographie des Contemporains;* Alison, *History of Europe;* Sarrut *et* Saint Edme, *Notice;* Feller, *Dictionnaire Historique.*)

BOURNE, HUGH, the founder of the Primitive Methodist Connexion, was born April 3rd, 1772, in the neighbourhood of Stoke-upon-Trent, in Staffordshire. He was brought up in the Wesleyan Methodist communion, and became an active and zealous preacher of that body. His zeal appears to have carried him beyond the bounds allowed by the leaders of the Wesleyan Conference, for when he was about thirty years of age he associated himself with William Clowes and some other preachers of the Wesleyan body in reviving open-air religious services and camp meetings, or great gatherings for preaching and public worship. These proceedings, although common enough in the early days of Methodism, and carried to very great lengths in America, were discountenanced by the Conference, which in 1807 passed a resolution to the following effect:—"It is our judgment that even supposing such meetings (camp meetings) to be allowed in America, they are highly improper in England, and likely to be productive of considerable mischief, and we disclaim all connection with them." This led to Mr. Bourne's separation from the Wesleyan Conference, and the establishment of the Primitive Methodist connexion, the first class (or local society) of which was formed at Standley, in Staffordshire, in 1810. This body, which in 1811 had two preachers and about 200 members, had increased in 1821 to 202 travelling and 1435 local preachers, and 7842 members. In 1853 the connexion numbered 1789 chapels and 3565 rented rooms, with 568 paid travelling preachers, and 9594 local preachers. The members at the same time had reached 108,926. The difference between the Primitive Methodists and the Wesleyan Methodists consists chiefly in the free admission of laymen to the conference of the former body.

Mr. Bourne, after he had organised the society in England, in which he was assisted by William Clowes, who had likewise been dismissed for similar irregularities from the Wesleyan body, made journeys in Scotland and Ireland for the purpose of forming religious societies in connection with his new organisation. In 1844 he visited the United States of America, where his preaching attracted large congregations. Mr. Bourne lived to fourscore years of age, and was much revered by the members of the Connexion. From his youth he was a rigid abstainer from intoxicating drinks, in which respect many of the preachers and members of the Primitive Methodist Connexion have followed his example. He died at Bemersley, in Staffordshire, October 11, 1852.

BOWERBANKIA, a genus of Ascidioid Polypes, or *Polyzoa*, belonging to the family *Vesiculariadæ.* It was named by Dr. Farre in honour of Mr. J. S. Bowerbank. The following character is given by Dr. Johnston in his 'British Zoophytes:'—Polypidom confervoid, matted or irregularly branched; the cells sessile, unilateral, irregular; the inflected portion with a spinous or filamentous rim. The polypes ascidian, with ten ciliated tentacula, and a strong gizzard. There is but one British species, *B. imbricata.* It has ovate or ovato-cylindrical cells, which are irregularly scattered on the polypidom in dense clusters. In its young state the polypidom is creeping and matted; but as it arrives at maturity it becomes arbuscular and erect. From this circumstance several names have been given to this species. It is found growing on the *Fuci* and corallines which are exposed at low water, and very generally distributed on the British coast. It grows in profusion on the chains of the steam-ferries at Southamptom and Portsmouth. (Johnston, *British Zoophytes.*)

BOWLES, REV. WILLIAM LISLE, a man of some importance as an English poet, but of still greater importance from the peculiar position he occupied in the history of English poetry, was born at King's Sutton, on the borders of Northamptonshire, on the 24th of September, 1762. His father was vicar of the parish in which he was born: his grandfather, Dr. Bowles, also a clergyman in the same neighbourhood, was of a Wiltshire family. His mother was one of the daughters of the Rev. Dr. Richard Grey, author of 'Memoria Technica,' and other works. When the boy was seven years old, his father was appointed to the living of Uphill in Somersetshire; and one of his earliest recollections was the journey of the whole family, consisting of the vicar, his wife, and seven children, with two maid-servants, in two lumbering chaises, preceded by a rustic in livery, on their way far westward to the new parish. In 1776, at the age of fourteen, he was sent to Winchester school, where his master was Dr. Joseph Warton. He was one of Warton's favourite pupils, and he himself expressed his obligations to Warton for the kindly care with which he instructed him in the principles of literary taste and criticism. It was probably on the recommendation of Joseph Warton that, on leaving Winchester School in 1782, after rising to be senior boy, Bowles chose Trinity College, Oxford, as the place of his farther education. Thomas Warton, Joseph's more distinguished brother, was then senior fellow of that college. Among his contemporaries at Trinity College, he seems to have taken a high place; gaining, among other honours, the prize for the chancellor's Latin poem in 1783. On quitting college, in 1787, at the age of twenty-five, he looked forward to some "independent provision in the church," which would enable him to marry a young lady to whom he was much attached. Dr. Moore, Archbishop of Canterbury, had been indebted, when a poor curate, to his maternal grandfather, Dr. Grey; and the young clergyman was led in consequence to expect some preferment from that prelate. None came however; and "worldly circumstances interfering," the engagement with the young lady was broken off. A second engagement also came to a melancholy close by the death of the young lady. After it had been determined not to wait any longer for "episcopal or archiepiscopal patronage," in great depression of spirits, Bowles made a tour through the north of England, Scotland, and some parts of the continent; and it was during this tour that he composed the 'Sonnets' which first made him known as a poet. The 'Sonnets' were intended for his own solace, and were not even committed to paper; but in 1789, when he had been some time back in England, it occurred to him, as he was passing through Bath on his way to Oxford, to write out as many of them as he could remember, correct them, and have them printed. Accordingly, he got Mr. Cruttwell, printer of a Bath newspaper, to strike off a hundred copies 4to, under the title of 'Fourteen Sonnets, written chiefly on Picturesque Spots during a Journey.' The expense of this modest publication was 5*l*. About six months after the publication he received a letter from Mr. Cruttwell, informing him that the 100 copies were all sold, and that he could have sold 500. Much encouraged (his father was just dead, and his mother was in somewhat reduced circumstances), he printed a second edition of 500, adding some new sonnets; and some time afterwards a third edition of 750 was called for.

It is curious now, looking back, to think that, in a year like 1789, when France was in the throes of revolution, the publication from a provincial press of 'Fourteen Sonnets,' by a young clergyman disappointed in love, should have been an event of any consequence in England; and yet so it was. A new literary spirit, and new notions of poetry, were beginning to be abroad; and young men were craving for something fresh and natural, even if but feeble, after the strong and fine artificialities, as they are called, of Dryden, Pope, and their followers. Bowles's sonnets came at the proper moment. Other young men of promise had already attempted, or were attempting poems in a new vein; but, both as the pupil of the Wartons and by reason of his natural susceptibility, Bowles was fitted to take the lead. His sonnets were read and read again by all academic young men of taste and poetical aspiration, including Coleridge, Wordsworth, Southey, and Lovell. "I had just entered on my seventeenth year," says Coleridge, when the sonnets of Mr. Bowles, twenty-one in number [this was the second edition], and just then published in a quarto pamphlet, were first made known and presented to me by a school-fellow who had quitted us [that is, Christ's Hospital] for the university. As my school finances did not permit me to purchase copies, I made, within less than a year and a half, more than forty transcriptions, as the best presents I could offer to those who had in any way won my regard. And with almost equal delight did I receive the three or four following publications of the same author." These "three or four following publications" of Bowles were short copies of verses on occasional subjects, published separately at Bath or Salisbury in 1789, 1790, and 1791. Thus in 1789 were published 'Verses to John Howard on his "State of Prisons and Lazarettos;"' and in 1790 verses 'On the grave of Howard.' In these, although not so conspicuously as in the 'Sonnets,' a tender and true spirit of poetry was visible, while the diction was far less artificial than had till that time been usual in poems. In short, though the revolution in British poetry had already broken forth in Cowper and Burns, and though it was to be completed in Wordsworth and Coleridge, Bowles's 'Sonnets' and other pieces, published in 1789 and the following years, were perhaps the first conscious insinuation of the new principles. Wordsworth and Coleridge soon proclaimed and illustrated them with greater power of genius; but all their lives these poets kept up a kind of dutiful allegiance to Bowles as their titular patriarch.

Hardly foreseeing all this, Bowles left Oxford finally in 1792, having taken his degree, and devoted himself to the duties of his profession. From an humble curacy in Wilts, which was his first appointment, he was transferred first to a living in the same county, and afterwards to another in Gloucestershire. In 1797 he married a daughter of the Rev. Dr. Wake, prebendary of Westminster. In 1803 he obtained a vacant prebend in the cathedral church of Salisbury; and in 1805 the long-expected patronage of Archbishop Moore at last visited him in the shape of a preferment to the valuable living of Bremhill in Wiltshire. Bowles was then forty-three years of age; but he continued to reside in his picturesque and elegant parsonage of Bremhill almost continually during the remaining forty-five years of his long life, discharging the duties of his parish in such a manner as to win the affection of his parishioners, varying his theological readings and his ecclesiastical business with continued exercises in literature, receiving visits from his friends, and happy in what he considered "the inestimable advantage of the social intercourse of such a family as that of Bowood" (Lord Lansdowne's). Subsequent ecclesiastical preferments, which did not interfere with the quiet tenor of his life as rector of Bremhill, were, his appointment in 1818, to be chaplain to the prince regent, and his appointment in 1828 to be canon of Salisbury cathedral.

Till 1804, Bowles was contented with issuing fresh editions of his 'Sonnets' and early poems (an eighth edition of the 'Sonnets' appeared in 1802), and with adding a few occasional pieces to the collection. In 1804 he published his longest poem, entitled 'The Spirit of Discovery,' in six books of blank verse; which was followed by his edition of Pope's works in 10 vols. in 1807. These two publications, together with his general fame as a writer of sonnets, were the ground for the well-known attack upon him in Byron's 'English Bards and Scotch Reviewers.' Notwithstanding Byron's onslaught, Bowles, like Coleridge and Wordsworth, retained his reputation, and went on republishing old and producing new poems. He and Byron met in a friendly way at Rogers's in 1812; and Byron in later life made amends for his satire by speaking of him with respect. Omitting minor productions, the following is a list of Bowles's poetical publications subsequent to the 'Spirit of Discovery:'—'The Missionary of the Andes,' in six books of heroic verse, published in 1815; 'the Grave of the Last Saxon, a Legend of the Battle of Hastings,' in six books, published in 1822; 'Days Departed, or Banwell Hill,' a descriptive didactive poem in blank verse, published in 1829; 'St. John in Patmos,' a blank verse poem of considerable length, first published anonymously in 1833; 'Scenes and Shadows of Days Departed,' a series of poems with a prose autobiographic introduction, published in 1837, in the author's seventy-sixth year; and the 'Village Verse-Book,' published in the same year, and consisting of simple hymns composed by him for the use of the children of his parish. After 1837 Bowles did not publish much. Nor had any of his poems since 'The Missionary,' which is considered on the whole the best of his large works, greatly added to his reputation. In all of them were discerned the same free taste, the same sensibility to the gentler beauties of nature, the same pathos, the same poetic fancy, and the same power of cultured expression which had distinguished his first sonnets; but it was felt on the whole that he was a kind of feebler Wordsworth, whose poetry, so long as he chose to write any, was rather to be received with respect and dipped into at leisure than eagerly read and appreciated.

But the whole virtue of Bowles's life did not lie in his poems. He was also a very busy prose-writer. If the list of his prose-writings is classified, it will be found to prove considerable versatility on the part of the author.

The 'Pope and Bowles Controversy,' which lasted from 1819 to 1828, if indeed it may not date from 1807, when Bowles's edition of Pope was published, has a permanent interest in our literary history. It was the battle, fought in prose, between the old or eighteenth century school of English poetry and the so-called new or nineteenth century school. Bowles, while doing justice as he thought to Pope's true excellences, had made some reflections on his moral character, tending to depreciate it; and had also, in an appended essay 'On the Poetical Character of Pope,' laid down this proposition, as determining the comparatively inferior rank of certain portions of Pope's poetry—"All images drawn from what is beautiful or sublime in nature are more beautiful and sublime than images drawn from art, and are therefore more poetical; and in like manner the passions of the human heart, which belong to nature in general, are *per se* more adapted to the higher species of poetry than those which are derived from incidental and transient manners." Byron in his 'English Bards and Scotch Reviewers' had pilloried Bowles for what he had said of the moral character of Pope; but it was reserved for Campbell, when preparing his 'Specimens of the English Poets,' in 1819, to offer the first distinct contradiction to Bowles' critical theory of poetry. Campbell vigorously defended the right of the world of the artificial to furnish images to poetry, and instanced 'ships' and the like to prove how beautiful and poetical such images might be. Bowles replied in his 'Letter on the Invariable Principles,' &c. Byron, then in Italy, wrote home to Murray that he was going "to plunge into the contest, and lay about him like a dragon, till he had made manure of Bowles for the top of Parnassus." He accordingly sent over two spirited letters for Pope and Campbell against Bowles, to which also Bowles replied. Other critics, including Octavius Gilchrist and the 'Quarterly Review,' took up the question on Campbell's side. Bowles manfully met them one after another, restating his real views in opposition to what he considered misrepresentations of them, and supporting these views by reasonings and examinations of the reasonings and examples of his antagonists. For some time he stood alone; but at last Hazlitt and the 'Blackwood' critics came to his assistance, and maintained that on the whole he had had the best of the argument. This view is now pretty generally acquiesced in. Bowles never said anything so absurd as that Pope was no poet—an opinion which has been ignorantly palmed on him by some who have engaged in the controversy; he only laid down some critical canons determining the *kind* of much of Pope's poetry, as compared with higher kinds, of which fine examples were found, he said, in other poems of Pope himself; and what he advanced on these points was founded on a right instinct, and was argued with much logical acumen, though not with any of that philosophical depth which distinguishes the similar reasonings of Coleridge and De Quincey.

Enjoying repose in his old age after this battle, and looking round on such men as Rogers and Wordsworth as his junior coevals, and on younger poets rising in the room of the departed Coleridges and Southeys, and Scotts and Byrons, whose births and deaths lay within his own protracted span of life, Bowles survived to find himself almost forgotten in the midst of new persons and themes and interests. He had a presentiment of this as early as 1837, when he wrote these words: "Many years after my gray head shall have been laid at rest in Bremhill churchyard, or in the cloisters of Salisbury cathedral, the reader of the memorable controversy with Lord Byron, in which I believe all dispassionate judges will admit that his lordship was foiled and the polished lance of his sophistical rhetoric broken at his feet, or perhaps some who may have seen those poems of which Coleridge spoke in the days of his earliest song so enthusiastically, may perhaps inquire 'Who was W. L. Bowles?'" The event thus anticipated came to pass on the 7th of April 1850, when Bowles died at Salisbury at the age of 88. His wife had died in 1844; and they left no family.

In his personal habits and manners Bowles was simple, genial, and kindly. He was also "famous," it is said, "for his Parson Adams-like forgetfulness." A life of him, the joint work of a relative and Mr. Alaric Watts, has been advertised as forthcoming; meanwhile we have gathered the above particulars from various notices, and from the autobiographical parts of his own writings. As we said at the outset, he will be remembered with interest on account of some of his poems, particularly his 'Sonnets,' and his 'Missionary' and his 'Village Verse-Book,' but with greater interest as a man occupying a position in our literary history entitling him in the opinion of some to be called the 'Father of modern English Poetry.' If the designation is accepted, it must be allowed that he has had some very rebellious sons.

BOYLE. [ROSCOMMON.]

BRACKEN. [PTERIS, *S.* 1.]

BRADNINCH. [DEVONSHIRE.]

BRAGANTIA, a genus of plants belonging to the natural order *Aristolochiaceæ*. One of the species, *B. tomentosa*, is said by Dr. Horsfield to be intensely bitter, and to be used as a medicine in Java.

BRAIN, DISEASES OF, [MEDICINE, *S.* 2.]

BRAKE, [PTERIS, *S.* 1.]

BRAKES ROCK, a common name for the *Allosorus crispus*, a plant belonging to the natural order *Polypodiaceæ*. *Allosorus* is known by its nearly circular sori, which are at length confluent, and are concealed by the reflexed margin of the frond. *A. crispus* has a slender very brittle stem, which attains a height of from 6 to 12 inches. It grows in stony places on mountains throughout Great Britain.

BRANTFORD. [CANADA, *S.* 2.]

BRAYERA, a genus of plants belonging to the natural order *Rosaceæ*. One of the species, *B. anthelmintica*, yields the anthelmintic remedy known by the name Cusso, Cabotz, or Kousso. Although its anthelmintic virtues have been long known, it has only been recently introduced into Europe. The plant is a native of Abyssinia.

BRAYLEY, EDWARD WEDLAKE, F.S.A., a laborious and an accurate topographer, was born in London (in the parish of Lambeth, Surrey), in the year 1773. He was apprenticed to one of the most eminent practitioners of the art of enamelling, but having from an early age been strongly addicted to literary pursuits, he gradually abandoned that business as a means of life, and devoted himself, a few years after attaining his majority, to the more congenial occupations of professional literature. His acquaintance with Mr. Britton [BRITTON, JOHN, *S.* 2,] had commenced before the expiration of his apprenticeship, and he also being desirous of exchanging a servile occupation for the pursuits of literature and the fine arts, the two young aspirants were associated in several literary undertakings of a minor description, until they united in projecting and in producing the well-known work on which their reputation was originally founded—'The Beauties of England and Wales,' the earlier volumes of which were written by them. This work greatly contributed to extend and gratify the zest for topographical history by which the early part of the 19th century was so remarkably characterised. The illustrations, chiefly copper-plate engravings, directed also by the authors, were the means by which many of the most eminent of our architectural and landscape draughtsmen and engravers became qualified for the execution of works of a higher grade in art. Mr. Brayley himself contributed also to the progress of the fine arts in another direction. Having become acquainted with the late Henry Bone, R.A., when that artist was endeavouring to elevate painting in enamel to the position it subsequently acquired in his hands, as an integral and a legitimate branch of accepted pictorial art, he had early begun to prepare enamelled plates for Mr. Bone's use. This he continued to do for some years after he had become eminent as a topographer, and the plates for the largest paintings in enamel which Mr. Bone executed—the largest ever produced until they were exceeded, in several instances, by those of the late Mr. Charles Muss—were not only made by Mr. Brayley, but the pictures also conducted by him throughout the subsequent processes of 'firing,' or incipient fusion on the plate, in the muffle of an air-furnace requisite for their completion. He derived from the practice of enamelling and the preparation of enamel colours a certain interest in science and its pursuits, especially those of chemistry, mineralogy, and the allied departments of natura knowledge, which, though it scarcely rose above the character of an intelligent curiosity, was retained by him through life, and contributed to the care with which he introduce into country history—in 'The Beauties,' and in his subsequen works—the more characteristic or interesting features of th natural history of the localities described. He acquired als from the same early occupations, a skill in manipulation which in after-life he applied to good purpose in his archæological researches, in taking casts of sculptured ornaments impressions of inscriptions, rubbings of engraved monumenta brasses, &c. It may here be remarked, with reference to hi topographical works generally, that though there were bette geographers and historians, better architectural and recor antiquaries, better heralds, critics in art, and bibliographer there were probably few of his contemporaries—certainl none of his earlier ones—who could unite and apply a competent knowledge of the subjects of all these branches o literature and archæology to what is termed Topography, i a manner at once so useful and so acceptable to gener readers and the public.

In the year 1825 Mr. Brayley was appointed librarian an secretary of the Russell Institution, Great Coram-street, th third in date and in rank of the literary and scientific institutions established in London, which had been founded abou seventeen years before to meet the intellectual requiremen of the populous superior middle-class suburb which was the growing up on the estates of the Duke of Bedford and th Foundling Hospital, on the north side of the metropolis. H was the third librarian in succession of the Russell Institution, the first having been the late Nathaniel Highmore, LL.D and M.D. of Jesus College, Cambridge (author of 'Jus Ecclesiasticum Anglicanum,' &c.). In this capacity Mr. Brayle greatly improved the library, and conducted with ability th general business of the institution, continuing however t follow the pursuits of a topographer and antiquary. H produced several catalogues of the library (the last in 1849 which are not however remarkable in a bibliographic point of view, except perhaps for the extent to which th principle of the analysis of collections is carried. Having singular strength of constitution, neither the wear and tear o these united official and professional vocations, nor the progress of age, sensibly impaired his faculties, either physic or mental, for many years. His most extensive, and, wit the exception of 'The History of Westminster Abbey,' pe haps his best work, was also his last, 'The Topographical History of the County of Surrey,' which he composed and produced between the ages of sixty-eight and seventy-six, during which period the history of the places and objects described was diligently and critically investigated in the localities themselves in very many journeys into the country. For a year or two prior to his decease, gradually increasing though slight weakness and liability to disease was observed in him by members of his family, but his intellectual powers remained unimpaired until the period of his death, which was occasioned by the consecutive fever of cholera, on the 23rd of September 1854, in the eighty-second year of his age; he having filled his official position for nearly twenty-nine years, and been actively engaged in the pursuits of historical and descriptive literature for about fifty-six years. Mr. Brayley became a Fellow of the Society of Antiquaries on the 19th of June 1823. His wife had predeceased him a few years: their surviving children are the eldest son and daughter.

The following is a list of Mr. Brayley's principal works and contributions to literature:—

'A Picturesque Tour through the Principal Parts of Yorkshire and Derbyshire, by the late Mr. Edward Dayes; with Illustrative Notes by E. W. Brayley,' 1805: second edition, with additional notes, 1825. 'Views illustrative of the Works of Robert Bloomfield, accompanied with Descriptions; to which is added a Memoir of the Poet's Life,' 1806. 'Cowper: illustrated by a Series of Views; accompanied with Copious Descriptions, and a Brief Sketch of the Poet's Life,' 1810. 'Descriptions of Places represented in Middiman's Views and Antiquities of Great Britain,' 4to, 1813. 'Popular Pastimes: a Selection of Picturesque Representations, accompanied with Historical Descriptions,' 1816. 'Delineations, Historical and Topographical, of the Isle of Thanet and the Cinque Ports,' 1817. 'History and Antiquities of the Abbey Church of St. Peter, Westminster; including Notices and Biographical Memoirs of the Abbots and Deans of that Foundation,' 1818-23. 'The Ambulator, or Pocket Companion for the Tower of London and its Environs: twelfth edition, with an Appendix containing Lists of Pictures in all the Royal Palaces and principal Mansions round London,' 1819. 'A Series of Views in Islington and Pentonville, by A. Pugin; with a Description of each subject, by E. W. Brayley,' 1819. 'Topographical Sketches of Brighthelmstone and its Neighbourhood,' 1825. 'An Enquiry into the Genuineness of Prynne's Defence of Stage Plays, &c., together with a reprint of the said Tract, and also of Prynne's Vindication,' 8vo. 1825. 'The History and Antiquities of the Cathedral Church of Exeter,' 1826-27 (in Britton's 'Cathedral Antiquities'). 'Historical and Descriptive Accounts of the Theatres of London,' 1827. 'Londiniana; or Reminiscences of the British Metropolis,' 1829. 4 vols. 'Devonshire Illustrated, in a Series of Views of Towns, Docks, Churches, Antiquities, Abbeys, Picturesque Scenery, Castles, Seats of the Nobility, &c., &c.,' 1829. 'The Antiquities of the Priory of Christ's Church, Hants; accompanied by Historical and Descriptive Accounts of the Priory Church; together with some General Particulars of the Castle and Borough,' 1834. 'The Graphic and Historical Illustrator: an Original Miscellany of Literary, Antiquarian, and Topographical Information,' 1834. 'A Journal of the Plague Year; by Daniel De Foe: a new edition, attentively revised and illustrated with Historical Notes,' 1835. 'Illustrations of Her Majesty's Palace at Brighton, formerly the Pavilion; executed under the Superintendence of John Nash, Architect: to which is prefixed a History of the Palace by E. W. Brayley,' 1828. 'The Topographical History of Surrey,' 5 vols., 1841-48: the names of Mr. Britton and Mr. Brayley, jun., are inserted in the title-pages, but neither took any part in the work. The article 'Enamelling' in 'Rees's Cyclopædia,' vol xiii.; published before 1811.

'The Antiquarian and Topographical Cabinet,' a very popular and successful work, published by the well-known engravers Messrs. Storer and Gregg, was designed by Mr. Brayley, and the first number or two written by him, and produced under his direction.

In conjunction with J. Britton:—'The Beauties of England and Wales; or Original Delineations, Topographical, Historical, and Descriptive, of each County,' 1810-14. 'The British Atlas; comprising a series of Maps of all the English and Welsh Counties; also Plans of Cities and Principal Towns,' 1810. 'Memoirs of the Tower of London,' 1830. 'The History of the Ancient Palace and late Houses of Parliament at Westminster,' 1836.

In conjunction with William Herbert:—'A Concise Account, Historical and Descriptive, of Lambeth Palace,' 1806.

BREAST, DISEASES OF. [SURGERY, S. 2.]

BRIDGES. The requirements of railways have led, within the last few years, not only to the erection of stone and brick bridges and viaducts of unusual size and scale upon the ordinary system, but to a far more extensive use of iron, and the adoption, in connection with its employment, of new constructive principles, as well as the bolder, and often novel, application of principles already in general use. Of the stone and brick bridges and viaducts, important and beautiful as works of art, and interesting for their modes of construction, as many of them are, we do not intend here to speak. Our purpose is to notice some of those great iron bridges which have been constructed on novel or newly-applied principles since the publication of the 'Penny Cyclopædia' and 'Supplement.'

All the bridges we have to describe are applications of the beam or girder. Crossing indifferently populous thoroughfares, and navigable rivers and straits, as well as streams and ways which commercial traffic seldom visits, the railway bridge or viaduct must often be of wide span, and so constructed as neither to impede traffic nor interfere with the public safety and convenience. But to this end, neither the direction nor the level of the way can be materially altered, and the space to be crossed must be left as much as possible unbroken by divisions. The problem for the railway engineer, therefore, was to span the widest area with the least practicable encroachment upon it. The arch, even in its flattest form, was soon found to be unsuitable. The readiest mode was to return to the most primitive. One of the earliest artificial bridges, if not the very earliest, was no doubt a beam or girder,—whether that was the trunk of a tree or a plank matters not,—laid across the stream or place to be crossed, with its ends resting on the banks or on artificial supports. And after the invention of the arch, the beam continued to be used for bridges as well as for innumerable other purposes. In course of time, however, experience showed the weakness of the beam, except within very narrow limits, and various methods were invented for strengthening it by the addition of diagonal and other bars or rods, technically known as bracings, stays, and trusses. Of these, *trussed girders*, as they are called, the general principles and applications, and the methods employed for determining their strength, ample accounts will be found in 'The Penny Cyclopædia' articles, TRUSSING, vol. 25, p. 318; ROOFS, vol. 20, pp. 144-147; and MATERIALS, STRENGTH OF, vol 15, p. 8.

Trussed-girders were very early employed for carrying railways across wide streets and streams. Among other instances, may be mentioned the bridge which carried the Blackwall Railway across the Minories, London; and several others on the same line, and some important ones on the North-Western Railway. At first, the girders were commonly made of cast-iron, flanges being added to give greater strength; but the fall of the cast-iron girder bridge over the Dee at Chester led to the abandonment of that material, and the substitution of wrought-iron. The best distribution of the material has likewise been made the subject of the most careful study, and the very ingenious and elaborate experiments which have been devised in the course of the searching and protracted investigations instituted, have resulted in placing in the hands of the engineer a body of formulæ, applicable to almost every purpose on which he can be called to exercise his skill.

The principal varieties of trussed girders which have been adopted for railway bridges are the trellised, the bow-and-string, and the hollow-beam, or tubular: the application of which will be sufficiently illustrated in the Crumlin and the Boyne viaducts; the Chepstow and the Saltash; the Newcastle High-level; and the Britannia and the Victoria bridges. We shall also notice an adaptation of the suspension principle to railway purposes in the Niagara Falls bridge.

The *Crumlin Viaduct* was constructed from the designs and under the superintendence of Mr. T. W. Kennard, to carry the Newport Abergavenny and Hereford line across the valley of Crumlin, in South Wales, and to connect the above line with that of the Taff Vale. With its approaches, the bridge is a third of a mile long. The bridge itself consists of seven spaces, each of 150 feet span, the roadway in the centre spans being at an elevation of 200 feet. The entire structure is of iron. The piers which support the girders are composed of groups of thin cast-iron columns, each of 17 feet high by 1 foot in diameter, and arranged in tiers of fourteen columns each, cross-braced by wrought-iron ties and cast-iron struts. The central piers are 60 feet by 30 feet at the base, tapering upwards 24 feet by 16, and containing 140 columns, which are bound together by no less than 540 wrought-iron ties. At the top of each pier is a triangular frame of cast-iron, upon which rest the ends of the main girders. The girders themselves are strengthened by a complete series of diagonal wrought-iron ties and cast-iron struts, which it would be impossible to explain clearly without diagrams, but which forms an admirable system of trellis trussing. There are four main girders to each span, to which six-inch planking is bolted for carrying the permanent way. The whole structure has a remarkably light and symmetrical appearance, yet seems to be sufficiently strong not merely to support the heaviest traffic, but to withstand the most violent storms. It was opened in May, 1857.

Another admirable example of the trellis-girder bridge is the viaduct which carries the Dublin and Belfast Railway over the Boyne, near Drogheda, and of which Sir John McNeil was the engineer. This noble work consists of a centre span of 264 and two side spans of 138 feet each. The height of the roadway above spring-tides is 90 feet. It was opened in April, 1855.

The High-Level Bridge, Newcastle-upon-Tyne.—Under Roof, 'Penny Cyclopædia,' vol. xx., p. 147, a cut and description are given of the simplest form of bow-and-string rafter and girder; and under Trussing, p. 319, the application of the principle to girders of wrought-iron is noticed. For carrying railways over spaces of unusual width, or at a very oblique angle, bridges of wrought-iron bow-and-string (or as they are by railway engineers usually called bow-string) girders were early found to be peculiarly suitable. Among others of an important character, it may be sufficient to mention an excellent one, which carries the North-Western Railway across the Regent's Canal, near the Camden-town station; the great skew-bridge, by which the North London Railway crosses the Commercial-road at Stepney; and one, of rather peculiar form, on the Gloucester and Birmingham Railway at Cheltenham. But by far the most magnificent bridge erected on the bow-string girder principle, is the High-level Bridge which unites the towns of Newcastle-upon-Tyne and Gateshead.

When the Newcastle and Berwick Railway was planned, it was felt that a junction with the Newcastle and Darlington line could be effected only by the construction of a very lofty bridge over the Tyne at Newcastle; because the banks of the river at that spot are very steep, and the general level of the railways would not permit of a crossing at a relatively small height above the water. It had long been wished by the inhabitants to have a 'high-level' bridge, since the old bridge was adapted only for the low or water-side districts of Newcastle and Gateshead; and Mr. Robert Stephenson boldly designed a scheme which should meet this requirement, as well as the requirement of the railway companies. His plan was to have a *double* bridge, with a railway line over a common road. The railway companies and the town corporations assented; an Act was obtained; the works were actively commenced about the beginning of 1847; and the bridge was opened by the Queen in person in September, 1849.

The width of the river at this spot is 515 feet; but from the high ground in Gateshead to that in Newcastle the distance is above 1400 feet. The bridge is of six spans, each of 138 feet. Four piers of massive masonry rise from the bed of the river, and one from each bank; besides minor piers to support the roadway on either side. The superstructure consists of two platforms, an upper, carrying three lines of rails; and a lower, which forms the public road. The lower platform is about 90 feet above the high-water level; the upper is 20 feet higher. Each span or bay of the bridge is crossed by four main cast-iron arched ribs, with horizontal tie-bars. These ribs are disposed in pairs,—the two inner ribs being rather over 20 feet apart, the space between them forming the carriage road; while between the inner and outer ribs is a space of six feet, which is used for foot passengers. The upper, or railway, platform rests upon the arches, the lower roadway being suspended from them by wrought-iron rods. Each arched rib was cast in five segments, which, when put together, gives a span of 125 feet, with a rise of 18 feet. Besides the tie or tension bar, the ribs are braced by horizontal and vertical bracing frames, while diagonal bracings are inserted in the spandrels, or spaces between the arches and the girders which carry the railway. On the tops of the spandrel pillars, girders extend lengthwise, from which others stretch at right angles across the arched ribs. The whole has thus a perfectly rigid character, and is found to bear the heaviest weights without deflection. Altogether, this bridge is one of the finest engineering works of our time, though eclipsed in magnitude by the vast work, by the same engineer, which we are about to describe.

Britannia Tubular Bridge.—The object of this bridge was to carry the Chester and Holyhead Railway across the Menai Strait, from Bangor to the Isle of Anglesey. As the Menai Strait is navigable by shipping, the Admiralty Commissioners refused to sanction the construction of any bridge which did not afford a clear way for ships at least 100 feet in height. Mr. Stephenson at first proposed to meet the requirements of the Commissioners by erecting an iron bridge of two immense arches; but his plan proposed that the arches should be 100 feet high at the centre, and only 50 feet at the spring of the arches, and the Commissioners refused to permit it to be executed unless he raised the level so that the spring of the arches should be 100 feet above the water. As this would have compelled the height of the centres to be 150 feet, Mr. Stephenson abandoned his original intention, and boldly resolved to cross the channel by a girder bridge. He found a site about a mile on the Caernarvon side of Telford's famous suspension bridge, which was admirably adapted for the kind of structure he contemplated,—the opposite shores being bold steep rocks, and there being just about mid-channel a rocky island, which would afford an excellent foundation for a central pier.

The space to be crossed was 1100 feet wide, and each principal division of the bridge must be nearly 500 feet in span. It was necessary not merely to provide that the enormous beams, as yet unapproached in bulk, which were to be suspended at an altitude of a hundred feet above high-water, should be sufficiently strong to sustain their own immense weight, and that of a loaded railway train in rapid motion, but that they should be able to withstand the action of the fierce gales which are frequent in this locality. It was deemed advisable, therefore, to institute an extended series of elaborate and costly experiments and investigations on the strength of iron, and the manner in which it might be arranged, so as most to conduce to the strength and rigidity of the bridge. These experiments, which were conducted by Mr. William Fairbairn and Mr. Eaton Hodgkinson, called into exercise a union of the highest mechanical and mathematical skill, and not merely sufficed for the immediat purpose, but have afforded a sure basis for the labours of succeeding engineers. The result was the demonstration tha the greatest amount of strength would be obtained by givin to the materials the form of a hollow quadrangular beam o girder, somewhat larger in section in the centre than at th ends, and making the top and bottom (or the floor and roofs) instead of being solid, to consist of shallow tubes or cells Of these great hollow beams, it was decided to have two each upwards of a quarter of a mile long, placed side by side one for the down, the other for the up, traffic, the ends o which should rest upon abutments, the intermediate portions being supported across the strait by three massive an lofty stone piers or towers.

The bridge, then, as finally constructed, consists of fou spans,—two principal spans, of 460 feet each, which ar over the water, and two smaller ones, of 230 feet each which are over the land. The central, or Britannia Towe stands on the rock already mentioned, in the middle of th strait. It is constructed, with the exception of the inne masonry, which is of Cheshire red sandstone, of a hard carboniferous limestone, obtained from the Penmon quarries i Anglesea. Its height from the foundation is 230 feet, o nearly 30 more than that of the London Monument; its widt at the base is 62 feet by 52 (the pedestal of the Monumen being 20 feet square), and it tapers gently to 55 feet by 4 where it receives the tubes. This tower contains 148,62 cubic feet of limestone, and 144,625 cubic feet of sandston in all near 20,000 tons; and 387 tons of cast-iron bars an girders are built into it. The east and west, or land, towe are similar in general construction to the Britannia Towe but somewhat smaller, and only 190 feet high: they stan at a clear distance of 460 feet from the Britannia Towe The east and west, or Caernarvonshire and Anglesey abu ments, are situated inland, at a distance of 230 feet from th east and west towers respectively, and are constructed of massive masonry.

Although the tubes form two continuous hollow beams or tunnels they consist in fact of eight pieces, four to each tube, which are joined end to end at the piers. The height of the tubes is 30 feet at the Britannia tower, and diminishes to about 23 feet at the abutments: the upper surface being slightly arched, but the lower horizontal. The clear internal height varies from about 19 feet to 26 feet. The external width is nearly 15 feet, and the internal about 14. The sides, top, and bottom are all formed of wrought-iron boiler plates, varying from 6 to 12 feet in length, from 21 to 28 inches in width, and from ⅜ths to ¾ths of an inch in thickness. The plates (some of which weigh nearly 7 cwt. each) are laid lengthwise in the top and bottom, but vertically in the sides of the tube. The largest plates are in the bottom, where they are arranged in a double layer. The plates are joined together by rivets; and are stiffened and strengthened at the joints by T-shaped iron, both inside and out, which form vertical bars up the sides, at distances of two feet apart. The connexion of the top and bottom with the sides is made more substantial by triangular 'gusset-pieces,' rivetted in at the corners. The rivets in the entire structure are almost incredibly numerous; they are placed four inches apart in the top and bottom, and three inches apart in the sides. They are rather more than an inch in diameter, and were driven red-hot into the rivet-holes, which holes were made by a powerful machine that punched out forty holes in a minute. The whole bridge contains nearly 2,000,000 of these rivets. The rectangular tubes or cells, which form the top and bottom, are 14 in number: viz. 8 in the top, measuring 21 inches high by 21 wide; and 6 in the bottom, 21 inches high by 28 wide. The vertical sides of these cells are strongly connected to the plates of the top and bottom with L-shaped bars of wrought-iron. The two tubes contain 65 miles in length of T and L iron. The whole weight of wrought-iron in one of the large tubes is about 1600 tons, of which 600 tons are in the sides, 500 tons in the top, and 500 tons in the bottom.

The mode of constructing these tubes was not the least remarkable part of the operations. The short tubes (those between the abutments and the side towers) were constructed on platforms at their ultimate level; but the long tubes (those between the side towers and the Britannia tower) were constructed on floating platforms on the Caernarvonshire beach. The scaffolding for building the towers and the short tubes was among the finest ever yet formed. It consisted of whole 'balks' of timber, logs from 12 to 16 inches square, and some of them as much as 60 feet long; they were fastened together without nails, so as to be afterwards available without injury for other purposes. This beautifully formed scaffolding beneath the short tubes was abont 100 feet in height; and round the Britannia tower it rose to a height of 250 feet. The span between the abutments and the side towers is 230 feet; but the short tubes are each 242 feet long, to allow space for resting on their supports. In like manner the span between the Britannia tower and the side towers is 460 feet; but the long tubes are 472 feet, to furnish supports at the ends.

The platforms on which the long tubes were constructed were made of whole balks of timber, and extended nearly half a mile along the Caernarvonshire beach; each of the four long tubes having a platform to itself. When finished, each tube was conveyed to the base of the tower on eight huge pontoons or close barges; each pontoon being capable of floating a weight of 400 tons. These pontoons were brought beneath the ends of the tnbe; and by taking advantage of variation of tide, they lifted the tube off the platform and supported its whole weight. They were then navigated, by enormous hawsers, cables, and capstans, to the Britannia rock, where the tube was brought as nearly as conld be to its proper position. Each of the four long tubes as soon as it was finished was floated in a similar way to the Britannia tower, and placed across the river at the proper spot, where arrangements were made for supporting them until they were raised into their places.

The lifting of these tnbes was a remarkable engineering effort. With the apparatus attached to it for aiding the lift, each of the four large tubes weighed 1800 tons; and this unparalleled weight had to be raised to a height of about 100 feet. It was effected through the medium of hydraulic pressure. Chains of enormous strength were fastened to the ends of the tubes and the upper ends of these chains were connected with hydraulic presses constructed on the tops of the towers: these presses, like many other parts of the apparatus, were larger and more powerful than any before constructed for any purpose. Two steam-engines of 40 horse power each worked the presses; the presses gradually drew up the chains, and the chains carried up the tube; when the masonry was built up under the tube, the end of which moved within a groove left for the purpose in the tower. When raised to their proper position, the tubes were brought into connexion, end to end, in the cavities left near the tops of the towers, and converted from independent into continuous tubes; and the mode of fastening them at these points greatly strengthened the whole structure, while space was left to allow for the expansion of the metal. Rails were laid down on the floor of the tubes, properly supported and strengthened; and oval windows were formed in the sides of the tubes.

The first stone of the Britannia tower was laid in May 1846, and on March 5, 1850, Mr. Stephenson himself drove the first train from shore to shore through the first tube. The second tube was completed and the bridge formally opened for traffic on the 21st of October, 1850. Subject to the severest tests with trains loaded to the extent of 300 tons, the tubes did not exhibit a deflection of more than ¾ of an inch; and they have now been subjected for more than seven years to the strain of traffic and the fury of the elements without any appreciable permanent influence having been produced upon them, or any perceptible increase of deflection. How fertile a principle the hollow-beam with cellular top and bottom has proved need hardly be pointed out: it is almost unnecessary to mention indeed as an illustration that it is to having been constructed on this principle, that the Leviathan steamer owes the enormous strength which has been so severely tested in the course of its protracted launch.

The *Conway Tubular* bridge is a repetition on a smaller scale of the Britannia bridge, but was constructed before it; every untried principle being first thoroughly tested in the smaller structure before it was applied in the larger. The Conway bridge consists of a single span of 400 feet clear, the platform of the tube being only 18 feet above the high-water level. The first stone of the masonry was laid in June, 1846; the whole was completed in November, 1848.

Victoria Bridge, Canada.—A more remarkable bridge as to size and in many other respects than even that over the Menai Strait of a similar superstructure is the Victoria bridge of the Grand Trunk of Canada railway, which is in course of construction across the St. Lawrence, near Montreal, and is expected to be completed in 1859. From shore to shore of the St. Lawrence, the Victoria bridge will be nearly two miles in length, being about five and a half times the length of the Britannia bridge, and seven times and a half the length of Waterloo bridge, London. The tubes, which are similar in construction to those of the Britannia bridge, will be supported on 24 piers, of which 14 were completed in December, 1857. The abutments have also been completed to the tube level. Of the tubular spans 24 will be each 242 long, the centre span being 330 feet, and 60 feet above the summer level of the St. Lawrence. The length of the bridge between the abutments is 8000 feet. The engineer is Mr. M. Ross.

Chepstow Bridge.—In this bridge, which carries the South Wales railway across the river Wye, near Chepstow, Mr. Brunel has employed two kinds of trussed girders, and also applied the rigid suspension principle. In one portion of the bridge wrought-iron girders 100 feet in span, and of the ordinary form, rest on cast-iron columns; while in the other portion, which is 305 feet in span, the trussed girders are sustained by chains, the tension of which is resisted not, as in an ordinary suspension bridge, by being fixed to the ground at either end, but by attachment to a horizontal wrought-iron column or strut, 9 feet in diameter and ⅝ths of an inch thick, which rests on the towers at the ends of the bridge. The chain consists of three straight links only—its rigid form being maintained, and the flexure of the horizontal column prevented by vertical and diagonal bracings: the chain in effect is converted into the lower member of a rigid beam. The girders which carry the roadway have only two points of suspension, one at each end of the centre link of the chain, and they rest at each end on cast-iron columns. These girders are 87 feet above the ordinary low-water level, bnt owing to the remarkable rise of tide here, only 46 feet above high-water. The towers at the ends of the bridge present no peculiar features, but tho middle one rests upon a pier formed by six enormous cast-iron cylinders which pass through 50 feet of soil to the solid rock beneath. They were sunk to their positions by the removal of the mud, and the pressure of their own weight, (in the same way as the foundations of Rochester bridge were formed,) fresh cylinders being added as the previous ones sunk down. They were then filled up with concrete, and eventually carried up to a height of 190 feet, when they were bound together by the cast-iron frame work which supports the tower.

A somewhat similar combination of the rigid suspension bearing with the tubular form is being carried out in Mr. Brunel's *Royal Albert Bridge*, at Saltash, near Plymouth, which is intended to carry the Cornish railway across the river Tamar, in order to connect it with the South Devon line. The total length of this bridge is 2200 feet, the principal spans are each 455 feet, and the height of the railway above high-water level is 100 feet. The centre tower is built of solid granite to a height of 12 feet above high-water mark, upon this rest four octagonal cast-iron columns which carry the standards upon which one end of each tube rests; this tower rises to a height of 240 feet above the foundations. The principal side piers are of solid masonry, and carry the bed plates and rollers upon which rest the other ends of the tubes, and which permit their free expansion or contraction under the influence of variations of temperature. The tubes are similar in principle to those of the Britannia bridge, and like them after being constructed at the river side were floated out on pontoons to a spot between the towers, and thence gradually lifted by hydraulic pressure to their ultimate position.

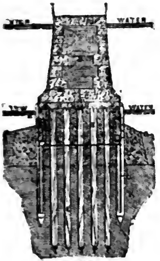
Niagara Falls Suspension Railway Bridge.—The most remarkable application of the suspension principle yet made to railway purposes, has been made in the bridge constructed across the Niagara river, by Mr. J. A. Roebling, in order to carry the railway, and also the ordinary carriage and passenger traffic across that river. The space to be crossed was above 820 feet, and the level above the water 245 feet. From the nature of the locality it was necessary that the bridge should consist of a single arch or span, whilst the erection of scaffolding or the floating of portions of the structure to their place was impracticable, and hence a suspension bridge appeared to be the only available form of structure. But any other than rigid bridges had been shown to be unsuitable for railways, and it became necessary to overcome the flexibility inherent in suspension bridges of the ordinary kind. This the engineer has successfully accomplished, and the bridge which links the British possessions with the United States is, confessedly, one of the most remarkable achievements in modern engineering.

The bridge is a hollow beam, slightly curved in form, 25 feet wide at the bottom, and 24 feet at the top, 18 feet high, and 821 feet long from the centres of the towers. Along the bottom floor the ordinary passenger traffic is carried; along the top runs the railway. Separate systems of wire cables, two for each (and each 10 inches thick), support these two roadways, which are constructed of timber beams. The roadways are connected by double trusses so arranged that their resistance acts in opposite directions, upwards as well as downwards. The beams of the two floors are connected by posts which serve to transmit the depressive action of loads from one floor to the other. The posts are trussed together by diagonal rods. By these simple arrangements in combination with the tubular form of the bridge, a considerable increase of rigidity is obtained. To maintain horizontal stability the upper cables are braced laterally, and there are diagonal stays of wire above and below the floors. Fifty-six stays from the lower floor at the ends of the bridge are strongly anchored in the rocks. For the secure anchorage of the cables, expansion and contraction from variation of temperature, high winds, &c., it is needless to say careful provision is made. The railway traffic passes along the centre of the upper floor, the common waggon traffic along each side of the lower floor. The anchorage was commenced in September, 1852, the bridge was opened for traffic in March, 1855. The total cost was under 400,000 dollars. The bridge answers its purpose perfectly; but it must not be supposed that it has proved the suitableness of the suspension principle for railway bridges, except under peculiar circumstances. In this case the river being unnavigable, the engineer has been enabled to obtain stable rigidity by the use of an extended series of stays below the roadway, securely fastened to each shore, a means of course only available in exceptional cases. And although by the judicious application of the tubular form, and the use of a happy combination of trusses, girders, stays and weights, a remarkable amount of rigidity has been obtained, it is yet considered unsafe to allow the railway trains to cross the bridge at a higher speed than three miles an hour. At that rate when a train of 326 tons is passing over it, the bridge only cambers to the extent of 10 inches, and the roadway assumes its original level immediately the train has passed.

Londonderry Bridge.—The applicability of the suspension principle to railway bridges is about to be further tried by an English engineer. For some time this subject has been in various forms under investigation, and at the last meeting of the British Association (1857), Mr. C. Vignoles read a paper before the section of Mechanical Science, in which he stated that the suspension bridge which he erected in 1852 over the river Dnieper, at Kieff in Prussia, and to the platform of which he gave great rigidity by a careful system of bearings had not only effectually resisted the fierce hurricanes t which it had been exposed, but had successfully withstoo the severest tests in the passage over it of Russian armie with heavy ordnance during the recent war in the east. A the result of his experience with this bridge, and of othe inquiries, he had arrived at the conclusion that the adap tation of suspension bridges to railway purposes is quit practicable if the speed of trains when passing over them b moderate as compared with the ordinary speed on railways The question as we said is about to be practically tried b Mr. P. W. Barlow, who is constructing a girder bridge, to b supported by suspension chains, for the purpose of uniting th Londonderry and Enniskillen and the Londonderry and Cole raine railways. The importance of the question in a economic point of view will be seen from the statement o Mr. Barlow, that while the span of the Londonderry bridg is about equal to one span of the Britannia bridge, th weight of iron in the span of the Britannia tube is abov 3100 tons, whereas the weight of metal in the proposed Londonderry bridge will be only 432 tons—or only about on seventh of the former. In a paper which he read before th British Association on the subject, Mr. Barlow strongly urge the superiority of the suspension bridge under certain circumstances. The following summary presents the results o his investigations :—"That the deflection of the wave of girder attached to a chain similar to the Londonderry bridg will not exceed one twenty-fifth of the deflection of the sam girder not attached to the chain. That theoretically the saving of metal to give equal strength in a suspension bridge i only one-half of a girder; but as it can be made of grea depth without practical difficulty, and as the deflection varie as the cube of the depth, a bridge, on the principle of suc spans as the Londonderry bridge may be made, under averag circumstances, with at least one-fourth of the metal of a ordinary girder bridge having equal rigidity."

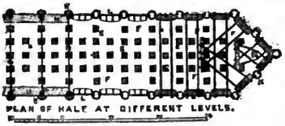
Foundations of Bridges. To our notice of new principle applied in constructing the superstructure of bridges, it ma be well to add a brief account of one or two of the mo important of the new expedients adopted in forming the foundations. Until recently, in order to build the found tions of the piers and abutments of a bridge under wate one of two plans was adopted: the first was to constru around the site of the pier, a *coffer-dam*, or wooden wate tight enclosure from which the water was pumped out so to allow a firm and dry foundation to be laid—this was t plan adopted at London and Waterloo bridges and in m other bridges of an important character; the other, and much less costly, though less stable method, was to surrou the platform on which the foundation of the pier was bui with water-tight sides, and thus make a large water-tight bo or *caisson*, the sides of which, when the platform was sunk its proper level could be detached, the bottom or stage remai ing as a foundation—this was the method used in construc ing the piers of the old Westminster bridge. [COFFER-DA 'Penny Cyclopædia,' vol. vii. p. 324] Coffer-dams and caisso were of course modified in form according to situation, and the method of construction according to the views of individu engineers; but wherever used they have been the same principle. A more economical and less tedious system, y one which should be equally durable, has long been desir by engineers, and various plans have been suggested for su plying the requirement. Some of these have been succe fully carried out in practice, as far as construction goes, whi there seems no reason to doubt their permanent stabilit Numerous bridges have in fact been erected both in th country and on the continent, where coffer-dams and caisso have been dispensed with. Piles and concrete, cased in ti ber, have been used in Brunel's railway bridge at Chepstow described above, and in various parts of the continent; and the same materials unprotected, have been used, as in the bridge at Rouen, and the bridges of Jena, Austerlitz, Alma, and Victoria, over the Seine. Cast-iron as an outer casing, in various forms, and with concrete or other materials as the filling, has been used in England and Ireland in numerous instances. In the Alma bridge over the Seine, having a length of 470 feet and three arches, the piers are founded on piles driven into the bed of the river over the whole area. The space between the piles is filled in with concrete and rough stones, the whole is enclosed by wooden sheet-piling, and is protected from the scour of the river by rough stones. The Suspension bridge at Chelsea was built by enclosing the area by piles and iron plates, driving wooden piles at short distances over the whole space, and filling in with concrete, and of course without using either coffer-dams or caissons; and the new bridge at Westminster is being built by the same engineer, Mr. T. Page, on a similar principle. In the Town bridge and the Railway bridge recently erected alongside of each other at Rochester, the piers are supported solely by a number of cast-iron cylinders, filled with brick-work and concrete. A description of the methods adopted by Mr. Page at Westminster bridge, and by Mr. Hughes at the Rochester bridges, will serve to indicate sufficiently the direction taken by civil engineers in this branch of their practice.

It having been decided,—partly on the score of economy in cost, partly on that of saving in time, but chiefly perhaps in order to avoid the excessive obstruction of the water way which would have arisen from building a bridge of several arches close against an old bridge of a still greater number of arches, the piers of which would not coincide in position with those of the new,—not to use coffer-dams in constructing the piers of the new Westminster bridge, the system proposed by the engineer, Mr. Page, was examined and approved of by the Bridge Commissioners. His plan, which is being carried out as rapidly as circumstances permit, was to drive a number of bearing-piles over the whole area, to a sufficient depth in the clay, but to leave them standing at some considerable height above the gravel, as the base of the pier; to enclose the area for the pier in a circuit formed with round hollow iron piles, and flat plates alternately, the former sustaining the latter by grooves, and all driven down to a sufficient depth; to dredge out in the spaces between the bearing-piles to the hard gravel; and to fill up all the spaces and area in the casing up to the level of the tops of the piles, with concrete made from Portland cement, which has the property of setting under water, the concrete being deposited through the water by means of shoots. The casing was previously tied together, across the intended pier, by iron bolts. This system of construction was to terminate at or rather below low-water line. Blocks of granite were to be fixed over the piles, concrete to be again filled in, and the whole to be levelled off to receive a heavy bed of granite capping, or rather base course, above which the pier would be continued in brickwork faced in granite, to finally attain the level for the springing of the great iron ribs or arches of the bridge. The works in course of execution are of course retarded by the rise of the tide: but otherwise, though below water, they are conducted above it, except as to the requisite inspection, the attachment of the iron ties, and in similar cases where the diving-bell or the diving-dress is used.



SECTION.

- **A** Brickwork.
- **B** Granite.
- **C** Granite plinth as bond, over whole area of the pier.
- **D** Granite blocks, on the timber-bearing piles.
- **E** Timber-bearing piles.
- **F** Concrete of Portland cement and gravel.
- **G** Concrete of Portland cement in trench, around the piles, externally.
- **H** Gravel to be left in.
- **J** The London clay.
- **K** Cast-iron cylinder-piles, about 4 feet apart.
- **L** Cast-iron plate-piles, with flanges, placed intermediately.
- **M** Granite slabs, 8 feet long, and 1 foot 8 inches thick, also intermediate, above the plate-piles.
- **N** Tie-rods through the pier, one to each pair of cylinder-piles, nutted and screwed inside, before the cap of pile is fixed.
- **P** Tie-rods through the pier, two to each pair of plate-piles, nutted and screwed outside.
- **Q** Curved line intended to be given to the bed of the river by dredging.



PLAN OF HALF AT DIFFERENT LEVELS.

The letters refer to the same parts in Section and Plan.

The 145 bearing-piles in each pier of Westminster bridge are driven to an average depth of 29 feet 6 inches below low-water line; the 44 cast-iron piles, each 24 feet 9 inches in length, are driven 23 feet 9 inches below the same line, so that their heads stand somewhat above it; the 44 cast-iron plates or flat sheeting-piles, 15 feet in length, are driven down to 21 feet below low water, and to make up the height, they are surmounted by granite slabs, which, consequently with the upper part of the round piles, are part of the casing. The bearing-piles are thus 22 feet below the average level of the caissons of the old bridge, and the cast-iron piles and plates are respectively 16 feet 9 inches, and 14 feet below that level. Supplementary protection external to the pier is intended to be provided by a solid mass or bank of concrete round the pier; this concrete when set forming a kind of artificial rock, which is found to be harder than the stone of the old bridge. For this concrete a trench is dredged out to the clay, and it is proposed that it shall have a thickness of five or six feet; so that, should it endure, as the hardness and heaviness of the mass would make probable, the flat piles would be always underground, and at the junction at the feet of the granite slabs there could be no escape of the gravel. Mr. Page further proposes to dredge out the channel under the arch to a regular curve, commencing at three feet below low water at the piers, laying bare the clay at the centre, so as to give a low-water depth there of about 12 feet; and he believes from his observation of the flow of the stream of the tides, that the tendency would not be to scour at Westminster bridge, but that the first operation would rather be to silt up. The entire cost of constructing the foundations of Westminster bridge on Mr. Page's system is estimated at about 60,000*l.* less than by the employment of coffer-dams. A peculiarity in the construction of the new Westminster bridge is that, in order to save the usual expense of building a temporary wooden bridge when a new bridge is to be erected on the site of an old one, only one half of the bridge—the western—is in the first instance to be built along side of the old structure, which is during its progress to be used for the ordinary traffic. This half of the new bridge is then to be used for traffic, the old bridge is to be demolished, and the other, or eastern half of the new bridge erected on its site. This necessitates the construction of the piers, as well as of the bridge itself, in two parts, at intervals of time, and doubts have been expressed whether there are not in consequence likely to be unequal settlements in the completed structure. Mr. Page has, however, suggested arrangements for the formation of the piers, and for the introduction of peculiar bracings in the coupling together of the two parts of the superstructure which will afford sufficient provision for any inequalities of subsidence.

In the system of Mr. J. Hughes employed in forming the foundations of the Town and Railway bridges which cross the Medway side by side at Rochester, the piers are entirely supported on cast-iron cylinders, which were sunk down to the hard chalk by using each cylinder as a diving-bell. A somewhat similar principle has been applied to other bridges, and there are different claimants to the invention of the principle. In the original invention of Dr. Potts, the sinking of the cylinder was effected by the exhaustion of the air contained within it, but though that method has been adopted in some cases, it has not met with general success. Mr. Cresy and Mr. Hughes ascribe the first successful sinking of hollow cylindrical piles through sand by means of compressed air, to M. Triger, who thus sunk a shaft through a quicksand 65 feet thick, on the banks of the Loire. But the actual conversion of the cylinder into a diving-bell in which the workmen carry on their operations, the diving-bell then forming a part of the permanent structure, is an extension of the principle which is due to the ingenuity of Mr. Hughes.

The Railway and Town bridges are both borne on abutments at the banks, and two piers in the bed of the river. To sustain the abutment on the Strood side 30 hollow cylinders were used; for the Rochester abutment 12; and for each of the two piers 14; making in all 70 hollow cylindrical piles, each 7 feet in diameter. The piers are respectively 70 feet long and 17 feet wide, and the cylinders are set at distances of 9 feet apart lengthwise, and 10 feet transversely. The bed of the river was found by boring to consist of strata of soft clay, sand, and gravel, overlying hard chalk, which appeared at a depth of 44 feet below high-water level. On this hard chalk the cylinders were to be based. To reach it for the Strood pier a mass of hard stone, part of the foundation of the original wooden bridge, had to be passed through. The plan of sinking hollow cylinders by exhaustion was evidently impracticable here. To ensure a firm foundation workmen must excavate the stone, gravel, &c., in order to prepare a passage for the descent of the cylinders, and then to secure their stability fill them with brickwork as soon as they were in the positions they were ultimately to occupy.

The cylinders were in lengths of 9 feet each, the diameter as already mentioned being 7 feet. Operations were commenced by converting one of these lengths of hollow cylinder into a diving-bell, by securely bolting to one end of it a wrought-iron cover. Through this cover were two cast-iron air-locks (or chambers bearing a certain resemblance to the locks of a canal), with air-tight flaps or doors, through which the workmen entered and quitted the cylinder, the excavated materials were passed out, and the brick and concrete passed in. Separate cocks, one under the control of a workman inside, the other under the charge of a workman outside, permitted the passage at will of the buckets outwards or inwards, the filling of the chamber with compressed air, &c. There were besides a great number of ingenious appliances for the convenience of the workmen and to facilitate the various operations, which it would be out of place to describe here, but which are fully described and illustrated in Mr. Hughes's Memoir on the subject, and in the Supplement (1856) to Mr. Cresy's 'Encyclopædia of Civil Engineering.'

A substantial timber stage having been erected over the site of the pier, and steam-engines and air-pumps conveniently placed, the prepared cylinder was connected with an air-pump, and with its various apparatus was lowered to the proper position on the bed of the river. "The working of the apparatus commenced by setting the pumps in motion, the flap of one of the air-locks and the door of the other being closed, a few strokes compressed the air within the pile [or cylinder] sufficiently to seal the joints; and every subsequent stroke delivered an additional quantity, until the density was sufficient to expel the water, and leave the bottom dry. Fifteen feet of water was cleared out in five minutes; and whilst the pumping continued the workmen passed through the air-locks to their respective stations; and as the excavations proceeded, the material, sent up in buckets, was discharged into lighters placed alongside. During the time of shallow water, the pile descended as rapidly as the excavations below would permit it; but when the water was deep, and the weight of the pile and elasticity of compressed air contained in it were nearly in equilibrio, the excavation was carried down 14 inches below the edge of the pile, when it would at once descend through the whole space as soon as the pressure was removed." ('Cresy's Encyclopædia of Civil Engineering,' p. 1697). When the cylinder had thus sunk 9 feet, the cover, with the air-chambers, was lifted off, and another 9 feet length of cylinder was bolted on to the first, the air-locks being now fastened to the top of the upper cylinder. The air-pumps were again set to work, the excavating process was repeated, and the cylinder sank another 9 feet. These operations were repeated till the necessary depth had been reached, when the cylinders were filled up with brickwork and concrete. In the Strood pier nine lengths of cylinder were employed. The lowest rested on the hard chalk; that above it was surrounded by soft chalk; the third by Kentish rag stone; while about half of the fourth was above the bed of the river.

For forming the foundations of bridges, but more particularly of lighthouses, landing-stages, beacons, breakwaters, and other structures which have to be based upon sand or soft ground, hollow cast-iron *screw-piles*, the invention of Mr. Mitchell, have been extensively used. These piles have the lower end converted into an auger-screw, which enables the pile to be screwed with great facility through shingle, sand, &c.; while the upper part of the worm may be expanded into a disc, varying in breadth according to the character of the soil, thereby increasing greatly the firmness of its hold. The value of these screw-piles is very great in situations where the loose sandy soil is incapable of supporting any solid structure, or where the action of the waves quickly undermines any work based on ordinary piling.

BREISGAU. [Brisgau.]

BRIBERY. [Election, *S.* 2.]

BRIEY. [Moselle.]

BRIGHT'S DISEASE. [Medicine, *S.* 2.]

BRILL. [Pleuronectidæ.]

BRITTANY. [Bretagne.]

BRITTON, JOHN, was born July 7, 1771, at Kington-St. Michael, near Chippenham, Wiltshire, where his father was a small farmer, and kept a village shop. His parents dying early, he was received as a servant by an uncle in London, who after a while apprenticed him to a wine-merchant. After having served six years, his health gave way, and his master agreed to cancel his indentures. Young Britton had in the village schools received a little rudimentary instruction, and during his apprenticeship he had become extremely fond of reading, but his reading was desultory and aimless. On reaching manhood he was still uneducated, and his mind quite unformed. At the close of his apprenticeship he found himself without connections, and without any definite pursuit. For some years he had to struggle hard with poverty, and was driven to a variety of shifts to earn a livelihood. Among other things, he engaged himself for a time to recite and sing at a kind of dioramic exhibition with the sounding title of Eidophusikon. During this unsettled course of life he formed the acquaintance of various persons connected with the humbler walks of literature, and he was induced to embark in a small way on authorship himself, by compiling some common street song-books, &c., and at length adventured on writing an 'Account of the Surprising Adventures of Pizarro.' Some short notices which he prepared for the 'Sporting Magazine' brought him acquainted with Mr. Wheble, its publisher, and to the connection thus formed Mr. Britton owed his introduction into the career which he so long and honourably pursued.

Mr. Wheble, whilst residing at Salisbury, had issued the prospectus of a work to be called the 'Beauties of Wiltshire,' but after having received some subscriptions for it, found himself unable to carry it on. But now, learning that Britton was a native of Wiltshire, Wheble proposed to him to compile the work he had announced. It is hardly possible to conceive of such a proposal being made to a person less qualified by previous pursuits or attainments, but among Britton's acquaintances was a young man named Brayley of about his own age, but somewhat better taught; they had assisted each other in their studies, and were prepared to enter upon a sort of literary partnership. In conjunction with his friend Brayley, Britton promptly undertook to 'get up' from ready sources an 'Account of Wiltshire,' and as their first preparation for it, the friends set out on a tour, not, as might be supposed, through Wiltshire, but through Wales. In due time however, the 'Beauties of Wiltshire' were completed in 2 vols. 8vo (1801), to the satisfaction of the publishers; and at their invitation the joint authors immediately set to work on the 'Beauties of Bedfordshire.' Eventually the 'Beauties' of all the other counties of England were published in 26 vols., but only the first nine volumes were written by the original authors. [Brayley, E. W., *S.* 2.] While compiling his 'Wiltshire,' Mr. Britton not only became conscious of his deficiencies, but endeavoured resolutely to supply them; and the criticisms and advice of various antiquaries and topographers with whom the work brought him into connection materially assisted his progress. Finding his publisher averse to the admission of antiquarian matter, he began to collect materials for another and more elaborate work, the 'Architectural Antiquities of England,' of which the first part was published in 1805, and which was above nine years in progress. It eventually formed five splendid quarto volumes. Henceforth Mr. Britton's course was one of laborious and persevering authorship in the path which he made for many years in a special manner his own —that of architectural and topographical description and antiquities. It would occupy too much space to enumerate his many publications, which in his own chronological list, in the second part of his 'Autobiography,' number eighty-seven distinct productions. The most important of them is the 'Cathedral Antiquities of England,' a magnificent work, which was commenced in 1814 by the publication in a detached form of the 'Antiquities of Salisbury Cathedral,' and ultimately embraced a series of elaborate illustrations of the entire cathedrals of England. In its completed form the 'Cathedral Antiquities' occupy 14 vols. fol. and 4to, 1814-35, with upwards of 300 highly-finished steel-engravings.

The production of these works was carried on throughout under Mr. Britton's immediate superintendence, many of the artists working in his own house, and being trained to their work by himself; and the facility he thus acquired in the production of this class of publications led to the preparation of many other works of a similar kind. Among the illustrated works of which he was either author or editor may be named—an 'Historical Account of Corsham House,' 1806; the 'Fine Arts of the English School,' 4to, 1812; 'Historical Account of Redcliffe Church,' 4to, 1813; 'Illustrations of Fonthill Abbey,' 1823; 'Historical Account of Bath Abbey Church,' 1825; the 'Public Buildings of London, from drawings by A. Pugin,' 2 vols. royal 8vo, 1825–28; 'Architectural Antiquities of Normandy, drawn by A. Pugin,' 1825-27; 'Picturesque Antiquities of English Cities,' 4to, 1830; 'A Dictionary of the Architecture and Archæology of the Middle Ages,' 4to, 1832-38; 'A History, &c., of the Ancient Palace and Houses of Parliament at Westminster,' jointly with E. W. Brayley, 8vo, 1834-36; 'Historical Account of Toddington, Gloucestershire,' 1841; 'Historical Notices of Windsor Castle,' 1842; &c. &c. But besides these Mr. Britton wrote on many subjects connected with general literature, either as distinct works or as contributions to literary journals, &c. In biography he published in 1845 a 'Memoir of John Aubrey,' and in 1848 an essay entitled 'The Authorship of the Letters of Junius Elucidated, including a Biographical Memoir of Colonel Barré, M.P.' Mr. Britton wrote the articles 'Avebury,' 'Stonehenge,' and 'Tumulus,' for the 'Penny Cyclopædia.'

In 1847 the literary and other friends of Mr. Britton gave the veteran author a dinner on his retirement from the active pursuit of his calling; and it being determined to mark their esteem for him by a permanent testimonial, a social gathering called the 'Britton Club' was organised to carry out the project. The form of the testimonial, at Mr. Britton's own suggestion, it was eventually agreed should be an 'Autobiography,' which he was to prepare and to print with the testimonial funds. Despite of his advanced age, Mr. Britton continued to labour at his self-imposed task; and some of the parts of his 'Autobiography' were published, but he died before the work was completed, January 10, 1857.

Mr. Britton was not a man of marked originality or great mental power, but as a careful and diligent writer in a branch of literature which had been cultivated chiefly by minute antiquarians, he did excellent service in calling the attention of the educated public to the long-neglected topographical and architectural antiquities of England; and there can be little doubt that his elegantly-illustrated works have been a chief exciting cause in bringing about the improved state of public feeling with reference to our national antiquities. The career of Mr. Britton was moreover an admirable illustration, as he himself describes it, "of what may be effected by zeal and industry, with moderate talents, and without academic learning."

BROCKVILLE. [CANADA, *S.* 2.]

BROMAL. [CHEMISTRY, *S.* 1.]

BROMOFORM. [CHEMISTRY, *S.* 1.]

BROMLEY, ABBOT'S. [STAFFORDSHIRE.]

BROMUS, a genus of plants belonging to the natural order *Graminaceæ*, and the tribe *Festuceæ*. It has unequal many-flowered herbaceous glumes, the lower being 1-nerved, the upper 3 to 5-nerved. The flowers are lanceolate, compressed. The outer palea short, (usually) founded on three nerves from below the tip. The styles below the summit of the fruit lateral. The sheaths of the leaves divided half way down.

The species are generally known under the name of Brome-Grass. Four of the species are common in Great Britain.

B. erectus has an erect stem two or three feet high, and grows on dry sandy and chalky soils. It is known from the other species by the outer palea being indistinctly 7-nerved and one-third larger than the smaller glume.

B. asper has its outer palea hairy and 5- to 7-ribbed, with the leaves broad and hairy. The stem reaches a height of four or five feet. It grows in damp woods and thickets.

B. sterilis is a common plant in waste places, and is known by its outer palea having 7 distinct equidistant ribs. It has large flat broad pubescent leaves, and a stem from one to two feet high. It grows in waste places.

B. diandrus is remarkable for its erect panicle. It is a rare plant.

Some of the species, as *B. purgans* and *B. catharticus*, are purgative, whilst *B. mollis* is said to possess poisonous properties.

BROMYARD. [HEREFORDSHIRE.]

BRONGNIART, ALEXANDRE, an eminent chemist and mineralogist, son of the architect of the Invalides, was born at Paris in 1770. He received a good education, promoted by his father's care, and the friendship of Lavoisier and Franklin; and it is said, delivered a lecture on chemistry before he was fifteen. He pursued his earliest scientific studies at the École des Mines, and at the École de Médécine. At the age of nineteen he assisted in establishing the Société Philomatique, and in 1790 he visited England for a scientific examination of the mines and mining processes and pottery works of Derbyshire. One of the results showed itself on his return to France by his publication of a 'Mémoire sur l'Art de l'Émailleur,' in which improvements were suggested. He then became assistant for a time to his uncle, who was chemical demonstrator at the Jardin des Plantes.

By the requisition for military service which called every Frenchman to the frontier, Brongniart was attached as apothecary to the army of the Pyrenees, and for fifteen months he enjoyed opportunities, which he turned to good account, of studying the botany, zoology, and geology of the mountains. Having however been suspected of favouring the escape of the naturalist, Broussonnet, he was imprisoned; but the ninth Thermidor restored him to liberty. He returned to Paris, and was employed as engineer under the Agency of mines. Next he was chosen professor of natural history at the École Centrale des Quatre Nations; and in 1800 he was appointed director of the porcelain manufactory at Sèvres, which office he held for the rest of his life. He owed it to his paper on enamelling, which having been read by Berthollet, procured him the recommendation of that distinguished chemist.

In 1807, at the instance of the Imperial University, Brongniart published his 'Traité élémentaire de Minéralogie,' which is described as "one of the best, and in particular one of the clearest and most practical" then known. It became a text-book for lecturers; and it exhibits the originality and lucidity which had been remarked in the author in his early years. Pursuing his zoological researches, he studied the freshwater formations of Auvergne, and revisited England to study the corresponding formations of this country. It was he who established the four divisions of reptiles, and first gave the names *Saurians*, *Batrachians*, *Chelonians*, and *Ophidians*, by which they are now familiarly known. To him naturalists owe the name *Trilobite*, and a basis of classification for those singular *Crustacea*. It has been the starting-point for all subsequent works on the subject.

Brongniart's studies rendered him the congenial associate of Cuvier; he helped to classify the Montmartre fossils, and in 1810 appeared the joint publication 'Essai sur la Géographie Minéralogique des Environs de Paris.' It was reprinted in the following year, with important additions, and has ever since been recognised as the classical type of similar works. It confirmed Brongniart's reputation, and in 1815 he was elected a member of the Academy of Sciences of the Institute, and a foreign member of the Royal Society of London.

In 1817, accompanied by his son and one of his pupils, he made a scientific tour to Switzerland and Italy, during which, by his discoveries and generalisations, he strengthened his claim to be considered as "the legislator in fossil zoology." All the new results obtained were included in a third edition of the 'Essai,' published in 1822. In 1824 he travelled to Sweden, and with Berzelius for his companion and interpreter, laid down the first foundations of a classification of the most ancient fossiliferous formations, and gathered materials for a memoir on the erratic blocks. He afterwards put forth his clear and ingenious views on volcanoes, particularly of Vesuvius, and an original memoir on the 'Ophiolithes of the Apennines.'

With all this activity Brongniart did not neglect his duties as director of the national manufactory of porcelain; his journeys and labours to acquaint himself with the best processes and materials would alone have sufficed to occupy any ordinary man. The results of his long experience appeared in 1845 in his 'Traité des Arts Céramiques.' And carrying out his earliest researches on enamelling, he revived at Sèvres the almost lost art of painting on glass. He found time moreover for a diligent share in the affairs of the Institute, and in promoting the interests of science, and the views of scientific inquirers. He died on the 14th of October, 1847.

Brongniart was a foreign member of the Geological Society of London, and other learned societies. His writings are to be found in the 'Mémoires de l'Académie des Sciences,' 'Annales des Mines,' 'Annales de Chemie,' and 'Annales des Sciences Naturelles.' Many have been published in a separate form. Among them 'Essai d'une Classification des Reptiles,' 1805; 'Essai sur une Détermination et une Classification minéralogique des Roches mélangées,'' 1813; 'Mémoire sur les Corps organisés fossiles nommés Trilobites,' 1814; Histoire Naturelle des Crustacés fossiles sous les Rapports zoologiques et géologiques,' 4to, 1822 (jointly with Desmarest); 'Introduction à la Minéralogie,' 8vo, 1825; 'Tableau des Terrains qui compose l'Écorce du Globe,' 8vo, 1829; 'Premier Mémoire sur les Kaolins, ou Argiles à Porcelaine,' 4to, 1839; 'Second Mémoire sur la Nature et l'Origine de cette sorte d'Argile,' 4to, 1841.

(*L'Institut.; Biog. Univ.; Proc. Royal Soc.; Journal Geo. Soc.*)

BRONTÉ, CHARLOTTE (MRS. NICHOLLS, better known by her pseudonym CURRER BELL), was born April 21st, 1816, at Thornton, in the parish of Bradford, in the West Riding of Yorkshire, of which her father, the Rev. Patrick Bronté, had then the living. He afterwards held the living of Haworth, also in the West Riding, about four miles from Keighley. Mr. Bronté removed from Thornton to Haworth, February 25, 1820. Charlotte Bronté and her sister Emily, in February, 1842, went to Brussels, in order, by acquiring a better knowledge of the French language than they already possessed, to qualify themselves for keeping a school. On the death of their aunt at the end of 1842, they returned to Haworth. Emily Bronté remained at home, but Charlotte returned to Brussels in the beginning of 1843. She was engaged as teacher of English in a school for young ladies, completed her education in French, made considerable progress in German, and returned to Haworth at the end of 1843. The novel entitled 'Jane Eyre, by Currer Bell,' published in 1847, was the first production of Miss Bronté's pen which caught public attention, but it was not her first venture in authorship. Her first essay was in a little volume of 'Poems by Currer, Ellis, and Acton Bell,' published in 1846. The poems passed almost unnoticed, but the success of the novel was immediate and extraordinary; and curiosity was for some time exercised not only as to its paternity, but as to the sex of its author; many separate passages and traits bearing manifestly the traces of a woman's mind, yet the general cast of thought, it was urged on many sides, was as evidently unfeminine. The appearance almost simultaneously of other stories, marked by the same peculiarities of thought and general style, with the names of Acton Bell and Ellis Bell as their authors, served to stimulate still further the public curiosity, and when it was confidentially announced that Currer Bell was the daughter of a clergyman in a remote part of Yorkshire, and that Acton and Ellis Bell were her sisters, there was a general feeling of surprise almost amounting to incredulity. In truth, 'Jane Eyre' is a remarkable work, and as the production of the daughter of a country clergyman, it would be still more remarkable if it were as necessary as sometimes seems to be supposed, to have a wide acquaintance with society to obtain intimate knowledge of the human heart, and to portray diversities of character. 'Jane Eyre' was followed in 1849 by 'Shirley,' and that in 1853, by 'Villette,' both marked by the same vigour of intellect, and keen, in fact morbidly keen dissection, of character and motives, though with less of that somewhat wayward originality which had in her first work called forth so much adverse criticism, but at the same time had excited such intense interest.

What is unpleasant, painful, morbid in these powerful novels may, there can be little doubt, be set down to the action of disease upon an overwrought and intensely susceptible mind. Young as she was at her death, she was the last survivor of the three gifted sisters, and in fact of all her father's children. Emily Bronté (Ellis Bell), the author of 'Wuthering Heights,' and next to Charlotte the most gifted of the sisters, died Dec. 19, 1848. Anne Bronté (Acton Bell), the author of 'Agnes Grey,' died May 28, 1849. Miss Bronté married in June, 1854, the Rev. Arthur Bell Nicholls, her father's curate; but pulmonary disease, the same insidious malady which had carried off her sisters, had already marked her as its victim. She died at the parsonage, Haworth, on the 31st of March, 1855; and was laid beside her sisters, in the crowded but quiet churchyard there. In 1857 appeared 'The Professor, a Tale by Currer Bell,'—a novel written in 1848, but laid aside and much of it recast to form 'Jane Eyre.' "The life of Charlotte Bronté." 2 vols. sm. 8vo., 1857, has been published by Mrs. Gaskell.

BROSSÆA, a genus of plants, belonging to the natural order *Ericaceæ*. The fruit of *B. coccinea*, like that of *Gaultheria procumbens* and *Arctostaphylos alpina*, is succulent and grateful to the taste, and sometimes used as food.

BROWN, CAPT. SIR SAMUEL, R.N., was born in London in 1776. At the age of eighteen he entered the navy, and served with distinction during the French war. He passed through the successive grades in his profession, rising to the rank of commander in 1811, and accepting that of retired captain in 1842.

It is however as a civil engineer that Sir Samuel Brown has claim to remembrance. To his ability and ingenuity may be ascribed the introduction into use of both chain-cables and suspension-bridges. The idea of substituting iron cables in the place of those made from hemp, first occurred to M. de Bougainville, whose account of a voyage which he made round the world was published in 1771. [BOUGAINVILLE, LOUIS A. DE.] But the idea was not put in practice; and though a patent was taken out by a Mr. Slater, a surgeon in the British army, in 1808, little was done until Captain Brown carried out a series of experiments, the results of which were deemed so satisfactory that the Board of Admiralty ordered iron chain-cables to the tried in the navy. Their use, it need hardly be added, has since become general. Iron suspension-bridges had, as is well known, been erected in several instances both in America and Europe before Captain Brown directed his attention to them. But they were generally regarded as insecure, except for crossing narrow streams, until Brown introduced his improved method of constructing chains for suspending the roadway. Instead of chains of the ordinary construction, he proposed to form them of long bars of flat or round iron, pinned together by short links and bolt-pins. He made a model of his invention in 1813, having however designed and prepared specifications for suspension-bridges much earlier, but he did not obtain his patent till 1817. Brown's plan was soon after adopted in principle by Telford (who had in the first instance proposed to use cables of merely the ordinary construction) in the erection of his magnificent bridge over the Menai Strait. The first extensive bridge erected wholly on Captain Brown's plan was the Union bridge which crosses the Tweed at Berwick, in which the length of the chord-line between the points of suspension is 449 feet: it was opened for use in July 1820. In 1821 Captain Brown commenced the construction of the Trinity suspension-pier at Newhaven near Edinburgh. He subsequently erected several other bridges and piers, but it may suffice to mention, as his great work, the suspension-pier at Brighton, which consists of four openings of 255 feet each, with a deflection of 18 feet. The Brighton pier has suffered considerable damage on two occasions in severe storms, but, as subsequently strengthened, it has successfully withstood others of excessive force.

Captain Brown was knighted in 1835. He died on the 15th of March 1852.

BRUCIA. [CHEMISTRY, *S.* 1.]

BRUNEL, SIR MARK ISAMBARD, was born on April 25, 1769, at Hacqueville, in the department of L'Eure, a few miles from Rouen. His parents, who were respectable agriculturists, had four children, of whom he was the eldest. From his earliest boyhood he showed a decided inclination for mechanical pursuits; and on being sent to the seminary of St. Nicaise at Rouen, preferred the study of exact science, mathematics, mechanics, and navigation, to the classics; and during the vacations, which he passed at home, he was never happier than when busying himself in a joiner's workshop. He familiarised himself with the tools and some of their applications, and when but twelve years old was already a proficient in turning and in the construction of models—ships, machines, and musical instruments. All this constructiveness was little gratifying to his father, who would have preferred to see his son in the church or in the merchant's office.

On leaving the seminary at the age of fifteen, Brunel passed some time in the family of M. Carpentier, a friend of his father, at Rouen; and went through a regular course of lessons in drawing, perspective, and hydrography. He took so much interest in the astronomical part of his nautical studies, that on his visits home he set himself to observe the stars, greatly to the astonishment of the villagers. He made an octant, guided by the one belonging to his tutor, and a treatise on navigation; and finding its results unsatisfactory, he studied the instrument, and constructed another of ebony, which enabled him to take trustworthy observations.

Influenced perhaps by M. Carpentier, who had been a trading captain, Brunel enlisted as a sailor in 1786, from which date up to 1793 he made several voyages to the West Indies. He was remarked for the skill, intelligence, and good humour with which he discharged a seaman's duties; won good opinions from everybody; and astonished his companions by using instruments of his own construction, and by making a pianoforte while the ship once lay at Guadaloupe. During a visit to Paris after his last voyage in 1793, Brunel ventured to raise his voice in one of the political clubs against the ferocious doctrines there actively promulgated, and thereby endangered his personal liberty; but, obtaining permission from the minister of marine, he escaped to America, hoping to find employment for his abilities in a new country.

Brunel had not been long in New York when he joined a party of his countrymen who were about to explore the wild and unsettled regions bordering on Lake Ontario, to survey the lands of a French company. The operations were carried on for two months, during which the party, seven persons in all, Brunel being leader, encamped in the woods, finding a charm in the adventurous nature of their work. In 1794 Brunel was appointed, conjointly with one of his fellow-explorers, to survey for the canal which now connects Lake Champlain with the river Hudson at Albany. With this task, in which his fertility of invention and readiness in overcoming difficulties were strikingly manifested, his career as an engineer may be said to have begun. When designs for the houses of congress were called for he sent in one which, though acknowledged as the best, was rejected as too costly and magnificent for simple republicans. He afterwards acted professionally as an architect, and among other works built and fitted up one of the principal theatres of New York. It has since been burned down. He was employed on the forts erected for the defence of the city, and in the establishment of an arsenal and foundry, where his ingenious contrivances for boring cannon and moving large masses of metal with facility, showed how successfully he could bring new ideas to bear on the work immediately in progress.

In the family of his friend Carpentier, at Rouen, Brunel had become acquainted with Miss Sophia Kingdom. This acquaintance, and a desire to work among the scientific engineers of Europe, drew him to England. He married shortly after his arrival; and to initiate his career in this country, produced an autographic machine, designed to copy drawings, maps, and written documents. Soon afterwards, he submitted to government a plan for making block-pulleys for ships by machinery, and was employed to carry it into execution in the dockyard at Portsmouth. The ingenuity of this contrivance is not less remarkable than the accuracy and economy with which its operations are performed. It comprises, so to speak, sixteen different machines, all driven by the same steam-power; seven of which cut and shape logs of elm or ash into the shells of blocks of any required size, while nine fashion stems of lignum-vitæ into pulleys or sheaves, and form the iron pin, which being inserted, the block is complete. Four men with this machine turn out as many blocks as four-score did formerly, and at less cost. The supply has never failed, even in time of war, though 1500 blocks are required in the rigging of a single ship of the line. Results so satisfactory produced a corresponding liberality on the part of government, and the inventor was rewarded beyond his expectations. The steam saw-mill in Chatham dockyard was erected by Brunel. The success of the circular saws there introduced led him to further improvements, by which in the cutting of veneers double the usual number could be obtained. He invented a machine for making seamless shoes for the army, which, after two years' trial, was given up from an economical motive. Among other inventions may be enumerated a machine for making wooden boxes; for nail-making; to twist, measure, and form sewing cotton into hanks; for ruling paper; a contrivance for cutting and shuffling cards without the aid of fingers, produced in reply to a playful request of Lady Spencer's; a hydraulic packing-press; new methods and combinations for suspension-bridges; and a process for building wide and flat arches without centerings. He was employed in the construction of the first Ramsgate steamer, and was the first to suggest the advantages of steam-tugs to the Admiralty. He constructed a machine for using carbonic acid gas as a motive power, and, assisted by his son, carried on a series of experiments, for more than ten years, in the endeavour to bring it to perfection. Most of the mechanical difficulties were overcome; but although an intense power was obtained, and with a very low temperature, the economical advantages as compared with the cost of the vapour of water, did not appear to be such as to compensate for the increased cost of the machinery, and the usual difficulties in its use.

Brunel's works of engineering construction are to be found in different parts of the United Kingdom. That by which he is most popularly known is the Thames Tunnel. This great work, commenced in March, 1825, was successfully accomplished, notwithstanding the accidents, obstacles, and overwhelming disasters that hindered its progress. The water broke in more than once, and flooded the whole of the excavations. Brunel, however, proved himself equal to each emergency, and his persevering genius at length triumphed. The tunnel was opened to the public in March, 1843.

Brunel was elected a Fellow of the Royal Society in 1814, and was chosen on the council, and appointed vice-president in 1832-33. He was a member also of other scientific societies and institutions. The honour of knighthood was conferred on him in 1841. With advancing years he became subject to a disease of which he had felt the first approaches while completing the tunnel, and he died in December, 1849, having nearly reached the venerable age of eighty-one. His life is an example of what may be accomplished by genius, seconded by industry. The high character of his inventions, their essential usefulness, give them especial claims to consideration. In the words of a French writer, these have gained for him "the celebrity that now distinguishes his name, the admiration of men of learning and of labour, and the affectionate remembrance of all those who, fortunate enough to know him personally, could appreciate his simple and noble character."

(*Travaux de l'Académie de Rouen; Proceedings of the Royal Society; Proceedings of the Institution of Civil Engineers; Quarterly Review.*)

BRUSA. [BURSA.]

BRYDGES, SIR SAMUEL EGERTON, BART., was born November 30, 1762, at Wootton Court, Kent. His father was Edward Brydges, Esq., of that place: his mother was the daughter and co-heiress of the Rev. W. Egerton, LL.D., Prebendary of Canterbury, &c. Young Brydges was educated first at Maidstone Grammar School, and afterwards at the King's School, Canterbury, whence he proceeded to Cambridge, entering at Queen's College in October, 1780. He left the University without taking a degree; entered himself of the Middle Temple in 1782, and in 1787 was called to the bar. He never practised, however; but having married in 1786, devoted himself to literature, and especially to genealogical and bibliographical studies. His earliest appearance in print was as a poet, a volume of 'Sonnets and other Poems' being published by him in 1785. Soon after the death of the last Duke of Chandos, in 1790, his uncontrolled imagination, excited perhaps by his somewhat superficial genealogical inquiries, a large share of vanity, and a passion for titles, led him to stimulate his elder brother the Rev. E. T. Brydges, to prefer a claim to the barony of Chandos, alleging his descent from the first Brydges or Bridges, who bore that title. Litigation was protracted till June 1803, when the House of Lords decided that the petitioner had not made out his right to the title. Henceforth every thing which Sir Egerton Brydges wrote, was more or less a wail for the lost dignity, and after the death of his brother, he always wrote himself 'per legem Terræ Baron Chandos.' The worthlessness of his claim is amply shown in a 'Review of the Chandos Peerage Case, adjudicated in 1803, and of the pretension of Sir S. E. Brydges, Bart., to designate himself per legem Terræ Baron Chandos of Sudeley. By George F. Beltz, Esq., Lancaster Herald,' 8vo, 1834. By improvident expenditure in the purchase and improvement of the estate of Denton, Kent, Mr. Brydges had early become involved in his pecuniary circumstances, and in 1810 he removed to Lea Priory, the seat of his son, where he amused himself by setting up a private press, and superintending the printing of various pieces in prose and verse of his own writing, and reprints of scarce old books. After several unsuccessful efforts to get into parliament, he was elected in 1811 for Maidstone, which place he represented till 1818. In 1814 he obtained a patent of baronetcy. On losing his seat in parliament he retired to the Continent, where he remained till his death, which occurred at Compagne Gros Jean, near Geneva, September 8, 1837.

Besides the works above enumerated, and several pamphlets on population, wealth, &c., Sir Egerton Brydges wrote 'The Topographer,' 4 vols. 1789-90 (in which he was assisted by the Rev. Stebbing Shaw); the novels of 'Mary de Clifford,' (1792); 'Fitz Albini,' a kind of fictious autobiography (1798); 'Le Forester' (1802); "Coningsby' (1819); and 'The Hall of Hellingsey' (1821); 'The Censuria Literaria,' a bibliographical work of some value, 10 vols. 8vo, 1805-1809; 'The British Bibliographer,' written in conjunction with Joseph Haslewood, 4 vols. 1810-12; 'Restitua, or Titles, Extracts, and Characters in Old Books revived,' 4 vols. 1814-16; a new edition of 'Collins's Peerage,' 9 vols. 1812; 'The Ruminator,' and 'The Wanderer,' two series of essays, 1813, 1814; 'Occasional Poems,' 1814; 'Bertrand, a Poem,' 1815: 'Excerpta Tudoriana, or extracts from Elizabethan Literature,' 2 vols. 1819; 'Res Literariæ,' 3 vols. 1820-21; 'Letters from the Continent,' 1821; 'Letters on Lord Byron,' 1822; 'Gnomica, or Detached Thoughts;' 'Odo, Count of Lingen, a Poem;' 'Theatrum Poetarum,' 1824; 'Recollections of Foreign Travel,' 1825; 'The Lake of Geneva,' 2 vols. 1832; 'Imaginary Biography,' 2 vols.; and 'The Autobiography, Times, Opinions and Contemporaries of Sir Egerton Brydges, K.T.' (per legem Terræ) Baron Chandos of Sudeley, &c., 2 vols. 8vo, 1834.

BRYONIN. [Chemistry, *S.* 1.]

BRYOZOA, a name proposed by Ehrenberg for those Zoophytes in which a higher organisation is indicated by the presence of separate orifices for the mouth and anus. The same naturalist has applied the term *Anthozoa* to those Polypes in which the mouth and vent have but one orifice. The distinction between these two great families seems to have been observed by Mr. J. V. Thompson previously to the publication of Ehrenberg's name, hence his designation for this family, *Polyzoa*, is more generally received. Other names have been given to this interesting family of Zoophytes. Professor Owen calls them Molluscan Zoophytes, on account of their structure being supposed to ally them to the *Mollusca*. For the same reason they have also been called Ascidioid Polypes (*P. Ascidioida*). Milne-Edwards has also called them Tunicated Polypes (*Polypes tuniciens*). Dr. Farre in a paper in the 'Philosophical Transactions,' 1837, proposes to call them *Ciliobrachiata*, in reference to the ciliated character of their tentacula. Mr. Busk in his Catalogue of the Zoophytes in the Collection of the British Museum, adopts Mr. Thompson's designation of *Polyzoa* as prior to that of any others. [Polyzoa.]

BUCH, LEOPOLD VON, a distinguished geologist, was born on the 25th April, 1774, at Stolpe, in the Uckermark (Brandenburg). He came of an ancient and noble family, which reckons among its members not a few authors and statesmen. After the usual course of education, he became a student in the Prussian department of mines, and was marked for the earnestness of his scientific pursuits. In 1790 he entered the Mining Academy at Freiberg, where he had Humboldt for a companion, and where Werner, its eminent founder, taught the then novel science of mineralogy, in a way so interesting and genial, as thoroughly to enlist the sympathy of his pupils. Under his teachings grew up a school of young philosophers, destined to widen and confirm his reputation, and amend his errors, among whom Von Buch was one of the most conspicuous. In 1792 the publication of his 'Mineralogical Description of the Carlsbad region,' formed the first of that series of valuable papers with which he enriched his favourite science for the rest of his life—all distinguished as much by conscientious inference, as by perfection of observation. Next appeared his 'Versuch einer mineralogischen Beschreibung von Landeck,' describing a little-known part of the mountains of Silesia; followed shortly afterwards by 'Versuch einer geognostischen Beschreibung von Schlesien,' with (for that time) a very advanced geognostical map of the country. These works are written in accordance with the views of his great master, in which the Neptunian theory prevailed; and it is no small proof of the accuracy of the observed facts that they are now easy to be reconciled with the present more enlightened theory.

In 1797 Von Buch and Humboldt met in Styria, and spent some time in geological excursions among the Alps, and passed the winter together in Salzburg in observation and verification of natural phenomena. In the following year Von Buch travelled alone, on foot, to Italy, and furnished to scientific periodicals descriptions of the geology of the countries he traversed, in which, besides the clearness of perception, there began to appear doubts as to whether the Wernerian doctrine were tenable in its integrity. He grew mistrustful of his former views. Writing from Rome to his friend Von Moll, he says: "Make the finest and surest observations, and then go a few miles farther on, and you will find occasion, upon grounds just as certain, to maintain the very opposite of your former conclusions."

In February 1799, Von Buch arrived at Naples, and betaking himself to the study of Vesuvius, described the phenomena in that picturesque and eloquent style which among other qualities characterised his writings. In 1802 he visited the volcanic region of Auvergne. He revisited Italy, and was present at the eruption of Vesuvius in 1805. The results of these five years of observation were published in two volumes 'Geognostischen Beobachtungen auf Reisen durch Deutschland und Italien,' 1802-9, in which, though reluctant to throw doubt on Werner's conclusions, he abandons his view as to the action of water, and declares basalt to be a rock of volcanic origin.

For the next two years, from 1806 to 1808, Von Buch travelled into Scandinavia, and made some of his most important geological discoveries. He was the first to establish the fact of the slow and continuous upheaval of the Swedish coast above the sea-level; and he made valuable observations in climatology and the geography of plants, as may be seen in his narrative 'Reise durch Norwegen und Lappland,' two vols. 1810: of which an English translation was published with notes by Professor Jameson in 1813.

The more interest attaches to these journeys as they were performed on foot. Few who met Von Buch walking with unsteady gait, his head bent forward, wearing even in summer a great coat with numerous pockets to contain maps, specimens, his hammer and note-book, would have believed that they beheld one whom Humboldt describes as "the greatest geologist of our age; the first to recognise the intimate connection of volcanic phenomena and their mutual interdependence in regard to their effects and relations in space." Possessed of sufficient means, Von Buch could gratify his inclination for travel, and for the encouragement of others, especially youthful students, less fortunate than himself.

In 1815 he sailed from England (accompanied by the Norwegian botanist Christian Smith, who afterwards met with an untimely death in Tuckey's expedition to the Congo), for a geological exploration of the Canary Islands. In 1824 appeared the first geological map of Germany in forty sheets, of which Von Buch, though anonymous, was the compiler and author. He had visited the basaltic islets of the Hebrides and the Giant's Causeway on his return from the Canaries, and in 1825 he published 'Physikalische Beschreibung der Canarischen Inseln,' with an atlas, of which the subsequent works, 'Ueber den Zusammenhang der basaltischen Inseln und Ueber Erhebungs-Krater,' and 'Ueber die Natur der vulkanischen Erscheinungen auf den Canarischen Inseln und ihre Verbindung mit andern Vulkanen der Erdoberfläche' may be regarded as supplementary. These volcanic researches alone would suffice to establish his reputation. The science of volcanoes,—the fruitful source of many later advances—is therein developed and placed on a sure basis. He shows how the phenomena of upheavals are traceable to craters of elevation, and demonstrates the action of fire; and states his conviction that "the ancient seas have not rolled away over the mountain chains, but that the mountain chains have been upheaved into the atmosphere, bursting through the series of strata in long lines—fissures—and that these upheavals have taken place at different geological epochs."

Von Buch's life is strikingly manifest by his labours. His papers in the 'Abhandlungen' of the Berlin Academy of Science, would alone form several large volumes. They exhibit the development of his scientific views from first to last. In 1806 he had suggested certain ideas in his paper 'Ueber das Fortschreiten der Bildungen in der Natur,' as to the progress of forms in nature, and when past the age of fifty, he showed how the ideas had ripened in his mind by his papers on the *Ammonites*, *Cystidæ*, *Terebratulæ*, *Orthis*, *Productus*, and others, accomplishing for the geological branch of palæontology what Cuvier had accomplished for the physiological branch. In the words of the late Edward Forbes, it was Von Buch "who first developed the idea of the chronomorphosis of genera, the great leading principle of natural history applied to geology." He pointed the way moreover to a new field of fossil botany in the important conclusions which he shows to be deducible from the nervation of the leaves of fossil plants. And in his writings on climate, on hail, the temperature of springs, and the geography of plants—guiding principles apparent in all—he proves himself an able physicist as well as geologist.

In his many journeys Von Buch visited Sweden and Norway, and Auvergne a second time, and any excuse sufficed to draw him to Switzerland. He would leave his house in Berlin without telling any one of his intention, remain away for weeks or months, and return as unexpectedly. He liked to find out and make the acquaintance of geologists of eminence, and for this purpose he attended the meetings of naturalists on the continent and of the British Association in England. He was present at the Werner Festival, celebrated with so much pomp at Freiberg, in 1850. He never married, was somewhat eccentric in his habits, but always serious as regards science. When asked for his titles he was accustomed to reply, 'Royal Prussian Student of Mines.' He was created a baron, a knight of the Order of Merit (Berlin), and of the Red Eagle, and held the appointment of royal chamberlain in the court of Prussia. He was a member of the Academy of Sciences of Berlin, and of the chief scientific societies on the continent and elsewhere. In 1828 he was elected a foreign member of the Royal Society of London, and in 1840 was chosen one of the eight foreign associates of the French Academy of Sciences. He died at Berlin, after a few days' illness, on the 4th of March, 1853.

"Von Buch was a sower," says E. Forbes, in his anniversary address to the Geological Society. "He went about the world casting the seeds of new researches and fresh ideas, wherever his prophetic spirit perceived a soil adapted for their germination. The world of science has gathered a rich harvest through his foresight. He is the only geologist who has attained an equal fame in the physical, descriptive, and natural history departments of his science. In all these he has been an originator and a discoverer. In every subdivision of all three he has been a suggester—a high merit in itself."

The 'Abhandlungen' of the Berlin Academy of Sciences, Leonhard's 'Taschenbuch für Mineralogie,' and other German scientific periodicals, contain most of Von Buch's papers. Among his other works are—'On the Petrifactions collected by Humboldt in America'—'Die Bären Insel . . geognostisch beschrieben,' 4to, 1847; 'Ueber Ceratiten besonders von denen die in Kreidebildungen sich finden,' 8vo; besides those above-mentioned. A French translation of his 'Canary Islands' was published at Paris in 1836.

(Hoffman, *Geschichte der Geognosie*; *Monatsbericht, Acad. Berlin*; *Edin. New Phil. Journ.*; *Journ. Geol. Soc.*)

BUCHOLZITE, a mineral closely allied to Sillimanite. According to Thompson it is composed of—

Silica	46·4
Alumina	52·9

A specimen from Chester, Pennsylvania, gave Erdmann—

Silica	40·1
Alumina	58·9
Protoxide of Manganese	(a trace)

It is found at Fassa, in the Tyrol, and in several districts in the United States.

BUCIDA, a genus of plants belonging to the natural order *Combretaceæ*. One of the species, *B. Buceras*, yields a bark which is used in tanning.

BUCK. [DEER.]

BUCKINGHAM, JAMES SILK, was born in 1786, in the marine village of Flushing, near Falmouth, in Cornwall. His father had been a seafaring man, but then occupied a farm, and died while Buckingham was yet a boy. His mother sent him to school at Falmouth, and was desirous of bringing him up to the church, but he preferred going to sea, and made a few voyages to Lisbon, in the last of which the ship was captured by the French, and the crew made prisoners. After some delay they were set at liberty, but on their way home were impressed for the British navy. Buckingham however escaped from the press-gang, returned to Cornwall, and entered into an engagement with a bookseller at Devonport, in whose employ he remained about four years; and here he seems to have gained some knowledge of the trade of a printer. He however took to the sea again on board a king's ship, but deserted, returned home, tried the law, and abandoned that profession also. He married before he was twenty years of age. About this time his mother died, leaving him a considerable property in charge of trustees. He then commenced business as a bookseller, on borrowed money. One of his trustees robbed him of his property, his business proved a failure, and he was left destitute with a wife and female child.

Leaving his wife in the care of her friends, Buckingham then went to London, in the hope of getting an engagement as captain of some vessel; but having waited till he was almost in a state of starvation, he obtained employment in a printing-office, and was afterwards engaged at the Clarendon press, Oxford. At length he was appointed captain of a West-Indiaman, and continued four or five years in that trade. He afterwards was a captain in the Mediterranean trade, and made many friends at Malta and Smyrna. He then resolved to settle at Malta as a ship-owner and merchant, and having purchased a cargo of goods, he sailed from London in April 1813. When the vessel reached Malta, the plague had broken out there, and no persons were allowed to land; the cargo however was taken on shore, and the ship then proceeded to Smyrna. While he remained at Smyrna, many failures took place in Malta, and he among others lost all his property.

Buckingham then resolved to try his fortunes in Egypt, and left Smyrna for that purpose, August 30, 1813. He was well received at the British Embassy, and was introduced to Yuseff-Boghos, an Armenian, the principal agent of the pasha, Mohammed Ali, who was then absent on an expedition in Arabia. At this time there was much speculation about renewing the commerce with India through the Red Sea, and making a navigable canal from that sea to the Mediterranean. Buckingham had a despatch forwarded to the pasha, in which he offered his services to examine the Isthmus of Suez for an eligible track, and to trace as far as possible the course of the ancient canal. His offer, after some delay, was accepted, and having in the meantime ascended the Nile as far as the cataracts, he started from Keneh on the Nile, with a single attendant, for the purpose of travelling to Kosseir on the Red Sea. His attendant deserted him on the route, he was robbed of everything he possessed, and was left entirely naked. He was befriended by a poor Arab, who supplied him with some scanty covering, and at length reached Kosseir, whence however he was obliged to return to Keneh, and thence to Cairo, without effecting anything. At Cairo he was introduced to the pasha, Mohammed Ali, with whom he had some long conversations, and again set out February 15, 1814, for the same purpose as before; he reached Suez, and traced the ancient canal as far as it had not been filled up and obliterated. After his return to Cairo the pasha had changed his mind as to the canal, but gave him a commission to purchase ships for him in India, and to encourage a trade between India and Egypt.

Mr. Buckingham then left Cairo for the purpose of proceeding to Bombay by the Red Sea, and reached Suez, October 18, 1814, and Bombay April 6, 1815, having been delayed in Arabia. He found the merchants at Bombay distrustful of the pasha of Egypt, and unwilling to trade with him; he therefore accepted an engagement from the agent of the Imaum of Muscat as commander of a ship of 1200 tons burden, which was intended to trade to China on the Imaum's account. When this was made known to the civil authorities at Bombay, and also that he had no licence from the East India Directors to reside in India, he received an order to return to England, but, after much remonstrance on his part, was allowed to return to Egypt in one of the East India Company's ships, which was about to proceed up the Red Sea for surveying purposes. He accordingly sailed from Bombay June 27, 1815, was landed at Suez, and reached Cairo November 20, in the same year. After another interview with the pasha he received a firman and other assistance, by the aid of which he travelled overland to India through Syria, Mesopotamia, and Persia, dressed in Turkish costume, and speaking Arabic, which, he states, is more or less understood in all those countries.

From this period his proceedings in the East are imperfectly known. In 1816 he was in Calcutta, and established a journal there, but the boldness of his censures of the maladministration of Indian affairs led to his expulsion from the presidency of Bengal; his printing-presses were seized, and he was compelled to return to England.

After his arrival in London, Mr. Buckingham delivered many lectures against the monopoly of the East India Company, and in support of opening the trade to China. A liberal subscription was entered into to re-imburse him for the losses he had sustained by the suppression of his journal. He established in London 'The Oriental Herald,' which became the precursor of several similar journals, and 'The Athenæum,' which is now the leading literary journal among those which are published weekly. In 1822 he published his 'Travels in Palestine;' in 1825 'Travels in Arabia;' in 1827 'Travels in Mesopotamia;' in 1830 'Travels in Assyria and Media.' At a later period he made several tours through various parts of Europe and of North America. He published 2 vols. on Belgium, the Rhine, and Switzerland: and 2 vols. on France, Piedmont, and Switzerland. He was nearly three years in America, and traversed the United States in all directions, from Maine to Louisiana. His 'Travels' in America comprise:—3 vols. on the Northern States; 3 vols. on the Slave States; 3 vols. on the Eastern and Western States; and 1 vol. on Canada, Nova Scotia, and New Brunswick. Much of these volumes however consists of statistics, and a great variety of other matters of compilation. Their literary or other worth is very small.

In 1832 Mr. Buckingham was elected member of parliament for Sheffield, and he retained his seat till 1837. He was a supporter of liberal policy, and especially of social reforms. For many years his chief occupation was the delivery of public lectures in various parts of the country. His choice of subjects, style, and especially his manner, were popular and pleasing, and his lectures were always fully attended. In 1843 he was the chief agent in establishing a literary club called the British and Foreign Institute, of which he was appointed secretary, but which ceased to exist in about three years. In 1849 he published 'National Evils and Practical Remedies,' 1 vol., in which he expounded his views on many subjects connected with the public welfare. He was a zealous advocate of the temperance movement, and he was President of the London Temperance League formed in 1851. In 1855 he published the first two volumes of his 'Autobiography,' and he intended to publish the next two volumes in the course of the same year, but he closed his life of extraordinary vicissitude and adventure on June 30, 1855. The court of directors of the East India Company had made amends for their former ill-treatment by granting him a pension, which he enjoyed for a few of the last years of his life, and which is continued, we believe, to his widow, who is still living, having been his wife for fifty years. He had also for a few years a pension of 200*l.* a year from the civil list. The manuscript journals of his various travels occupy, as he states in his 'Autobiography,' 28 folio volumes, closely written.

BUCKLAND, THE VERY REV. WILLIAM, Dean of Westminster, an eminent geologist, was born at Axminster, Devon, in 1784. He was educated at St. Mary's College, Winchester, and from thence, in 1801, entered Corpus Christi College, Oxford, as scholar. In 1808 he was elected Fellow of this college. In 1813 he was appointed reader in mineralogy, and in 1818 reader in geology in Oxford University. His geological lectures were characterised by such clearness and comprehensiveness of description, and such apt illustration, that they met with brilliant success. Geology, as a science, was then in its infancy, and much of its subsequent vigorous advancement is due to Dr. Buckland's lectures.

The Geological Museum at Oxford owes its chief excellence to Dr. Buckland's industry in procuring and arranging specimens, particularly of the remains of the larger Fossil Mammalia, and other animals from the caves in different parts of England and Germany. He spared neither pains nor expense in travelling to make the collection worthy of the university and the science it was intended to illustrate, as exemplified in his 'Descriptive Notes,' with sections of 50 miles of the Irish coast, made conjointly with the Rev. W. Conybeare, dean of Llandaff, during a tour in Ireland in 1813, and published in the third volume of the 'Transactions of the Geological Society.'

In 1818 Dr. Buckland was elected a Fellow of the Royal Society. In 1820 he delivered a lecture before the university, which was afterwards published under the title 'Vindiciæ Geologicæ, or the Connexion of Geology with Religion explained.' The object of the lecture was to show that the study of geology has a tendency to confirm the evidences of natural religion, and that the facts developed by it are consistent with the accounts of the Creation and Deluge as recorded in the Mosaic writings.

In 1822 he communicated to the Royal Society an 'Account of an assemblage of Fossil Teeth and Bones of elephant, rhinoceros, hippopotamus, bear, tiger, hyæna, and sixteen other animals, discovered in a cave at Kirkdale, Yorkshire,' and for which in the same year the society awarded him their highest honour, the Copley medal. This paper was made the foundation of a treatise published in 1823 'Reliquiæ Diluvianæ, or Observations on Organic Remains attesting the Action of an Universal Deluge,' which proved of essential service in the promotion of geological science.

In 1825 Dr. Buckland was made canon of Christ Church, Oxford. He was president of the British Association at their second meeting at Oxford in 1832. Four years later he published his Bridgewater Treatise, 'Geology and Mineralogy considered with reference to Natural Theology,' 2 vols. 8vo. The discovery of new facts had materially advanced geological science; and modifying in this work the previous diluvial theory, Dr. Buckland brought the weight of his authority to support the views now generally received. One of the most able of his numerous geological writings, as subsequently testified by Murchison and Sedgwick, was a sketch of the structure of the Alps, published in the 'Annals of Philosophy,' in which he showed, for the first time, that many crystalline rocks of this chain are of no higher antiquity than our Lias, Oolitic, and Cretaceous Formations.

The 'Transactions of the Geological Society' contain highly valuable suggestive evidence of Dr. Buckland's skill as a field geologist, as well as a palæontologist, and among them, his description of the south-western coal district of England (1825) may be mentioned as an example. It has stood the test of more than thirty years, and is still appealed to as a standard work.

Dr. Buckland was chosen on the council of the Royal Society in 1827, and in subsequent years up to 1849. He was one of the earliest fellows of the Geological Society, having been elected in 1813, and twice filled the presidential chair. His anniversary addresses are printed in the society's 'Journal.' He was also a Fellow of the Linnæan Society. In 1845 he was made Dean of Westminster; and, coming to reside in London, he was appointed a Trustee of the British Museum in 1847, and took an active part in the meetings of scientific societies, and in the establishment of the Museum of Practical Geology in Jermyn-street. In the year 1850 he was obliged, in consequence of disease of the brain, to relinquish his favourite pursuits, and was never afterwards able to resume them. He died August 14, 1856.

BUFFALO, AMERICAN. [BISON.]

BUGEAUD DE LA PICONNERIE, THOMAS ROBERT, DUC D'ISLY, Marshal of France, was born at Limoges, October 15, 1784. He came of a good family, most of the members of which were among the emigrants of the first revolution. Young Bugeaud, however remained in France, and having chosen a military life, entered the army as a private in 1804. At Austerlitz he was a corporal; the following year he was made sub-lieutenant. He served in the campaign of Prussia and Poland, and was wounded at Pultusk, Nov. 26, 1806. Sent into Spain as adjutant-major he speedily caught the eye of Marshal Suchet, who in his despatches made frequent mention of Bugeaud's merits. He in consequence rose steadily in professional rank till he was made lieutenant-colonel, and appointed to the command of the 14th regiment of the line. On his return to France he was created colonel.

On the abdication of Napoleon I., Bugeaud gave in his adhesion to the restored dynasty; but, with most of the other officers, went over to the emperor on his return from Elba. During the Hundred Days he had the command of a small body of troops, and with it he succeeded in defeating a much superior Austrian force at l'Hôpital-sous-Conflans, June 1815. Upon the second restoration, Bugeaud retired to his estate, where he diligently cultivated the soil, till the revolution of July 1830 called him again into public life. He was elected a member of the Chamber of Deputies, and became an earnest supporter of Louis Philippe, whose confidence he quickly gained, and who made him marshal. In January, 1834, occurred a deplorable event, which caused great excitement in Paris, and rendered Bugeaud extremely unpopular: this was the death of M. Dulong, in a duel between him and General Bugeaud, arising out of some bitter remarks made in the Chamber of Deputies by Dulong in reply to Bugeaud, in a debate on the conduct of Marshal Soult. So great was the exasperation of the Parisians, that the government found it advisable on the occasion of Dulong's funeral to take precautions against an insurrection. A few months later Bugeaud's unpopularity was increased by the decisive measures he took for suppressing the various émeutes which broke out, and especially by having his name coupled with the massacre of the Rue-Transnonain.

In 1837 Bugeaud was sent to Algiers, where he concluded a treaty with Abd-el-Kader, which was much criticised at home, but which served the purpose for which Bugeaud made it—that, namely, of enabling the French commander, by securing the inactivity of the only chief whose prowess and authority were really to be feared, to direct his whole strength against the disunited tribes, and reduce them successively to submission. Bugeaud returned to Paris to give an account of his mission. It soon appeared that Bugeaud knew better how to deal with the Arabs than the officers previously sent; and in 1840, affairs appearing very unpromising, Marshal Vallée was recalled, and Bugeaud was appointed governor-general of the French possessions in Africa. An outline of his proceedings has been given under Algérie, *S.* 1. It will be enough here to observe, that the maxim he was fond of repeating was that "to conquer the Arab you must first become an Arab," and that in accordance with this he set about organising the Zouaves and other irregular soldiers, characterised by their capacity for acting independently as well as in masses, their celerity of motion, and their daring, and who have since become so important a part of the French army; and having established a chain of fortified posts, he was enabled to maintain incessant attacks and surprises, never permitting any body of armed natives to collect without immediately dispersing them, and never allowing any hostile tribes to carry on any of their ordinary agricultural avocations. From his energy and ruthlessness, there was no escape for the uncivilised natives. Attacked in detail, resistance was useless; there was only the choice of submission or destruction. In three years Bugeaud was able to announce that there was no longer an enemy in the field. Abd-el-Kader was a fugitive, and Algiers was formally annexed to the French crown. The Emperor of Marocco had ventured to oppose the progress of the French arms; but his coast-towns were ravaged, and at Isly, Bugeaud, with a far inferior force, had destroyed his army. For this last achievement Louis Philippe created Bugeaud Duc d'Isly; the Arabs gave him the more poetical title of Conqueror of Fortune. He returned to France in 1846; but in his absence Abd-el-Kader again collected an army, and the whole country was speedily in revolt. Bugeaud was sent back, and with an iron hand quickly and effectually crushed the Arab rising.

At the outbreak of the revolution of February 1848, Bugeaud was in Paris, and on the night of the 23rd the command of the troops was given to him. He would have adopted energetic measures, but the king shrank from shedding blood, and the military command was placed in other hands. Bugeaud was not again employed till Louis Napoleon became president, when he was named to the command in chief of the army of the Alps. He was also elected by Charente-Inférieure representative in the National Assembly. But he enjoyed neither dignity long: he died of cholera, on the 10th of June, 1849. Bugeaud published memoirs on infantry manœuvres, on army organisation, on the establishment of military colonies, and on a variety of matters connected with the governance of Algiers.

(*Galerie des Contemporains*; *Nouvelle Biographie Universelle*; Besancenez, *Biographie Complète de M. le Maréchal Bugeaud*.)

BUGLOSS. [Anchusa, *S.* 1.]

BUHRSTONE is a quartz rock containing cellules. It is as hard and as firm as a quartz crystal, and owes its peculiar value to this quality, and the cellules, which give it a very rough surface. Stones for grinding wheat and other kinds of grain are formed of this rock, and those which are most valued have the cavities about equal in space to the solid part. The best stones for this purpose come from France, and are obtained from the Paris basin and adjoining districts. When used for grinding, the stones are cut into wedge-shaped parallelopipeds, which are called panes. These are bound together by iron hoops into millstones. The Paris Buhrstone is a tertiary formation. A Buhrstone is obtained in Ohio in America, which is in part a true sandstone, and contains fossils. It also contains lime, and Mr. Dana suggests that the removal of the lime by solution may have given it its cellular character. It overlies the coal formation, and has an open cellular structure where quarried for millstones. The quartz rock of Washington in the United States is in some parts cellular, and makes good millstones. Buhrstone also occurs in Georgia near the Carolina line, and in Arkansas near the cove of Wichitta. (Dana, *Manual of Mineralogy*.)

BULGARIA, a country of Turkey in Europe, is bounded N. by the Danube, which separates it from the principalities of Wallachia and Moldavia, and from the Russian province of Bessarabia; E. by the Black Sea; S. by the crests of Emineh and Khojah Balkan; and W. by the principality of Servia, from which it is partially divided by the Timok, a feeder of the Danube. The area is above 32,000 square miles, and the population according to the estimate of 1844 was about 3,000,000, the majority of whom are adherents of the Greek Church. The area is thus distributed, as nearly as we can ascertain:—Pashalic of Silistria, including the territory of Varna, 13,000 square miles; pashalic of Nicopoli, 10,000 square miles; pashalic of Widdin, 4,500 square miles; and a portion of the pashalic of Sophia, 4,500 square miles. These divisions however do not coincide with the present Turkish divisions of Bulgaria, which are Widdin, Nisch, or Nissa, Sophia, and Silistria. We retain, however, the old divisions in our maps.

The Danube runs with many windings, but in the general form of a bow, with the convex side towards Bulgaria, all along the northern boundary to the mouth of the Sereth, whence it turns to the eastward and enters the Black Sea by several mouths. [Bessarabia; Danube.] Reckoning all its windings the river flows along the province for not less than 500 miles, and is navigable for steamers and large vessels all the way. It forms numerous small islands in its course and a delta at its mouth; and on both sides of the river at intervals are extensive marshes, which in the dry season are very unhealthy and infested by mosquitoes.

The Balkan Mountains, the ancient Hæmus, rise on the southern frontier to about 6000 feet above the sea. They sink down rapidly on the south side; on the north the slope is more gradual. The chain is traversed by many defiles and passes. [Balkan.] From its crest numerous ramifications extend northward to the plain of the Danube. These offsets are generally well wooded or covered with rich pasture; and they are separated by valleys or small plains drained by feeders of the Danube. The principal of these rivers, commencing on the Servian frontier and proceeding eastward, are the Timok, the Ogust, the Skitul, and the Isker, which cross the pashalic of Widdin; the Wid, the Osma, the Jantro (which passes the town of Tirnova), and the Lom, which traverse the pashalic of Nikopoli, sometimes called the sanjak of Rustchuk; and the Drista, the Taman or Jemurlu, and the Kara-Su, which drain that part of the pashalic of Silistria which belongs to the basin of the Danube. The Kamtchik, which rises west of the Selimno Pass of the Balkan, flows eastward through a longitudinal valley between parallel ranges of the Balkan, and enters the Black Sea between Cape Emineh and the port of Varna. In the mountains that screen the valley of the Kamtchik on the north is the town and fortress of Shumla. The most important of the other tributaries of the Black Sea in Silistria is the Parawadi, which passes through the marshy lakes of Devno and falls into the port of Varna. The Parawadi River is identified by General Jochmus in his 'Notes of a Journey to the Balkan' with the ancient Lyginos; and the site of Alexander's battle with the Triballi (B.C. 336) he considers to be the isthmus between the two lakes of Devno, a little west of the village Buyuk-Aladin. Not far from the same spot, but nearer Varna, is the site of the great battle fought between the Sultan Murad and King Wladislaus in 1444. The site is easily identified by two large mounds called Sandshak Tépé and Murad Tépé.

The coast of Bulgaria, or Silistria, from Cape Emineh, the eastern extremity of the Balkan, to Cape Kalakria or Gulgrad Burun, north of Varna, is generally high; to the northward of this last point the shore is for the most part flat, low, and marshy. The most important places along this coast are the city, port, and fortress of Varna, and the little town and roadstead of Kustenjeh, which is only about 30 miles distant from the point where the Danube makes the great bend to northward. It has been lately proposed to cut a navigable canal across the isthmus, in order to avoid the tedious navigation by the mouths of the Danube. Between the base of the Baba-Dagh, an elevated mass in the extreme north of Silistria and the sea lies the large lake of *Rassein*, or Razem, which is 35 miles long from north-west to south-east, and about 15 miles wide where broadest. It is separated by a narrow strip of land from the St.-George mouth of the Danube, from which a little arm called Dunavitz enters the lake. The lake itself communicates with the Black Sea by two principal channels called the Jalova and the Portitcha mouths. On the west shore of the lake is the town of *Baba-Dagh*, with 10,000 inhabitants, seven mosques, and extensive salt-works. The fishery of the lake is important. At the northern base of the Baba-Dagh range, and on the right bank of the Danube, is the fortress of Issatscha, near which the Russians in 1828, and Darius about 2300 years before them, passed the Danube. In consequence of the Russians having neglected to keep the Sulina mouth of the Danube in a navigable state, attention has been turned to the St.-George mouth, which belongs to Silistria, but is by treaty open to all trading vessels, and to the war ships of Austria and Russia. No vessel of any size however can easily enter it, owing to the banks of mud which have accumulated round its embouchure, and to the shallowness of the stream from the deposits of the river. It has however been lately surveyed with the view to make it navigable, and to free the trade of countries along the lower Danube from the vexatious regulations of the Russians.

A considerable portion of the sanjak of Sophia, and the pashalic of Nisch or Nissa, forms part of Bulgaria. This district of Bulgaria extends southward to the point where the Emineh Balkan, the Despoto-Dagh, and the Khojah Balkan meet near the source of the Isker and the Sulu Derbend, or Pass of Trajan. The Isker here traverses a beautiful plain, in which stands the populous and well built city of Sophia, famous for its hot springs. Into the plain from the north-west a high valley screened by the Khojah Balkan and Mont Tesovitch opens; in its northern part stands the city of Nissa, in a fertile country watered by the Nissava, a feeder of the eastern Morava. Near Nissa is the Tower of Skulls erected as a trophy of victory gained over the Servians by the Turks under Kumurgee.

The plains of Bulgaria are in general well cultivated, and the hill-slopes are covered with vineyards. On the Thracian side of the Balkan (excepting the valley of the Maritza) cultivation is generally confined to the immediate circuit of the villages; but in Bulgaria wide tracts are subdued by the plough, and large quantities of corn are produced by the industrious inhabitants. The largest quantities of corn are grown in Silistria and in the plains near the Danube. A good deal of flax, hemp, and tobacco are grown, large quantities of wine are made, and fruits are abundant. Roses are cultivated very extensively for making perfumes. Timber cut in the mountain forests is floated down the river for export to the towns on the Danube. For want of good roads however Bulgaria, like all other parts of the Turkish empire, has comparatively but a limited trade. The Bulgarians however seem to enjoy a rude abundance; it is rare to see a beggar, and their well-built dwellings, and neat fields and gardens present a most favourable contrast to the mud-plastered huts and wattles and the neglected or rudely cultured steppes on the Wallachian side of the Danube.

The soil of Bulgaria is in general fertile and well watered; the section between the town of Sistova and the Balkan, however, is deficient in water, although it yields grass abundantly. The best cultivation is seen in the districts extending from the western part of the pashalic of Silistria to the pashalic of Widdin: this region is inhabited chiefly by Bulgarians, a race always remarkable for industry and for their pacific disposition, notwithstanding their long oppression under the Turkish feudal system and the rapacity of the pashas. But the Tanzimat has now put the Bulgarian on a level in point of law with the Turk (in other respects he was always his superior), and the feudal system has been swept away; so that Bulgaria, at all times confessedly the best cultivated part of Turkey, will probably soon reach a high degree of prosperity and improvement.

That part of Silistria which skirts the Black Sea is sometimes called the pashalic of Varna, and is inhabited chiefly by Turks and Tartars, who barely raise enough of corn for their own consumption, and are chiefly occupied in rearing cattle. The fine plain south from the Baba-Dagh to the neighbourhood of Kustenjé is inhabited by Bulgarians, and by a goodly number of Russian colonists from Bessarabia, who raise large quantities of hard wheat of very superior quality. In the rest of Silistria the country is well cultivated throughout, and yields an abundant supply of provisions of all kinds. Hard wheat of two kinds, distinguished by the names of 'arnaut' and 'coloss,' is grown very abundantly. Barley also of fine quality is extensively grown. The other crops are maize, beans, and hemp, which in years of drought do not succeed so well. Several thousand oxen are slaughtered in the city of Silistria for the tallow, which is sent to Constantinople.

The eastern part of the pashalic of Nicopoli is well wooded as far as the neighbourhood of Rustchuk; it also possesses abundant pasturage, and, in ordinary years, when not visited by long droughts, it is very productive in corn. Wood for building, and oak planks of superior quality, are exported. Between Rustchuk and Sistova the plain of the Danube is occupied densely and solely by Bulgarians, and presents a fertile and pleasing aspect. Besides corn, the chief products are hemp, flax, attar of roses, and tallow. Sistova is considered the capital of the Bulgarians; it is one of the most important towns on the right bank of the Danube, and carries on a considerable trade with Wallachia. Westward from Nicopoli, and throughout the greater part of the pashalic of Widdin, the country is more thinly peopled, habitations being met with only where there is water, and agricultural produce is raised merely sufficient for the local consumption. The plain of the Danube here partakes of the nature of a steppe, and cultivation prevails more in the mountainous districts. Indeed the cultivation of corn for export was long effectually checked in this part of Bulgaria by a restrictive system, by which the farmers could not sell their surplus produce without the pasha's permission, and at a price fixed by him. Sometimes the pasha appropriated the surplus to himself, ground it at his own mills, and then forwarded it for sale to Constantinople. These regulations have been very injurious to the trade of Widdin, which, however, has a considerable commerce in manufactured goods imported from Austria.

The tallow trade causes the rearing of large numbers of cattle in Bulgaria. Large herds of oxen, to the number of 40,000 or more, are fattened during the summer months, and slaughtered during the autumn, in the neighbourhood of Varna, Silistria, Rustchuk, and other towns, for their hides and fat; for beef is seldom eaten by the Moslems, whose favourite animal food is mutton and goat. There is a depôt at Varna for the tallow and other products of the province. Owing to the difficulties, tediousness, and expense of the river navigation, and vexatiousness of the Russian quarantine regulations, the corn and other products of Bulgaria are generally brought by land carriage to Varna for export even from the plain of the Danube. Corn, however, for export to Constantinople is frequently conveyed in 'kirlaches,' or Turkish lighters, of from 30 to 100 tons, which are very numerous on the river, to Matzin, a small port opposite Brailoff, and there embarked in larger vessels. From the roadstead of Kustenjé also large quantities of corn are occasionally exported; but the exposed condition of this port since the destruction of its mole (built by Constantine the Great) is a great obstacle to its trade. Its position, however, has been at all times considered of great importance, as it is only 30 miles distant from Czernawoda on the Danube. A canal was projected in 1837 to unite the two points, and to give a short and direct route to the Danube trade, by avoiding the great northern bend of that river, and the intricate shoals and mud-banks in its mouth. This project has been recently revived, and will probably be one day executed.

Besides horned cattle, including buffaloes, Bulgaria rears a great many horses of inferior breed, sheep and goats in great numbers, and swine for the consumption of the Christian part of the population: pork to the Moslem, as to the Jew, is an abomination. The manufactures of the country are all of a coarse description, and for home consumption. The imports are manufactured goods, coffee, spices, sugar, salt, &c.

The principal towns of Bulgaria are—*Widdin*, *Nicopoli*, *Sistova*, *Rustchuk*, *Silistria*, *Rassova*, *Tirnova*, *Sophia*, *Varna*, *Kustenjé*, *Shumla*, *Nissa*, &c., of which the most important are described under their respective names.

Bulgaria comprises the greater part of ancient Mœsia, which was occupied in the time of Darius by the Getæ, and in the time of Alexander by the Triballi. It is a very interesting country for its historical associations, to illustrate which there is great need of enlightened exploration. General Jochmus, in the work already quoted, has thrown great light upon the history of the expeditions of Darius and Alexander in this country. He supposes Darius to have crossed the Balkan by the pass to the north-west of Mesembri, and to have marched northward to Issatscha by the same route that Marshal Diebitsch led the Russians in an opposite direction in the campaign of 1828. Alexander, he says, fought the action with the Thracians at the foot of the defile of the Balkan to the north of Aïdos; thence crossed the defile to the Lyginos, near the town of Parawadi; and after his victory over the Triballi, before mentioned, marched in three days to the Danube, which he is supposed to have crossed at or near Silistria, for the purpose of attacking the Getæ. Bulgaria contains some Roman remains: the great Roman road connecting Trajan's Bridge over the Danube with Dyrrachium on the Adriatic crossed the valley of the Timok, the ancient Timacus, above Widdin, and is still in parts entire. On the road from Shumla to Rustchuk numerous ancient mounds, covered with forest trees, are passed at a place called Lazgaret, marking no doubt the site of some great ancient battle.

Mœsia was originally inhabited by a Scythic or Slavonic people. It was subjected by M. Licinius Crassus about B.C. 29 to the Romans, who built entrenched camps along the Danube; one of these is still visible near Widdin. In the 3rd century it was invaded by the Goths, whose incursions were not thoroughly checked till the time of Aurelian, who planted several Roman colonies in the province. It was next overrun by the Visi-Goths, to whom Theodosius I., after the defeat and death of Valens at the great battle of Adrianople in A.D. 378, ceded the country; and a part of those who settled in the western part of it are known in history as the Mœso-Goths. In the 6th century Slavonian tribes spread over Lower Mœsia, and in the 7th century Upper Mœsia was given by Heraclius to the Serbs and other Slavonic people, to protect the empire in that direction against the Avars.

The Bulgarians, a Tartar people from the banks of the Volga, subdued the Slaves of Lower Mœsia about the middle of the 7th century; but became in a short time so blended with the Slavonic part of the population, that before the commencement of the 9th century they had adopted the Slavonic language and customs, the name of the race which gave its designation to the country alone remaining. They were governed by kings who put themselves under the protection of the Greek emperors. This alliance however they renounced in 1185, their king Asan remarking that the Greek empire needed protection more than Bulgaria. Long wars with Hungary desolated the country between this and the 13th century, when Bulgaria was subjugated by Stephen IV. about the time that the Turks made their first appearance in Europe. In 1392 the Turks made the Bulgarian king Susman prisoner, and the people lost their independence. There are many Bulgarian colonies in Thrace and in the countries along the left bank of the Lower Danube.

During the Russian war of 1853-4 a portion of Bulgaria was seized and occupied by the Russian troops, and the fortress of Silistria was besieged by them, but was not taken.

(Arrian, i. 1-5; Herod. iv.; *Dictionary of Greek and Roman Biography*; General Jochmus, *Notes of a Journey to the Balkan*, 1853; Macgregor, *Commercial Statistics*; *Frontier Lands of the Christian and Turk*; Ubicini, *Lettres sur la Turquie*, Paris, 1853.)

BULLER, CHARLES, RT. HON., was born in August, 1806, in the city of Calcutta. His father was in the civil service of the East India Company, and belonged to a family which possessed great parliamentary influence in the south of Cornwall, where they had for a long series of years represented West Looe as a nomination borough. Charles Buller was educated at Harrow School, Middlesex, at the University of Edinburgh, and at Trinity College, Cambridge, where he took the degree of B.A. in 1828. He was returned in 1830 as member of parliament for West Looe, and in the following year became a barrister of Lincoln's Inn. He voted for the Parliamentary Reform Bill, which disfranchised West Looe, and in 1832 was returned for the borough of Liskeard, in Cornwall, which he continued to represent till his death in 1848. Mr. Buller, throughout the whole of his parliamentary career, was distinguished for the liberality of his principles, for soundness of reasoning founded on an extensive acquaintance with the details of his subject, and for a liveliness of imagination, which rendered his speeches attractive by sallies of pleasantry and wit. He was from the first a steady opponent of the Corn Laws, advocated triennial parliaments, was against a property qualification for members of the House of Commons, maintained the necessity of national education, and was a supporter of the Poor Law Amendment Act. He early distinguished himself by his speeches on colonisation, and by the ability with which he advocated improved principles and practice in colonial government. When the Earl of Durham was sent out in 1838 as governor-general of Canada, Mr. Buller accompanied him as secretary, and is known to have contributed largely to the Report which was presented to parliament by the Earl of Durham, and published in 1839. After his return from Canada, Mr. Buller commenced the practice of the law, in appeals from the colonies and from Hindustan, before the Judicial Committee of the Privy Council. In 1841 Lord Melbourne appointed him secretary of the Board of Control; and Lord John Russell, after he became premier in 1846, made him Judge-Advocate General, with an understanding, it is said (which however was not realised), that he was to act in some way as colonial minister, though not included in the department. In November 1846 he was appointed a queen's counsel, and in July 1847 was sworn of the Privy Council. Upon the remodelling of the Poor-Law Commission, with a president as head of the board, he was appointed to that office in Nov. 1847. He died in London, Nov. 28, 1848.

Mr. Buller was a ready extemporaneous speaker, but was accustomed, on important occasions, to write out his speeches in their whole extent. He also wrote largely for the periodical press, especially the 'Morning Chronicle' and 'The Globe,' and for the 'Edinburgh Review' and 'Westminster Review.' He also wrote for the 'Colonial Gazette' a series of papers on 'Responsible Government for Colonies,' afterwards published as a small volume.

BUMELLA, a genus of plants belonging to the natural order *Sapotaceæ*. Many of the species are used in medicine. *B. nigra* has a bitter and astringent bark, which is used in fevers. The wood is very hard. *B. retusa* has a milky fruit. The fruit of *B. lycioides* is austere, with some sweetness, and is said to be useful in diarrhœa. The flowers of *B. graveolens* have a heavy unpleasant odour. (Lindley, *Vegetable Kingdom*.)

BUNTINGFORD. [Hertfordshire.]

BURDOCK, the common name for the species of ***Arctium***, a genus of plants belonging to the natural order *Compositæ*. This genus is distinguished by its globose involucre, the bracts terminating in hooked points, and imbricated, the flat receptacle with rigid subulate scales; the fruit compressed, oblong; the pappus short, pilose, and distinct. Two species of this genus are common in Great Britain. *A. majus*, the Greater Burdock, is characterised by its large subcorymbose heads and its cordate ovate leaves, the lowermost of which attain a very large size. *A. minus*, the Lesser Burdock, has small heads, which are racemose. The leaves are smaller than in the last species. They were both described as *Arctium Lappa* by Sir J. E. Smith.

BURNET. [Sanguisorba; Poterium, *S.* 1.]

BURNEY, MISS. [D'Arblay, Madame, *S.* 1.]

BURNTISLAND, Fifeshire, Scotland, a town, royal burgh, and sea-port, in the parish of Burntisland, on the north or left side of the Frith of Forth, is situated in 56° 4′ N. lat., 3° 13′ W. long., about 5½ miles nearly due north from Leith. The population of the royal burgh in 1851 was 2329, of the parliamentary burgh 2724. The burgh is governed by two bailies and ten councillors, of whom one is provost; and unites with Kirkaldy, Dysart, and Kinghorn, in returning one member to the Imperial Parliament.

Burntisland was made a royal burgh in 1568. At the General Assembly which met here in 1601 James VI. took the oath to the Covenant. The town was fortified in the reign of Charles I., and besieged and taken by Cromwell, who repaired and considerably improved the harbour. The town chiefly consists of two parallel streets terminated by the harbour on the west. The harbour is deep and well sheltered. Being now the principal ferry station, the town has much increased of late years. There is a good dry dock; and on the eastern pier is a lighthouse, the light of which may be seen a distance of seven miles. Burntisland formerly possessed a considerable trade. About 1656 there were twelve ports, including St. Andrews and the now extensive port of Kirkaldy, which were subordinate to Burntisland. For many years past its traffic has been confined to that arising from the curing of herrings and from distilleries in the neighbourhood. Ship-building is carried on. There is daily steam communication with Granton on the opposite coast, and the Edinburgh and Northern railway opens up a direct communication with the whole north-east of Scotland, the passage across the Frith being effected here by a floating railway.

The parish church was built in 1592. There are also a Free church, and chapels for Episcopalians and United Presbyterians.

North from the town, on the summit of Dunearn Hill, an eminence rising 695 feet above the sea, is a level space surrounded with a number of loose stones, which has been called Agricola's Camp, and supposed, very improbably, to mark the site of a Roman encampment. On another eminence overhanging the harbour stands Rossend Castle, erected about the 15th century.

BUTE, one of the islands which compose the county of Bute, Scotland, is situated in the Frith of Clyde, between 55° 42′ and 55° 56′ N. lat., 4° 58′ and 5° 10′ W. long., distant about six miles from the opposite mainland of Ayrshire, and about half a mile from Argyleshire, from which county it is separated by a narrow and crooked but picturesque channel called the Kyles of Bute. The population of the island in 1851 was 10,661. The island is about 16 miles long, and varies from three miles to four miles in breadth. To the north it is elevated, rocky, and barren; the central part is diversified by hills, valleys, and fertile tracts; and the south end is hilly and divided from the rest of the island by a low and sandy plain called Langal-chorid. The coast is rocky and indented by bays. The soil of the island consists of clay, loam, and sand, with moss lying on gravel. The greater part of the arable land is inclosed and cultivated; barley, oats, potatoes, turnips, and the artificial grasses are all cultivated with success. About the middle of the island are three small lakes—Loch Fad, Loch Ascog, and Loch Quein. The climate though damp, is mild and temperate, and the island is much resorted to by invalids, Rothsay being one of the favourite watering-places of the Clyde. The minerals are limestone, freestone, slate, and some indifferent coal. Beds of coral and shells, of considerable thickness, are found in several places half a mile from the sea-coast.

Bute island contains many remains of antiquity. Dungyle, or Dunnagoil, a vitrified fort, attributed to the Danes or Norwegians, and situated on a lofty crag in the south-west part of the island, is an object of interest and curiosity. In the southern extremity of the island are the ruins of an ancient chapel. Not far from the ruins are the remains of a circular erection about 30 feet in diameter and 10 feet high, known as the 'Devil's Cauldron;' the object for which it was erected has not been ascertained. Bute, and the adjacent islands, were long subject to the Norwegians. Haco of Norway in 1263 took possession of Bute, but after his defeat it returned to the allegiance of the King of Scotland. Edward of England held it till 1312, when it fell into the possession of Bruce. Robert III. and James III. made the island their occasional residence. It was garrisoned by Cromwell, and was the scene of the Earl of Argyle's unfortunate landing in 1685.

(*New Statistical Account of Scotland.*)

BUTEO, a genus of Birds belonging to the order *Raptores* and the family *Falconidæ*. It includes, according to Yarrell, two British species, *B. vulgaris*, the Common Buzzard, and *B. lagopus*, the Rough-Legged Buzzard. [FALCONIDÆ.] Various other species of the *Falconidæ* have been included under this generic name. (Yarrell, *British Birds.*)

BUTYRONE. [CHEMISTRY, *S.* 2]

BUTYRYLE. [CHEMISTRY, *S.* 2.]

BYRSONIMA, a genus of plants belonging to the natural order *Malpighiaceæ*. The bark of the species is astringent, and is used extensively for tanning in the Brazils. The wood of some of the species, especially *B. verbascifolia*, is of a bright red. The bark of *B. crassifolia* is used in fevers. *B. crassifolia* is one of the thousand remedies for rattlesnake bites. It is called Chapera Manteca. The Alcornoco Bark is the produce of *B. laurifolia*, *B. rhopalæfolia*, and *B. coccolobæfolia*. The acid and astringent berries of *B. spicata* are said to be good in dysentery. (Lindley, *Vegetable Kingdom.*)

BYTOWN, Canada West, the chief town of Carleton County, is situated in a very beautiful part of the country on the Ottawa, near the junction of the Rideau Canal with that river, in 45° 20′ N. lat., 75° 42′ W. long.; distant 126 miles N.N.E. from Kingston, and 284 miles N.E. by E. from Toronto: the population of the town in 1851 was 7760. The lower town, which is the older part, is that in which business is generally carried on: the upper town is of more recent erection; it is situated about half a mile distant on a more elevated site, and consists chiefly of private residences. Considerable improvement has taken place in the appearance of Bytown of late years. Several handsome stone buildings have been erected. The town contains places of worship for Episcopalians, Presbyterians, Wesleyan Methodists, Baptists, and Roman Catholics; several schools, a commercial reading-room, a mercantile library association, a court-house, barracks, and a jail. Bytown is supported chiefly by the lumber trade, a term applied to the system of floating large rafts of rough timber down the rivers of America to the depôts and ports in the lower parts of their course. Timber cut on crown-lands and brought down the Ottawa River is measured at Bytown, and the owner gives bond to pay the duties at Quebec. The value of timber brought down the river in one year, 1844, was estimated at 341,756*l.* About three-fifths of the whole being cut on crown-lands was liable to duty, amounting to about 24,000*l.* Fairs are held at Bytown in April and September. Steamers ply between Bytown and Grenville on the Ottawa, and between Bytown and Kingston on the Rideau Canal.

C

CACHELOT. [Whales.]

CACODYL. [Chemistry, *S.* 1.]

CADDICE, CADDIS-WORM, or CAD-BAIT, the common name for the larvæ of the species of *Phryganea*, which reside in the water, in cases which they form of various substances, such as bits of stick, grains of sand, small stones, shells, &c., which are held together by a silken thread secreted in their bodies in the same manner as in the silk-worm. The case acts as a protection to the larva, and it is capable of drawing in its head or putting it out, according to circumstances.

CADET, LIQUOR OF. [Cacodyl, in Chemistry, *S.* 1.]

CAHIR. [Tipperary.]

CAISTOR. [Lincolnshire.]

CALAMOPHILUS, a genus of Birds belonging to the family *Paridæ* and the tribe *Incessores*, sub-tribe *Dentirostres*. *C. biarmicus* of Yarrell is the *Parus biarmicus* of Pennant and other writers. This bird is common in Great Britain, and is known by the name of the Bearded Tit. [Titmice.] (Yarrell, *British Birds.*)

CALEDONIAN CANAL, a connected series of lakes and canals extending through Glenmore, or the 'Great Glen of Albion,' and connecting the Western Ocean with the North Sea. In 1773 the trustees for forfeited estates employed the celebrated James Watt to report on the practicability of a canal from sea to sea through Glenmore. Watt's report was most favourable; but the forfeited estates having been soon after restored to the families to which they had formerly belonged, the office of trustee was abolished, and the project dropped. In 1802 the scheme was revived, and government employed Mr. Thomas Telford, the civil engineer, to re-survey the district, and to report the result of his investigations. This report was in favour of the construction of the canal, and the work was immediately proceeded with under Mr. Telford's direction. Operations were commenced in 1803. In 1820 the eastern division of the canal was opened for navigation. The whole line was opened towards the close of 1823. The Caledonian Canal commences on the south-west on the shore of Loch Eil at Corpach near Fort William, in 56° 50′ N. lat., 5° 12′ W. long., and joins Loch Lochy by a cutting 8 miles in length; a short cutting of about 2 miles connects Loch Lochy with Loch Oich; a canal nearly 6 miles long continues the navigation from Loch Oich to Loch Ness from the north-east end of Loch Ness a canal of about 7 miles in length continues the passage to Clachnaharry near Inverness; whence by another short artificial cutting, it opens into the Moray Frith on the shore of Loch Beauly, in 57° 26′ N. lat., 4° 15′ W. long. The length of this communication between the west and east seas is in all about 60 miles, of which rather more than 37 miles are through natural lochs or lakes, and about 23 miles through artificial cuttings. The summit level is at Loch Oich, which is about 94 feet above high water on the east coast at spring tides. There are 28 lochs in the range, 14 being to the west of Loch Oich, and 14 to the east. The locks are about 170 feet in length and 40 feet in width, the rise at each lock being 8 feet. The width of the canal at water surface is 120 feet; at the bottom 50 feet; the depth of water is 17 feet. There were considerable engineering difficulties to be overcome in the construction of the canal. The object proposed in this national work was the avoidance of the tedious and often dangerous voyage by the Orkneys and Cape Wrath. From Kinnaird's Head on the east coast to the Sound of Mull on the west coast the passage by the Orkneys and Cape Wrath is about 500 miles, while by the inland navigation the distance is only 250 miles. By the Cape Wrath passage also many shipwrecks had occurred. A large amount of public money has been expended on the works. The returns have been very small in comparison with the cost; one chief source of expected revenue was indeed cut off by the act of the legislature in imposing duties upon the import of timber from the Baltic, in order to encourage the employment in this country of timber of Canadian growth. For a number of years after the opening of the canal, vessels were often detained in the lochs by calms and contrary winds: since 1847 this has been remedied by the establishment of steam-tug vessels, causing a considerable increase in the number of vessels using this line of navigation. The amount of public money granted by Parliament at various periods from 1803 to 1857 was 1,242,387*l.* 8*s.*; the amount received for canal dues, shore dues, &c., to 30th April 1857, was 95.048*l.*; for towages, 8152*l.* 6*s.* 4*d.*; for rent of houses, stables, lands, materials sold, &c., 11,318*l.* 15*s.* 3*d.*; for interest on Exchequer bills, interest from bank, &c., 11,767*l.* 16*s.* 7*d.* The cost of construction, repairs, management, law expenses, shipping, roads, &c., from 20th October, 1803, to 30th April, 1857, was 1,346,562*l.*; cost and maintenance of steam-tug vessels, 25,452*l.* The canal rates are in most cases one farthing per mile per ton for the whole passage, the rate for towage being similar. The charge on steam-vessels passing wholly through the canal is 2*s.* per register ton, whether laden or unladen. In 1848 the commissioners, with the view of inducing a greater number of the Baltic traders to use the passage by the canal, reduced the dues on trading sailing vessels exceeding 125 tons register to 1*s.* per register ton for the through passage; and to encourage the traffic connected with the fisheries, the towage rates on vessels laden with herrings or salt were reduced by one half. The opening of the Caledonian Canal has given rise to an increased intercourse and traffic between Inverness and Glasgow, and generally between the northern and western districts of Scotland. Much damage was sustained by the works of the canal in December 1848 and January 1849 by a severe storm and heavy rains. The damage was repaired with great skill and promptitude, and at less cost than was anticipated, under the direction of Mr. Walker, consulting engineer to the commissioners, and Mr. George May, their resident engineer. To cover the expense, Parliament granted 10,000*l.* to the commissioners in 1849.

(*New Statistical Account of Scotland; Fifty-Second Report of the Commissioners for Making and Maintaining the Caledonian Canal; Life of Telford, edited by* Rickman.)

CALENDULA. [Alaudinæ, *S.* 2.]

CALHOUN, JOHN CALDWELL, one of the most influential of the recent statesmen of America, was born on the 18th of March, 1782, at Abbeville, in South Carolina. His father, Patrick Calhoun, was by birth an Irishman, but he emigrated to America early in life, settled in Carolina, and took an active part on the American side during the war of independence. John C. Calhoun graduated with distinction at Yale College in 1804; and, having completed his legal studies in Connecticut, returned to his native place in 1807, to enter upon the practice of his profession. He was elected the following year a member of the South Carolina House of Representatives, where his clear vigorous intellect soon obtained for him considerable notice. In 1811 he was sent as representative to the United States Congress, and the rest of his life was spent at Washington. During the discussion of the important measures which in the course of the next five years excited the public mind, Mr. Calhoun played a prominent part, and his fervid eloquence, eagerly defending and stimulating the popular war-cry, won for him a commanding position. On Mr. Monroe's election to the presidency of the United States in 1817, he appointed Mr. Calhoun his secretary of war, a post he retained during the eight years of Mr. Monroe's tenure of office. His administration was marked by energy and judgment, and secured his position as one of the ablest public men of his time. On the next election, 1825, he was named as a candidate for the presidency, but withdrew his claim, and eventually he was chosen vice-president. To this high office he was re-elected in 1829, when General Jackson succeeded Mr. Adams as president; but he differed greatly from Jackson in policy, especially on the Tariff and Bank Charter questions; and in 1831 he resigned the vice-presidency, and was elected by South Carolina to the Senate of the United States. From the end of his term of six years he remained in retirement, until President Tyler, in 1843, appointed him secretary of state, an office he held till the election of President Polk in 1845. In that year he again became the representative of South Carolina in the senate. He had now come to be regarded as the great leader and representative of the southern states in Congress, and no man was listened to with greater attention by all parties. An intense and fervid republican, he was yet eminently conservative in spirit, a staunch defender of all southern rights, and the inflexible supporter of the 'institution' of slavery. In general and international politics, he commonly took the popular, or, as it is usually termed, the patriotic side. He died March 31, 1850. Many of Mr. Calhoun's speeches were printed as separate publications about the time of their delivery: and his collected 'Works' are now in course of publication at Charleston and Colombia.

CALIDRIS, a genus of birds belonging to the order *Grallatores* and the family *Charadriidæ*. It has the following characters:—Beak as long as the head, straight, slender, flexible, compressed at the base, with the point dilated and smooth; nostrils basal, lateral, narrow, longitudinally cleft in the basal furrow, which extends to the smooth point of the beak; wings of moderate length, pointed, the first quill-feather the longest; legs of mean length, naked above the tarsal joint; feet with three toes, all directed forwards, with a very small connecting membrane at their base. Gould, in his 'Birds of Europe,' regards the Knot (*Tringa canutus*) as a species of *Calidris*. With this exception, the only British bird which is a species of this genus is *C. arenaria*, the Sanderling. It is an inhabitant of most of the shores of Great Britain and Ireland. It obtains its food by probing the moist sands of the sea-shores, from which it obtains minute *Mollusca*, shrimps, annelides, &c. It visits the shores of Sweden, and is stated to breed still farther north. Sir John Richardson says it breeds on the coasts of Hudson's Bay. It does not appear to breed in the British Islands. (Yarrell, *British Birds*.)

CALIFORNIA, STATE OF, one of the United States of North America, is bounded N. by the United States territory of Oregon, N.E. by that of Utah, S.E. by that of New Mexico, and S. by the Mexican territory of Lower California. Its western boundary is the Pacific Ocean, along which it extends from 32° to 42° N. lat., its eastern boundary is defined by a line which runs along 120° W. long. from 42° to 39° N. lat., thence in a south-eastern direction till it intersects the Rio Colorado in 35° N. lat., whence it is continued down the mid-channel of that river to its mouth in the Gulf of California, 32° N. lat. The area is 160,000 square miles. The estimated population in 1856 was 507,067. The tract of country which now forms the State of California was, until lately, the coast section of the territory of Upper (Alta) or New (Nueva) California, the north-western part of the Mexican republic. It was ceded to the United States of North America by treaty in February 1848, and has since been admitted into the Union as a sovereign state. The extraordinary increase of its population will be seen by the following statement:—In 1802, Humboldt, from materials supplied by the padres at the head of the missions, estimated the entire population of Upper California, which included, besides the present State of California, the territory of Utah and (in part) that of New Mexico, at 16,862, of whom 15,562 were 'converted Indians.' The official return of persons resident in the missions of Upper California in 1828 was 23,105, of whom 18,763 were converted Indians. After the suppression of the missions the Indians became more scattered, and no official statement of the population was made. The first federal census after the cession of California to the United States was in 1850, when the State of California had a total population of 117,538. In 1852 a census was taken by the State authorities, when the agents' returns gave the population as 264,435; but the Secretary of State, in his official Report, states that all the census agents declare their inability to obtain the numbers of "the whole population of their respective counties," and he thinks it necessary, in order to render an approximately correct statement, to add one-sixth to the number returned. He therefore gives 308,507 as the population in 1852: of whom 210,858 were whites, little more than 30,000 being females, and 105,344 being citizens over 21 years of age; 2090 were negroes, of whom the females were under 300; 572 mulattoes; 33,539 domesticated Indians: and 59,991 foreign residents, of whom about 25,000 were Chinese. California sent in 1857 two members to the Congress of the United States, and like each of the other states two members to the Senate.

Coast-line, Surface, Hydrography.—The State of California owes its characteristic features to two great ranges of mountains, the Sierra Nevada and the Coast Range, which traverse it from north-west to south-east, having between them the splendid valley of the Sacramento and the Joaquin; on the eastern side wide sandy plains, and on the western the narrow slip of coast. The coast of California is generally rugged and precipitous. Beginning at its southern extremity, it makes a bold semi-circular sweep to the north-west as far as Point Concepcion. Off this part of the coast there are several small islands and rocks, and the coast-line is indented by several bays and harbours. The only valuable one of these is San Diego Bay (32° 41′ N. lat), which has an excellent natural breakwater at its mouth, formed by a narrow strip of shingle beach projecting into the sea. The bay itself is wide and spacious, and forms an excellent, though at present little-used, harbour. The harbours of San Pedro and Santa Barbara are also available for craft of considerable burden. From Concepcion Point the coast bears north-north-west to Point Pinos, the southern extremity of Monterey Bay, one of the safest and most capacious harbours on this coast; it is said to be capable of containing at one time the navies of the world. From Monterey Bay the coast continues as before for about 70 miles, in a direct line, to the almost unrivalled bay of San Francisco. The entrance, which is nearly in the centre of San Francisco Bay, is only about a mile wide, but the bay itself opens out for more than 30 miles both on the right and left; its entire length is 70 miles, with an average breadth of 8 miles, and it has a coast of 275 miles. By projecting points of land, several small inner bays are formed, the principal being San Pablo and Suisun bays. It is land-locked on every side, and quite safe within, but a bar at the mouth renders the entrance somewhat dangerous. This harbour is the natural outlet of the valleys of Sacramento and Joaquin, with their wondrous mineral riches and vast agricultural capabilities. Beyond San Francisco Bay is Port Bodega, where was formerly a Russian station. From thence the coast continues in the same north-west direction, but less broken than before, to Point Delgado, beyond which is the bold headland of Cape Mendocino, 40° 21′ N. lat., which forms the southern point of the Bay of Trinidad, in which the coast of California terminates.

The mountain masses which constitute the peninsula of Lower California extend undivided into the State of California as far north as the snow-capped peak of St. Bernardino, 34° N. lat., where they divide into the two great ranges already mentioned. These ranges both run in a north-western and generally parallel direction. The eastern range, called the Sierra Nevada, or Snowy Range, is by far the loftiest, many of its peaks being above the line of perpetual snow: the Saddle Peak is 7200 feet high, the Table Mountain 8000 feet, the Butte 9000, Mount St. Joseph above 10,000, and Mount Shasté at the northern extremity of the range (41° 34′ N. lat.) 14,390 feet above the sea. This range is traversed by few and those very elevated passes. North of 39° N. lat. its slopes, especially on the western side, have vast forests of pine, and lower down of oak. The distance of the Sierra Nevada from the coast averages about 200 miles. The Coast Range runs at a short distance only from the coast, to which it is generally nearly parallel. Its usual height varies from 2000 to 3000 feet: its highest peak, Monte Diavolo, at the head of San Francisco Bay, is 3700 feet above the sea. This range is broken near Monte Diavolo by the united Sacramento and Joaquin rivers; decreases in altitude towards the north; and finally re-unites with the Sierra Nevada near Mount Shasté. From this point northward the surface of the country is wholly mountainous and little known; the Sierra Nevada with its offsets and connected ranges occupying the entire breadth of northern California, and extending northward till it is lost in the cascade Range of Oregon. Between the highest mountains of the Sierra Nevada and the great valley is a line of lower mountains; and from both the Sierra Nevada and the Coast Range lesser lateral ranges and offsets diverge throughout California, forming numerous narrow valleys and ravines.

The basin included between the two main ranges, though really one geographical formation, bears the names of the Sacramento and Joaquin valleys, from the rivers which rise respectively at its northern and southern extremities, unite near the centre of the valley, and flow into San Francisco Bay. This fine valley is upwards of 500 miles long and 50 miles wide. It has evidently at some remote period been the bed of a vast lake of which the Sierra Nevada and Coast Range formed the margin. The water of this great lake has been drained by some convulsion of nature having broken a passage through the Coast Range at San Francisco Bay. At the southern extremity of the valley are the Tulare (Bulrush) Lakes, which during the wet season extend above 100 miles in length, but in the dry season have little water, and are fordable in many places. Within the last year or two a commencement has been made towards embanking these lakes and draining the rich tract of country hitherto subject to the annual floods. The soil and climate of this great valley vary considerably, but a large part of it is very fertile, including most of the eastern side, which is intersected by numerous streams, along which the land is extremely rich and productive. The surface of the valley is greatly diversified, being broken into rugged hills at its northern end, and in many places along its eastern side by well-wooded spurs from the Sierra Nevada. Towards its southern end by the Tulare Lakes, and along the banks of the two great rivers, it is low and level, rising gently at some distance from the rivers into undulating slopes, which break into low hills as they approach the bases of the mountains. The richest and most picturesque part of this fine valley is that central portion of it which incloses San Francisco Bay and the delta of the Sacramento.

The coast district west of the Coast Range—almost the only part of California inhabited previous to the American occupation, but now by no means the most populous part of the country—is full of narrow fertile valleys, the seats in former days of the mission stations, around which the industry of their occupants had caused most of the cereals and fruits of temperate climes to flourish abundantly. Along a good part of the coast the mountains come close down to the sea; but along a still larger portion there extends a tract of low sandhills, which in some places reach many miles inland. The country east of the Sierra Nevada, and west of the Rio Colorado, comprising the remaining portion of California, is mostly level, and a good part of it is sandy and barren. It is however but little known, owing mainly to the superior attractiveness of the mountains and great valleys, and partly to its being occupied by hostile tribes of Indians. It is believed that while much of it is of comparatively small account, there are very extensive tracts of valuable and hitherto unappropriated land. The country along the Colorado is supposed to have a rich alluvial soil; but near its entrance into the Californian Gulf the country about it is dry and barren, and the climate extremely hot.

The two most important rivers of California are the Sacramento and the San Joaquin: the value of the Colorado remains to be fully ascertained. The *Sacramento* rises at the northern extremity of the valley of the same name; its head-streams issuing chiefly from Mount Shasté or some of its spurs. Its course throughout is generally south, and it receives on its left bank a great number of affluents from the Sierra Nevada. Most of these are mere mountain torrents; but several of them, as the Feather, the American, Cosumes, and the San Juan rivers are of some importance. Near Monte Diavolo the Sacramento receives the San Joaquin, and the united river turns abruptly to the west, and soon after expanding to a considerable width opens into San Francisco Bay. The entire length of the Sacramento is about 300 miles; its width for many miles above its junction with the Joaquin varies from 200 to 300 yards, and it is navigable at all seasons up to Sacramento city, 150 miles from its mouth. The Sacramento is subject to great floods during the wet season, and on the melting of the snow on the Sierra Nevada. The *San Joaquin* issues from the Tulare Lakes at the southern end of the great valley. Its course is north and north-west, and like the Sacramento it receives numerous tributaries from the Sierra Nevada. During the wet season the San Joaquin is greatly augmented, and apt to flood much the lowlands on its borders. It is navigable for vessels drawing 9 feet of water up to Stockton, 3 miles above its junction with the Sacramento, and for vessels under 15 tons up to the Tuolumne River. The San Joaquin abounds in fine fish, and the taking and curing of salmon afford employment to many persons. The banks of the river and its tributaries are generally extremely fertile, and agriculture is pursued with much diligence. The country watered by the San Joaquin and its affluents is becoming rapidly settled. The *Colorado*, the lower part of which drains the south-eastern portion of California, and which falls into the Gulf of California, belongs rather to New Mexico, under which it is noticed. Except during the wet season, this river, though draining a vast extent of country, is said to have a depth of only 6 feet of water for some distance above its mouth: that part of California which lies in its basin is almost unknown. Along the coast are numerous rivers which rise in the Coast Range and after a short course fall into the Pacific. Among these are the San Buenaventura, San Felipe, San Pedro, and the Smith; many of them are of considerable value for irrigation, and may at some future period be rendered available for mechanical purposes, but none are navigable.

Numerous roads have been formed in the state since its cession by Mexico in addition to those previously existing, and many bridges have been built and ferries established across the principal rivers; but the communications of the state are of course yet very incomplete. Of the railways in contemplation the most important is the great line from the Mississippi to the Pacific Ocean. The only line completed in California is that of the Sacramento Valley, 22 miles, the receipts of which in 1856 were 1,254,639 dollars.

Geology, Mineralogy, &c.—The Sierra Nevada, with its connected ranges, has for its substratum schistose or talcose slate; quartziferous rocks are the prevalent strata covering the slate. In many places a fine white quartziferous granite occurs. In the Coast Range quartz also abounds. Sandstone is found throughout the lower ranges of hills. Bituminous coal is worked in the neighbourhood of San Francisco Bay; it has also been found about San Diego Bay, and is believed to occur in various localities.

Sir Francis Drake, who visited California, which he named New Albion, in 1578, received such reports of the existence of gold from the natives that he declared it to be his conviction that there was "no part of this country wherein there is not some special likelihood of gold." Yet though his statement was often repeated in the subsequent collections of travels, and occasionally in geographical works, no search seems to have been made for the precious metal. The remarkable discovery of the auriferous wealth of California was at last made by mere accident in December 1847, by a Mr. Marshall, who was engaged in erecting some saw-mills on the estate of Captain Suter, a wealthy American settler on the Sacramento River. The effect of the publication of this discovery was most extraordinary. The rush of adventurers to the 'diggings,' and of immigrants into the country was quite without parallel in the history of the world. California was at this time occupied by American citizens, and its formal cession soon after to the United States happily placed it in the possession of a people as distinguished for capacity of self-government as for energy, instead, as it had hitherto been, of a singularly indolent and incapable race; thereby affording as it were opportunity for the full development of its marvellous capabilities, and at the same time providing against the frightful anarchy which might else have ensued. As it was, towns and cities as they were termed, though the houses were commonly only of wood or canvass, sprang up with a rapidity hitherto unknown; the magnificent San Francisco Bay was for the first time alive with vast fleets of merchant vessels, crowded with anxious adventurers from almost every part of the world. All ordinary labour was neglected in the rage for gold seeking, which seized indiscriminately on all classes, and the value of food and labour rose to almost fabulous prices. The quantity of gold discovered continued for a while to increase even beyond the proportion of new searchers for it. By the end of the year 1851 it was estimated that gold to the amount of nearly 150 millions of dollars had been found. No correct estimate is possible, as no official account has been taken of the gold obtained, but from what appear to be unexaggerated estimates the quantity found in 1849 was valued at 40 millions of dollars, and it is believed that the average yearly find has since increased to between 50 and 60 millions of dollars. The quantity of gold-dust and coin manifested and shipped on board steamers and sailing-vessels from San Francisco during 1852 was 46,256,574 dollars; but this does not show the entire amount exported, as large quantities are taken abroad in ships without being entered on the manifests. If 10 millions be added for this the total quantity shipped in 1852 from San Francisco would be about 56 millions of dollars. The quantity received at the mint of the United States and its branches up to September 30, 1852, was 136,747,935 dollars. Since that date an Act of Congress has been passed for establishing a mint in California. The total shipments of gold from San Francisco from April 11, 1849, to Dec. 31, 1856, inclusive, were valued at 322,393,856 dollars.

What is known as the Gold Region of California extends for some 500 miles in length, with a breadth of from 40 to 50 miles, following the range of the Sierra Nevada. It occupies the lower mountains of that range lying between the central mountains and the valley of the Sacramento and the San Joaquin. These mountains average from 4000 to 5000 feet in height, and the gold is generally found either in the gulleys and ravines, or in the sandy beds of the mountain streams on their way towards the two great rivers. The geological formation of this region is very similar to that of the gold mountains of Australia and the Ural Mountains of Russia. [AUSTRALIA, *S.* 2.] Wherever the gold has been found *in situ* it has been in connection with quartz; and the water-worn gold found in the debris of the rocks and the sands of the rivers in like manner shows, by its frequently being attached to small particles of quartz, that it was derived from a quartzose bed. The main gold region, as we have said, is the lower mountains on the western side of the Sierra Nevada, but gold has been also found in the loftier central heights of the Sierra Nevada, and on its eastern side. Gold is likewise reported to have been found in the Coast Range, especially in the narrow valleys on its western side, and also in the connected ranges. Indeed Drake's words seem now singularly applicable; for there appears to be hardly any "part of this country where there is not special likelihood of gold."

Nor is gold the only important metal which abounds, though it is the only one to which much attention is at present given. A mine of quicksilver has long been worked in the neighbourhood of San José, in which the cinnabar from which it is produced lies near the surface and is easily procured. But the metal is believed also to be widely spread and in valuable veins in other parts of the state. Silver ore of great richness has been found at Monterey and elsewhere. Copper, iron, and other of the more important metals are also believed to abound. Coal is profitably worked at San Francisco, and is supposed to exist in extensive beds in other parts.

Botany and Zoology.—The botany of California is of a peculiar and interesting character. It contains among other striking plants some noble pines, especially one called from its discoverer, the Douglas pine (*Pinus Douglasii*), which occurs on the mountains about San Francisco Bay, and grows frequently to the height of 240 feet, with a circumference at the base of the trunk of 60 feet. The cones are eaten by the Indians. The *P. Sabiniana*, *P. Lambertina*, and *P. nobilis* are of less magnificent but still very large dimensions, and great beauty. The live oak (*Quercus virens*) grows to a considerable size on the lower hills of the west side of the Nevada, and on it Fremont found unusually large quantities of mistletoe. The white oak is common in the valleys. The maple, ash, beech, and chestnut are the other more usual denizens of the Californian forests, which however do not generally extend south of 39° N. lat. Two or three kinds of *Arbutus* abound on the banks of the rivers and the margins of the forests. The *Scilla esculenta* grows everywhere along the coasts; its root is the quamash of the Indians, with whom it is a common article of food. The fibres of the *Helonias tenax* are made by the natives into a very tough cord for snaring deer, &c.; and the amole and samate are used by them for soap. Large numbers of *Polemoniaceæ*, especially some beautiful specimens of the *Leptosiphon* and *Gilia;* some curious plants belonging to the genera *Nemophila* and *Emmenanthe;* several new genera of poppies, *Eschcholtzia*, lupines, *Calochortus*, *Cyclobothra*, *Calliprora*, *Brodiæa*, &c., stamp the vegetation with a character quite unlike that of any other part of America.

The black bear, the grizzly bear, and the barren-ground bear, the racoon, American badger, glutton, ermine, weasel, mink, martin, and skunk are common in many parts; as are also the beaver and the musk-rat about the mouth of the Sacramento: all of these are much sought after for their skins. Several kinds of wolves, foxes, and lynxes abound in the denser forests of the north, where they prey on the numerous deer and other animals which frequent those regions. Of the deer, the moose, the black-tailed, and the long-tailed or jumping deer, the elk, and the prong-horned antelope (*A. furcifer*) are the most plentiful. Mountain sheep abound. The bison is only occasionally met with.

Among birds the first place is due to the great Californian vulture (*Sarcoramphus Californianus*), which is inferior only to the South American condor in size, and very similar to it in its habits. The black vulture, the turkey buzzard, the golden eagle, the bald eagle, the peregrine falcon, the jer falcon, the osprey, and several other hawks and connected species as well as owls, are more or less common. Most of the ordinary European singing birds, swallows, woodpeckers, &c., or birds to which similar names have been given, also abound. The humming-bird is common in the south. Grouse are said to be more numerous and of more various kinds than have been found in any other country. The bays and inlets of the coast swarm with swans, geese, ducks, curlews, and most of the other ordinary wading and swimming birds. Large numbers of white pelicans frequent the coast, and albatrosses are sometimes shot, measuring 10 or 12 feet across the wings.

The coasts and rivers of California alike yield an astonishing number and variety of fish. In some of the rivers as many as 3000 salmon, many of them weighing from 20 to 30 lbs., are often taken in a single day. Salmon-trout and trout also largely abound. Sturgeons are sometimes taken in the mouths of the rivers measuring 8 or 10 feet long and weighing nearly 500 lbs. Mackerel, pilchards, and sardines swarm off the coast. The halibut, skate, turbot, bonito, &c. are caught. Oysters of excellent flavour and most other shell-fish are found. But though fish is so abundant, the fisheries are at present little heeded.

Climate, Soil, Agriculture, &c.—California has a dry and a wet season; the dry season lasting from about the middle of May to September or October, the wet season setting in early in November and lasting till May. But there are considerable variations, both in the temperature and in the amount of moisture in different parts of this extensive tract of country. In its northern part, north of 39° N. lat. for example, the air during the dry season is much less parched and rains occur earlier than in the southern districts. Along the coast the climate is much more temperate than in the great valley; while east of the Sierra Nevada the air is excessively hot and parching. In summer the coast is visited by heavy fogs, and a cold wind sets in regularly towards noon from the Pacific, and continues to blow with increasing force and keenness till late at night. Some few miles inland the cold is modified, and the temperature becomes equable and agreeable. Throughout the great valley of the Sacramento and San Joaquin, the mid-day heat is so great as to render labour in the open air everywhere unpleasant, and in many places impracticable.

The soil along the great valley is generally extremely rich. This valley has evidently been at some remote period the bed of a vast lake, and the rich alluvial soil only needs judicious irrigation to render it capable of producing almost every variety of crop. The banks of the rivers however require proper embankments to prevent the present often destructive floods, and to permit the full development of its agricultural capabilities. Tobacco, rice, maize, and most of the plants except cotton which grow in the warmer parts of the United States, flourish in the sheltered lateral valleys connected with this principal valley, while in the main valley itself most of the cereals produce extraordinary crops, and grapes, peaches, and nearly all other fruits of a moderately warm climate thrive admirably. The grasses are luxuriant and nutritious, affording excellent pasturage for cattle. North of 39° N. lat. are extensive forests of pine and oak. The valleys along the coast produce all the cereals, and all or nearly all of the fruits and vegetables of the temperate and colder parts of Europe. Onions are grown in large quantities; the produce from nine counties in 1852 was returned at 5,553,655 lbs. Tomatoes are extensively cultivated in parts of the great valley; 1,039,800 lbs. were raised in 1852 in Sacramento county alone, and in the same county 385 acres were planted with melons. In the county of Santa Barbara, on the southern part of the coast, 1370 barrels of olives were gathered; and in this and the adjoining county of Los Angeles 73,462 gallons of wine, and 73,056 gallons of brandy were made. Agriculture has however hitherto been comparatively neglected, but as more attention is being paid to it the various capabilities of the soil are becoming more apparent, and there can be little doubt that California is destined to take high rank as an agricultural country.

It is usual in taking the census of the various states of North America to ascertain the quantity and value of the various productions. In the state census of California for 1852 these returns are very incomplete, but they were sufficient to enable the Secretary of State to "take a comparative view of the position of California in reference to other states of the Union," which is at once so curious and interesting that it may be worth while to quote a few of the items. In barley California surpasses every other state in the Union except New York, and already raises half as much as is produced in the whole Union besides: in oats it cultivates more than three fourths of its sister-states; in wheat it surpasses ten of the states; of maize it produces less than any other; in potatoes it stands next to New York, and grows one-fifth of the quantity produced by the rest of the Union; in beans it surpasses nine of the states; in hay, though only half of the counties made returns, it surpasses nine states; and in fruit it exceeds all the states in variety, and one-half in quantity. In the number of horses it exceeds 15 of the states; of mules 26; of milch-cows 12; of work-oxen 8; of sheep 4, and of swine (though the returns of both these are very imperfect) 3. In live-stock it surpasses 22 of the states. In trade and merchandise it already exceeds half of the states. The number of horses returned in the state in 1852 was 64,773, mules 16,574, cows 104,339, oxen 344,457, sheep 82,867, hogs 38,976, poultry 96,230—of the last three the returns are from only 20 counties.

The vast and rapidly increasing extent of the commerce of the State of California, is partly shown by the statement of the number and tonnage of the vessels which entered and cleared at San Francisco in 1852:—

Entered—Sailing vessels	876	of	326,138 tons.
Steamers . .	127	„	118,876 „
Total .	1003		445,014

Of these, 40 vessels of 18,286 tons burden were British, and 594 vessels of 317,262 tons burden were American.

Cleared—Sailing vessels	1333	of	356,092 tons.
Steamers . .	158	„	127,047 „
Total . .	1491		483,139

Of these, 1121 vessels of 361,166 tons burden were American. In 1849 the tonnage of the vessels entered at San Francisco amounted to 313,351 tons, of which 247,417 tons belonged to the United States. The number of passengers arriving at San Francisco in 1849 was 41,709. In the year ending December 28, 1852, there arrived 64,190, of whom 5223 were females; and there departed 22,946, of whom 390 were females.

Of the manufactures we have no very exact account. At present, owing in a great measure to the high price of labour and the superior demands of other branches of industry, the articles manufactured are chiefly such as cannot be profitably imported. Bricks for example are now made in immense quantities to meet the enormous demand for new buildings: the county of Marin alone reported to the census agents the manufacture of 1,500,000 bricks a month during 1852, of the value in the year of 360,000 dollars; the total population of Marin county during the same year was only 1036.

Divisions, Towns, &c.—The state is divided into 35 counties. The original capital of the state was San José, next Vallejo, afterwards Benicia; it is now Sacramento City. The chief town is San Francisco [*S.* 2], on the bay of the same name; and next in importance to it is Sacramento City [*S.* 2], the capital of the 'diggings.' Numerous other towns and 'cities' have sprung up in various parts of the state, but most of them are built only of wood, or even canvass, and many of them disappear almost as rapidly as they arose. The following are among the more important and may require a brief notice:—

Stockton, on the Stockton Slough or Canal, formed by the junction of the Sacramento and Joaquin rivers, 100 miles E. from San Francisco by water, was founded in 1848. Population about 3000. It is the port of the southern mining district and of the valley of San Joaquin, and is likely to remain one of the first towns in the state. Vessels drawing 9 feet of water can discharge their cargoes alongside the shore. Constant steam communication is maintained with San Francisco. At present there is no public building of any consequence except an asylum for the insane. *San José*, population 1200, the original capital of the state, is pleasantly situated near the south extremity of San Francisco Bay about 50 miles S. from San Francisco city. It has some trade, but is chiefly agricultural. Near this town is the principal quicksilver mine. *Vallejo* is situated on the Napa Strait, 25 miles N.N.E. from San Francisco. It is merely an agricultural village. *Benicia* is an unimportant village on the west side of Suisun Bay, about five miles E. from Vallejo. *Monterey*, population about 1600, on the south side of Monterey Bay, was one of the largest and most frequented towns of Upper California prior to its cession by Mexico, and will eventually become again an important commercial place when the fine bay on which it stands is resorted to, as no doubt it will be, by shipping. At present being away from the mining districts it is comparatively deserted. *San Diego* is another old town which has fallen into neglect, but will doubtless again grow into importance. It stands on the safe and spacious bay of the same name near the southern extremity of the coast. Coal has been found near it. *Marysville*, on the Yuba, 98 miles N.N.E. from Vallejo, is a busy new town with a court-house, several hotels, mills, and stores, two newspapers each having 'tri-weekly and weekly issues,' and nearly 8000 inhabitants. *Oro City* on the Feather River, the capital of the Placer mining district, has 3000 inhabitants. *Placerville*, 112 miles N.E. from San Francisco, was one of the oldest and most flourishing of the gold district towns, but the 'diggers' have deserted its neighbourhood, its newspapers have ceased to be published, and the place itself is worn out and fallen into decay. In 1852 its population had decreased from 4000 to 2000. The state-prison is at *San Quentin*, 12 miles from San Francisco. Among the other towns which either have been, or are expected to be flourishing and important places, it must suffice to name Auburn, Downieville, Los Angeles, Mariposa, Napa, Nevada, Santa Barbara, Santa Cruz, San Luis Obispo, Shasté, Sonoma, Suisun, Tuolumne, Vernon, and Yuba: in all of these the population is constantly shifting, and a statement perfectly correct to-day would be wholly inaccurate in a month or two.

Government, Judicature, &c.—The constitution of California resembles in its general features the constitutions of the other states of the Union. Slavery is not permitted. The legislative power is in a General Assembly, consisting of a Senate of 16 members, elected for two years, and a House of Representatives of 36 members, elected for one year; the sittings of the General Assembly are held annually. The governor is elected for two years: his salary is 6000 dollars per annum. The receipts for the year ending June 30, 1856, were 723,289 dollars; the expenditure for the same period was 1,368,684 dollars. The total debt of the State, Jan. 1, 1857, was 4, 128.927 dollars.

The judicial power is vested in a supreme court and district and county courts. The supreme court consists of a chief justice, who has an annual salary of 8000 dollars, and two associate justices, each of whom has a salary of 6000 dollars a year. The justices are elected by the people for six years, and are so classified that one goes out of office every two years. The senior judge in office is the chief justice. The first judges of the district courts were chosen by the legislature, but all future judges are to be elected by the people: there are fifteen district judges, with annual salaries varying from 3000 to 7000 dollars. A county-court judge is elected in each county for four years.

The constitution directs that a superintendent of public instruction shall be elected, to hold office for three years; and that the legislature shall establish public schools, in which instruction shall be given during at least three months in the year; it also provides funds for their support. A Board of Education has been established, and the returns for 1856 from all but four counties exhibit 322 districts, 417 teachers, and 29,628 scholars from 4 to 14 years of age.

History.—California was discovered by Cabrillo in 1542. It was next visited in 1578 by Sir Francis Drake, who named it New Albion. It was first colonised in 1768 by the Spaniards, who established in various places, chiefly west of the Coast Range, military posts (presidios) and religious stations (missiones). There were four of these military stations and twenty-one missions; and while California remained subject to Spain the actual direction of the country was in the hands of the priests, the governor having scarcely any civil authority. The priests collected the native Indians in villages, and taught them to cultivate the soil, but gave them little other instruction either religious or secular. According to the latest account published by the priests there were above 18,000 of these nominally 'converted Indians,' who spoke twenty different languages. On the separation of Mexico from Spain the missions were broken up, and the Indians returned pretty generally to their native state. After the declaration of Mexican independence a good many Americans and other foreigners visited California for the purpose of hunting or traffic, and several Americans settled in the neighbourhood of San Francisco Bay. The governors appointed by Mexico were unable to maintain tranquillity in the province, and the discontent increased till, in 1836, it issued in a successful revolt, mainly excited it is said by the foreign residents. The government was overthrown without bloodshed, and the governor and other officials were put on board a schooner and shipped off to Mexico. The Mexican government agreed to permit the Californians to choose their own governors, and the country continued nominally subject to Mexico. It remained however in a state of anarchy, and for some time before its cession had become virtually under the control of American citizens. On the termination of the war between Mexico and the United States, California was, as already mentioned, formally ceded to the United States by treaty in February, 1848; and on its rapid growth in wealth and population, consequent on the gold discoveries, it was a year or two later admitted into the Union as a sovereign state.

(Colton, *Statistical Gazetteer of the United States*, 1853; *American Almanac;* Fremont, Wilkes, and various *Travels, Journeys, &c., in California; Visits to Gold Diggings, &c.*)

CALLIGONUM, a genus of plants belonging to the natural order *Polygonaceæ*, of which one species, *C. Pallasia*, yields in its roots an amylaceous gummy matter, on which the Calmucks feed in times of scarcity. The fruits and branches are acid, and are chewed by the same people to allay their thirst. This plant is destitute of leaves, and grows in great abundance on the sandy steppes of Siberia.

CAMBERWELL. [Surrey.]

CAMBORNE. [Cornwall.]

CAMEROON, or CAMAROENS, a river of Africa, which discharges itself into the Bight of Biafra and into the same æstuary as the Malimba, abont 45 miles E. from Fernando Po. It has a bar across its mouth, with an average depth of from 15 to 18 feet water over it. Of this river little is known beyond a few miles from the entrance. Like other rivers on this coast, it has been long known to be a great mart for slaves. Palm oil and ivory are obtained here; the latter is considered very fine. The system of traffic is by barter. This river is separated from those to the westward by high land called the Cameroon Mountains, the highest peak of which rises to 13,000 feet above the sea, and is generally capped with snow. The name is derived from the Portuguese word for shrimp, of which there is a great abundance. Each side of the river is governed by a separate chief, whose friendship must be purchased by presents before any traffic is commenced.

CAMPDEN, CHIPPING. [Gloucestershire.]

CAMPHORA, a genus of plants belonging to the natural order *Lauraceæ*. This genus was constituted by Nees von Esenbeck for the *Laurus Camphorifera* of Kämpfer, the plant which yields the Camphor of commerce. It is known by its hermaphrodite panicled naked flowers; 6-cleft papery calyx, with a deciduous limb; 9 fertile stamens, 3 in a row, the inner row with two stalked glands at their base; the anthers 4-celled, the outer turned inwards, the inner outwards; the fruit placed on the obconical base of the calyx; the leaves triply nerved, glandular in the axils of the principal veins; the leaf-buds scaly.

C. officinarum, the Camphor Laurel, is a tree with lax smooth branches; the leaves are bright green and shiny above, paler beneath, and somewhat coriaceous, with a sunken gland at the axils of the principal veins, projecting at the upper side, opening by an oval pore beneath. This plant is a native of Japan and China, and is cultivated in most of the warmer parts of the world. The Camphor of commerce is yielded by this tree, which is cultivated most extensively in the island of Formosa, from whence it is taken to Canton, which is the principal market for Camphor. [Camphor.]

CAMPION. [Lychnis, *S.* 1; Silene.]

CAMPSIE. [Stirlingshire.]

CANADA.—*Lower Canada*, or *Canada East*, is divided into 36 counties, the names of which we give here with the population of each in 1851:—Beauharnois, 40,213; Bellechasse, 17,982; Berthier, 34,608; Bonaventure, 10,844; Chambly, 20,576; Champlain, 13 896; Dorchester, 43,105; Drummond, 16,562; Gaspé, 10,904; Huntingdon, 40,645; Kamouraska, 20,396; Leinster, 29 690; L'Islet, 19,641; Lotbinière, 16,567; Mégantic, 13,835; Missisquoi, 13,484; Montmorency, 9598; Montreal, 77 381; Nicolet, 19,657; Ottawa, 22,993; Portneuf, 19,366; Quebec, 61,526; Richelieu, 25,686; Rouville, 27,031; Rimouski, 26,882; Saguenay, 20,783; St. Maurice, 27,562; St. Hyacinthe, 30,623; Sherbrooke, 20,014; Shefford, 16,482; Stanstead, 13,898; Terrebonne, 26,791; Two Mountains, 30,470; Vaudreuil, 21,429; Verchères, 14,393; Yamaska, 14,748;—total population of Canada East, 890,261.

In *Canada East* are *Montreal* and *Quebec*. [Montreal; Quebec.] The other towns are Three Rivers, St. Hyacinthe, Sherbrooke, and Sorel. *Three Rivers* is prettily situated at the confluence of the St. Maurice with the St. Lawrence, and has a population of 4936. There are iron mines near the town. There is a considerable trade in pot- and pearl-ashes. Three Rivers is one of the depôts of the north-west traders, and is on the whole a place of some importance in a commercial point of view. *St. Hyacinthe*, population 3313, in St. Hyacinthe county, is situated on the left bank of the Yamaska River, abont 30 miles E. by N. from Montreal. It is the seat of a college. *Sherbrooke*, population 2998, the district town of the eastern townships, is situated at the junction of the Magog with the St. Francis River. Its extensive command of water-power gives it great facilities for manufactures. The chief public building here is the court-house and jail. *Sorel*, or *William Henry*, population 3424, at the confluence of the Richelieu and the St. Lawrence, is likely from its advantageous situation to be of much greater importance than it has yet attained. By the Chambly Canal there is communication between Lake Champlain and the St. Lawrence, at Sorel. There is also a railway along the same line of route.

Upper Canada, or *Canada West*, is divided into 42 counties, as follows:—Addington, population 15,165; Brant, 25,426; Bruce, 2837; Carleton, 31,397: Dundas, 13,811; Durham, 30,732; Elgin, 25,418; Essex, 16,817; Frontenac, 30,735; Grey, 13,217; Glengary, 17,596; Grenville, 20,707; Haldimand, 18,788; Halton, 18,322; Hastings, 31,977; Huron, 19,198; Kent, 17,469; Lambton, 10,815; Lanark, 27,317; Leeds, 30,280; Lenox, 7955; Lincoln, 23,868; Middlesex, 39,899; Northumberland, 31,229; Norfolk, 21,281; Ontario, 30,576: Oxford, 32,638; Peel, 24,816; Perth, 15,545; Peterboro', 15,237; Prescott, 10,487; Prince Edward, 18,887; Renfrew, 9415; Russell, 2870; Simcoe, 27,165: Stormont, 14,643; Victoria, 11,657; Waterloo, 26,537; Wellington, 26,796; Welland, 20,141; Wentworth, 42,619; York, 79,719;—population of Canada West, 952,004. Total population of Canada, 1,842,265.

Canada West contains the cities of *Toronto*, at present the capital of the United Province, *Hamilton*, and *Kingston*. [Toronto.] *Hamilton* is beautifully situated at the western extremity of Burlington Bay, near the shore of Lake Ontario. It was founded in 1813, and became an incorporated town in 1833; the population in 1851 was 14,112. The construction of the Burlington Canal, a short cutting which opens a clear navigation into Lake Ontario, and the improvements of the Desjardins Canal, five miles long, which connects Hamilton with the manufacturing town of Dundas, have much promoted the prosperity of the place. It is the district town of Gore district, and as such contains the court-house for the district and other public buildings. The streets are well laid out, and many of the houses are built of stone. There are two market-houses, one of them including an upper story used as the town-hall, a custom-house, a post-office, and a theatre. There are places of worship for Episcopalians, Presbyterians, Wesleyan Methodists, Independents, Baptists, Roman Catholics, and others; news-rooms; and a mechanics institute. Good roads extend in all directions from the city, and numerous stage-coaches keep up communication with the surrounding districts. Steam-vessels ply regularly during the season to Toronto and to Queenstown aud Niagara. Hamilton has mnch increased in commercial importance of late years. *Kingston*, population 11,585, situated on lake Ontario, distant 199 miles S.W. from Montreal, and 177 miles E.N.E. from Toronto, was incorporated in 1838. It is advantageously situated at the beginning of the Rideau Canal and the Cataraqui River, and is important in a military as well as a commercial point of view, being the key of the central St. Lawrence, as Quebec is of the river's seaward extremity. In its neighbourhood is Navy Bay, a narrow and deep inlet of Lake Ontario, which is the chief naval station on the lakes. The market-house, which contains also the post-office, the town-hall, and several public offices, is a handsome stone building of considerable dimensions. There are places of worship for Episcopalians, Presbyterians, Wesleyan Methodists, Baptists, Roman Catholics, and others. There are here a Presbyterian college, an hospital, a mechanics' institute, and news-rooms. Ship-building is carried on. A bridge nearly 600 yards long crosses the river Cataraqui at Kingston. There are several mineral springs in the vicinity.

Of the towns of Canada West the following may be noticed:—*Amherstburg*, a garrison town on the Detroit

River, population 1880, is finely situated, the banks of the river in the vicinity of the town being very beautiful. The town received in 1845 a charter to hold a fair twice a year. There are Episcopal, Presbyterian, Methodist, Baptist, and Roman Catholic places of worship, a court-house, news and reading-rooms, and a market-place. British and American steamers frequently call. Several handsome dwelling-houses are in the neighbourhood of the town. *Barrie*, population 1207, commenced in 1832, is now the district town of Simcoe district. There are in the town a court-house, several places of worship, a mechanics' institute, and a jail. Steam-vessels ply on Lake Simcoe, which by the river Severn communicates with Georgian Bay and Lake Huron. *Belville*, population 4569, situated about 50 miles W. from Kingston on the Bay of Quinté, is a place of considerable trade. There are here a court-house for the district of Victoria, several places of worship, and some other public buildings. Steam-vessels call regularly at Belville. *Brantford*, population 3877, on the left bank of the Grand River, about 74 miles W. by S. from Hamilton, was commenced in 1830. A canal about 2½ miles long with three locks enables vessels of moderate draught to reach the town, thus avoiding the falls of the Grand River. There are chapels for Episcopalians, Presbyterians, Independents, Baptists, and Roman Catholics. Grist-mills, fulling-mills, soap-factories, and other establishments give considerable employment. *Brockville*, population 3246, situated on the river St. Lawrence, about 56 miles N.E. from Kingston, was founded in 1802; it is now an incorporated town. Most of the houses are built of stone, and the town has a handsome appearance. The court-house and jail, and the churches, of which there are several, are stone-buildings. Tanneries, saw-mills, a brewery, and other works employ some of the inhabitants. Steam-vessels call at Brockville on their passage. *Bytown*. [BYTOWN, *S.* 2.] *Chatham*, population 2070, on the left bank of the river Thames, 66 miles S.W. from London, and 50 miles E. from Detroit, is a thriving town, with an increasing trade. A steam-vessel belonging to the place maintains a regular communication with Detroit and Amherstburg. There are here saw-mills, tanneries, pottery works, &c. Several places of worship are in the town. *Cobourg*, population 3871, is situated on gently rising ground, on the bank of Lake Ontario, 103 miles W. by S. from Kingston, 72 miles E. by N. from Toronto. The town is well built, and has a good appearance. The harbour and lighthouse are of recent construction. There are churches for the leading denominations of Christians, a court-house, a mechanics' institute, &c. Victoria College, founded by the Wesleyan Methodists, but not exclusive in its management, is supported partly by a legislative grant. It has the power to grant degrees. There are here a large cloth-factory, mills, and other works. *Cornwall*, population 1646, situated at the termination of the Cornwall Canal in the St. Lawrence, was incorporated in 1834. There are many good stone dwelling-houses, several churches, and a court-house and jail. Some tanneries, a foundry, and other establishments give employment. *Dundas*, population 3517, a manufacturing town, about 5 miles N.W. from Hamilton, possesses extensive water-power, which has contributed much to its prosperity. The town is surrounded on three sides by high table-land, usually termed 'the mountain;' from this high land freestone and limestone are procured and exported. There are several chapels in the town. There is a mechanics' institute *Goderich*, population 1329, on Lake Huron, at the entrance of the Maitland River, was laid out in 1827 by Mr. Galt, who was at that time Secretary of the Canada Company. The town is finely situated on rising ground, more than 100 feet above the level of the lake. It is about 60 miles N. by W. from London. An expensive harbour was constructed, and a lighthouse was placed at the port, but the town has not been very successful. There are several churches, a court-house, breweries, tan-yards, &c. *Guelph*, population 1860, the district-town of Wellington district, about 42 miles N.W. from Hamilton, was laid out by Mr. Galt in 1828. It is pleasantly situated on elevated ground. The Episcopalians, Presbyterians, Wesleyan Methodists, Independents, and Roman Catholics have places of worship. *London*, population 7035, is finely situated at the junction of two branches of the river Thames, 85 miles W. by S. from Hamilton. It was laid out in 1826 by the crown, and was incorporated in 1840. London suffered severely from fire in 1844 and 1845, but the appearance of the town was much improved by the handsome streets of fine buildings which were subsequently erected. St. Paul's Episcopal church, erected by subscription to replace the edifice burnt down in 1844, is a beautiful gothic structure with a square tower surmounted with pinnacles. The court-house and jail, built of brick in the form of a castle; commodious barracks; two market-buildings; a theatre, and a handsome station of the Great Western railway are among the public buildings of the town. There are good roads in the vicinity. Machine-making, tanning, brewing, &c., are carried on. *Niagara*, population 3340, the district town of Niagara, 48 miles E. from Hamilton, is one of the oldest towns in Canada, and was for five or six years under the name of Newark the capital of the country. It has several churches, a town-hall, and a court-house. The Niagara Harbour and Dock Company, incorporated in 1830, have constructed in their ship-yards numerous barges, schooners, and steam-vessels. Considerable quantities of apples, peaches, and cider are shipped annually from the port of Niagara. *Ottawa*. [OTTAWA, *S.* 2.] *Perth*, population 1916, the chief town of Bathurst district, distant about 40 miles N.W. from Brockville, was laid out by the government in 1816. It stands on the river Tay, which is made navigable to the Rideau Canal by a branch canal about 11 miles in length. The town contains several places of worship, a court-house, and a jail, and many good dwelling-houses built of stone. White marble is found a few miles from the town. *Peterborough*, population 2191, occupies a beautiful situation on the Otonabee or Trent River, about 34 miles N.N.W. from Cobourg. It was commenced in 1826, is well laid out, and has a handsome appearance. Part of the town on the east or left bank of the river is called Peterborough East. Most of the places of worship are built of stone. On an elevated site behind the town is the court-house and jail, a handsome stone edifice. There are here woollen manufactories, fulling-mills, saw-mills, chair-factories, breweries, &c. *Picton*, population 1569, chief town of Prince Edward district, is finely situated on the Bay of Quinté. It is an old town and contains many good stone houses. Steamers call here on their passages between Kingston and Trent. There are several places of worship, a court-house, a jail, and a library. A good deal of trade is carried on. Wheat, flour, butter, leather, &c., are exported. *Port Hope*, population 2476, on Lake Ontario, about 8 miles W. from Cobourg, between Toronto and Kingston, is built on the side of a hill commanding interesting views of lake and inland scenery. It contains some handsome buildings, including four places of worship. Wheat, flour, and timber are the chief exports. *Prescott*, population 2156, on the St. Lawrence, about 12 miles N E. from Brockville, possessed considerable trade previous to the opening of Rideau Canal, but since then it has not made rapid progress. Among the buildings are four places of worship and a custom-house. At this place the river is about a mile and a quarter broad. A good deal of pot and pearl ashes is exported. *Sandwich*, population not given separately, on the Detroit River, is finely situated and well laid out. It is one of the oldest towns in Canada, and has assumed very much the appearance of an English country town. Many flower-gardens and orchards are kept by the inhabitants. The Episcopalians and Methodists have places of worship in the town. *Simcoe*, population 1452, the chief town of Talbot district, is situate near the shore of Lake Erie, about 24 miles S. by W. from Brantford. Grist- and saw-mills, a carding-machine and fulling-mill, with other establishments, furnish employment. *St. Catherine's*, population 4368, on the Welland Canal, about 12 miles W. from Niagara, occupies a beautiful situation, and possesses a good trade. Ship-building is carried on. Great quantities of flour are annually exported. There are six places of worship. *Woodstock*, population 2112, chief town of Oxford county in the Brock district, about 32 miles E.N.E. from London, is pleasantly situated. It is composed of East and West Woodstock, forming one street of about a mile long. There are six places of worship, a court-house, and a mechanics' institute. Considerable trade is carried on.

Of the population of Canada East, 890,261, as many as 669,528 are natives of Canada of French origin, and 125,580 are Canadians of other than French origin; 51,499 are of Irish origin; 14,565 of Scotch; 12,482 are from the United States of North America; and 11,230 from England and Wales. The remainder is composed of natives of the European continent, and of our own colonies.

In Canada West, the population of which is 952,004, the Canadians of French origin number 26,417, and the Canadians not French, 526,093: the Irish, 176,267; English and Welsh, 82 699; the Scotch, 75,811; natives of the United States, 43,732; natives of Germany and Holland, 9957.

With respect to the whole of Canada, of which the total population is 1.842,265, the seven principal items stand as follows:—Canadians of French origin, 695,945; Canadians, not French, 651,673; Irish, 227,766; English and Welsh, 93,929; Scotch, 90,376; natives of the United States, 56,214; of Germany and Holland, 10,116. At the time of the surrender of Canada to Great Britain, the population was chiefly French, and located in the lower province. Although this class has not been much increased by immigration, its numbers have in the course of 90 years increased about 1000 per cent. The progress of Canada West has been still more remarkable. In 1791, the date of the Constitutional Act, the population was 50,000; in 1811 it was 77,000; in 1824 it was 151,097; in 1832 it was 261,060; in 1842 it was 486,055; in 1851 it amounted to 952,004.

The amount of immigration into Canada is stated in a separate article. [Emigration, *S.* 2.]

In January 1857, the total length of main railways in Canada was above 1000 miles. These railways consist of two principal lines, the Grand Trunk Line and the Great Western Line, which are united at Toronto, and form a continuous railway from St. Thomas, east of Quebec, to the western boundary of Canada, on Detroit River. The Grand Trunk Line proceeds from St. Thomas 49 miles to New Liverpool, opposite Quebec, and thence by Richmond (where it unites with the line from Portland, in the State of Maine) to Montreal 170 miles, throwing off a branch northwards from Prescott to Ottawa. From Montreal the line proceeds through Prescott, Kingston, and Toronto, to Stratford 421 miles; total 640 miles. The Great Western Line extends from Toronto through Hamilton and Chatham, to Windsor, opposite Detroit, 229 miles. There is also an independent line from Niagara Falls to Hamilton 34 miles. This gives a total length completed of 903 miles, exclusive of the Ottawa branch and other smaller railways.

The revenue and expenditure in each year, from 1848 to 1853, are as follows:—

	Revenue			Expenditure.		
	£	*s.*	*d.*	£	*s.*	*d.*
1848 . . .	213 037	6	0	389,992	14	11
1849 . .	421,998	4	0	370,613	15	2
1850 . . .	578,822	11	3	437,312	11	3
1851 . .	692,206	4	9	521,643	11	3
1852 . . .	723,724	7	4	535,171	6	7
1853 . .	982,334	10	2	611,667	16	5

The imports and exports in each year, from 1848 to 1853, are as follows.—

	Imports.			Exports.		
	£	*s.*	*d.*	£	*s.*	*d.*
1848 . .	2.629.584	17	11	2,302,830	17	6
1849 .	2 468.130	6	9	2,193,078	0	3
1850 . .	3,489,466	3	5	2 457,886	1	2
1851 .	4,404,409	0	2	2,663,983	14	4
1852 . .	4,168,457	8	5	2,888,213	19	3
1853 .	6,571,527	19	9	4,523,060	19	1

Canada receives from the United Kingdom coals, metal, cordage, East India produce, and the various kinds of British manufactures; from the British West Indies, sugar, molasses, coffee, rum, and hard woods; from the United States, beef and pork, biscuit, rice, and tobacco. The exports of Canada are:—To the United Kingdom, pot and pearl-ashes, wheat and flour, and timber; to the West Indies, beef and pork, beer, grain, and flour; to the United States, forest produce, wheat, flour, butter, wool, livestock, &c.

CANNABINACEÆ, *Hempworts*, the Hemp Tribe, a natural order of Exogenous Plants. This little order which has been separated from *Urticeæ* embraces two well-known plants, the Hop (*Humulus Lupulæ*) and the Hemp (*Cannabis sativa*). They are distinguished from the Nettle Tribe by having a solitary suspended ovule, and a hooked ex-albuminous embryo, with a superior radicle. [Humulus; Cannabis.]

CANON LAW. In the university of Oxford, the common law has been substituted for the canon law. This is effected by stat. 17 & 18 Vict. c. 81, s. 45. The canon law still governs the court of the university of Cambridge.

CANTERBURY. [Zealand, New, *S.* 2.]

CANTHARADIN. [Chemistry, *S.* 1.]

CANTIRE. [Argyleshire.]

CANTON, WAR AT. [China, *S.* 2.]

CAPELLEN, GODERD ALEXANDER GERARD PHILIP, BARON VAN DER, a distinguished governor-general of the Dutch East Indies, was born at Utrecht on the 15th of December 1778. He lost his father, Alexander Philip van der Capellen, Heer van Berkenwonde, before he was nine years old. After studying at Göttingen under Martens and Blumenbach, with both of whom he continued in correspondence to the end of his life. he entered the public service of Holland, and became in 1809 Minister of Internal Affairs under King Louis Bonaparte, whom he strongly advised to defend the entrance of Holland by force against the armies of Napoleon; and when the French system was introduced into the country Jan. 1, 1811, he accompanied Louis to his retreat at Gratz in Styria. A coolness however arose on the part of the ex-king when he found that his late minister looked with no unfavourable eye on the rising in Holland to restore the house of Orange; and after the complete emancipation of Holland from the French yoke, Van der Capellen was in fact appointed Minister of Commerce and the Colonies, and on the 1st of August 1814 Governor-General of the Dutch East Indies. Owing to an important mission to the congress of Vienna, and the return of Napoleon, which gave Van der Capellen an admirable opportunity of showing his constancy and courage at Brussels on the day of Waterloo, he did not leave Europe for his post till October 1815, and a further delay occurred before he finally received Java from the hands of the English, agreeably to the arrangements made at the peace. He remained beyond the five years, which had been originally intended, and was recalled in disgrace in 1826, when he was universally censured in Holland for having effected a loan of fifteen millions of sicca rupees at Calcutta, at nine per cent., on the security of the revenues of the Dutch East Indies. It was said that of all measures that could be adopted the most unadvisable was that of pledging the Dutch possessions to the English. Van der Capellen had however shown no partiality to our nation; he had, on the contrary, strongly urged the Dutch government not to consent to the English establishment of Singapore. He had however followed up the arrangements made by Sir Stamford Raffles during the English possession of Java, and by that means an immense improvement was effected in the position and prospects of the country. He had also abolished the monopolies which under the old Dutch system pressed heavily upon the natives of Celebes and the Moluccas, made alterations and improvements much required in the coinage, and taken measures for the abolition of the slave trade and slavery. The most unfortunate circumstance connected with his administration was the outbreak of the great revolt of Diepo Negoro, a Javanese chief, which lasted many years, and which on his return to Europe he left still unsubdued. On the whole however, when his administration came to be reviewed, the unpopularity which had collected around him gradually cleared off, and his merits are now universally acknowledged. He was nominated to several high posts, among others to that of ambassador to England on the occasion of the Coronation of Queen Victoria, President of the Commission of Education, and President of the University of Utrecht. In February 1848 he was unfortunately on a visit to Paris, on an invitation from King Louis Philippe, who was a personal friend, when in the outbreak of the revolution he was struck on the head by a stone thrown by one of the mob. No outward injury appeared, but on his return to his seat at Vollenhoven he sunk into a deep melancholy, produced partly by his feelings at the events he had witnessed, and this was succeeded by an inflammation of the brain, attributed to the blow, which carried him off on the 10th of April, 1848.

CAPPOQUIN. [Waterford.]

CARAPA, a genus of plants belonging to the natural order *Meliaceæ*. *C. Touloucouna* yields the Tallicoonah or Kundar Oil, which has a reputation as an anthelmintic. It is said to be well suited for burning in lamps. The bark of the root of *C. obovata* is bitter and astringent. The bark of *C. Guianensis* is used as an anthelmintic and febrifuge.

CARBUNCLE. [Garnet.]

CARDIOSPERMUM, a genus of plants belonging to the natural order *Sapindaceæ*. The root of one of the species, *C. Halicacum*, is said to be diuretic, diaphoretic, and aperient. In the Moluccas the leaves are cooked and eaten.

CARDIUM. [Conchacea.]

CARDUELIS. [Goldfinch.]

CARIA. [Karia, *S.* 2.]

CARLINGFORD. [Louth.]

CARLOS, DON (Count de Molina), Infante of Spain, and pretender to the Spanish throne, was the second son of Carlos IV. of Spain, and was born on the 29th of March 1788. Left chiefly in the hands of priests, to whom the superintendence of his education had been entrusted, Don Carlos remained in comparative obscurity during the domination of Godoy. On the first abdication of his father and the accession of his brother Ferdinand VII., Don Carlos was sent to meet Bonaparte, who had announced his intention to visit Spain. The young prince was inveigled beyond the Spanish provinces, and made in effect a prisoner, and Ferdinand, like his brother, soon found himself also in the hands of the French. Bonaparte next compelled the weak ex-monarch of Spain to proceed to Bayonne, and refusing to acknowledge his former abdication, forced him first to resume the crown, and then, for himself and his posterity, to "abdicate all claims to the Spanish kingdom in favour of his ally the Emperor of the French." In this renunciation, after a strenuous opposition, Don Carlos, as well as Ferdinand, was compelled to join. The brothers were sent to Prince Talleyrand's house at Vallençay, where they were detained prisoners, though treated with great respect, till 1813, when Napoleon restored them to liberty, and Ferdinand to the throne of Spain.

When, after the suppression of the constitutional party by the French invasion under the Duc d'Angoulême, Ferdinand appeared inclined to adopt a somewhat more moderate policy, the absolutists turned their attention towards Don Carlos, and determined if possible to raise him to the throne. A conspiracy of a formidable character was organised, and an insurrection broke out in Catalonia in 1825, but was repressed by the vigorous measures of the Count d'España.

Don Carlos had himself taken no open share in the insurrectionary movements of his partisans. He was heir to the throne, and it is probable he was anxious not to endanger his succession by a premature declaration. His hope of legal succession was however quickly dispelled. Ferdinand had been three times married without having any children, but by his fourth wife, Christina, he had in October 1830 a daughter, Isabella, the present queen of Spain. By the ancient laws of Spain females could inherit the crown in default of male issue; but the Salic law of France had been introduced with the Bourbons, and females continued to be excluded from the throne till 1789, when Carlos IV. abrogated the restriction, and restored the ancient rule of succession. In 1812 however the Cortes re-established the Salic law, and Don Carlos was therefore still the heir-presumptive to the throne. But Ferdinand now issued a decree which annulled the provision of the Cortes, and restored the order of succession in the female line. Don Carlos protested, but remained quiet. His partisans however throughout the kingdom prepared for the struggle which the weak state of the king's health showed to be not very distant. In September 1833 Ferdinand was believed by himself and those about him to be dying, and the feeble king, terrified at the mischiefs which he was assured would result from the measure which excluded his brother from the throne, and acting on the advice of his favourite minister Calomarde, signed a decree by which he restored the Salic law. Ferdinand however rallied, and was easily induced by his sister-in-law to destroy the evidence of his recent vacillation. He died a few days later, and his death was the signal for a general rising of the adherents of Don Carlos in opposition to Queen Isabella, who had succeeded to the throne of her father.

For full five years Spain was desolated by a civil war, in its early period at least one of the most atrociously cruel which has ever disgraced a civilised country. Carlos was supported by the great body of the priests, by a large portion of the country party, and by nearly the whole of the inhabitants of the Basque Provinces—the bravest and most devoted portion of the Spanish people. Had he been a man of more energy and ability, the great probability is that he would have succeeded. But he possessed in full the hereditary bigotry, weakness, and obstinate folly of his race, and he more often marred than followed up the successes which his generals achieved. Yet the energy and courage of his generals, Cabrera and Zumalacarregui, maintained the balance decidedly in his favour, till the valuable aid of the British legion under General Sir de Lacy Evans, and the death of Zumalacarregui, turned the scale. The defection of Maroto, and the surrender of his army to Espartero in August 1839, left Carlos no alternative but flight, and he at once took refuge in France.

Louis Philippe assigned him a residence in the city of Bourges, where he was joined by his family, and where for some years he maintained a mimic court, in which was observed all the elaborate etiquette of the Spanish monarchy. At length, sick of hope deferred, he in 1845 formally relinquished his claim to the Spanish crown in favour of his eldest son Don Carlos Louis Maria Fernando, Count de Montemolin. The abdication of Don Carlos was strongly opposed by his wife, the Princess Maria Theresa (daughter of John IV. of Portugal), and by his leading supporters, including General Cabrera. In Spain it probably strengthened the hands of the Queen; and the subsequent rising in favour of the Count de Montemolin was easily suppressed. Don Carlos was permitted in 1847 to remove to Trieste, where he remained in strict retirement till his death, March 10th, 1855.

CARRICK. [Ayrshire.]

CARRICK-ON-SHANNON. [Leitrim.]

CARRICKMACROSS [Monaghan.]

CARSHALTON. [Surrey.]

CARTHAMIN. [Chemistry, *S.* 1.]

CASEARIA, one of the five genera of plants constituting the natural order *Samydaceæ*. Several of the species are used medicinally. The leaves of *C. ulmifolia* are astringent, and in the Brazils are applied to recent wounds. A decoction of the leaves of *C. lingua*, called by the Brazilians Cha de Frade and Lingua de Fin, is used in fevers and inflammatory disorders. *C. astringens* is used as an external application on account of its astringent properties. *C. Anavinga*, an Indian species, is bitter. The leaves of *C. esculenta* are eaten, but the root is bitter and purgative.

CASEIN. [Chemistry, *S.* 1.]

CASTAÑOS, FRANCISCO XAVIER, the most eminent Spanish general in the Peninsular War, was born at Madrid, according to the best Spanish authorities, about 1756. His father, who was a military officer, procured him a captain's commission at the age of twelve, and he remained in the service till he was ninety-six, being then probably the oldest soldier on record. In his early years he was sent with General O'Reilly to the court of Frederick the Great to study the Prussian tactics, and he passed through various grades in the Spanish army without achieving any high reputation till the invasion of Spain by Napoleon I., when he was fortunate enough to strike the first blow of the long series of victories against the French, which terminated in the downfall of their power. On the 22nd of July 1808, eighteen thousand French, commanded by General Dupont, laid down their arms and surrendered to the Spanish army, under Castaños, at Baylen. It is stated by Lord Holland, in his 'Reminiscences,' that when the French general delivered his sword to Castaños, he said, "You may well, General, be proud of this day; it is remarkable that I have never lost a pitched battle till now; I, who have been in more than twenty, and gained them all!" "It is the more remarkable," was the Spaniard's quiet reply, "because I never was in one before in my life." The chief merit of the victory has, however, been ascribed by many to the second in command, Aloys Reding, a Swiss patriot, who, after vainly endeavouring to defend his native country against Napoleon, had entered the service of Spain. The effect of this great battle was to drive Joseph Bonaparte from Madrid, and on the 23rd of August Castaños made his triumphal entry into the capital, where, on the next day, Ferdinand was proclaimed. Later in the same year, in November, Castaños was defeated by the French at Tudela, and he held but a subordinate position to the Duke of Wellington and Marshal Beresford during the remainder of the war, in which he took a share in the battles of Albuera, Salamanca, and Vitoria, particularly the last. In 1815, on the return of Napoleon, he was in command of an army of 80,000 Spaniards, which had already partly advanced into France when the news of the battle of Waterloo arrived. In the year before, however, he had received some disgusts from the government, which excited the indignation of the Duke of Wellington, his companion-in-arms; and in the years which followed he did not hold a prominent position, though he possessed much of the esteem of both parties. Towards the close of his life, however, his popularity revived, partly perhaps on account of the phenomenon of his great age, and the Duke of Baylen was looked on as the representative of Spanish chivalry. "In spite of his ninety years of age," says Mellado in 1846, "General Castaños, though much bent, still constantly shows himself in the public streets, moving about on foot, and in the enjoyment of astonishing health. For some time he has been an almost daily visitor at the royal palace, and has the reputation of being full of sharp and weighty sayings; many of his reputed repartees to King

Ferdinand, who was very fond of him, circulating amongst the lower classes." Among other posts of dignity, he held that of one of the guardians of the present Queen of Spain. He died at Madrid, on the 24th of September, 1852, and his remains were honoured with a public funeral.

CASTEL VETRANO, a town in the province of Trapani, in Sicily, is situated near the left bank of the Delia, 30 miles E. from the town of Trapani, about five miles from the nearest point of the south coast of the island, and has a population of about 13,000. The town is famous in works in coral and alabaster. It is built on a hill, and is an old-looking place, with an old castle, several churches, convents, and palaces. The country round Castel Vetrano is fertile in wine and rich pastures. A few miles from Castel Vetrano, to the south-eastward, are the ruins of the ancient *Selinus*. This ancient site is covered with broken columns, capitals, and other architectural fragments. The columns are all Doric, and of large dimensions; they are called 'Giants' Pillars' by the peasantry. A few columns are still standing. Some finely sculptured metopes were discovered at the base of the façade of the central temple in 1822. There are ruins of six temples in all.

CASTELLAMMARE, the chief town of a subdivision of the province of Napoli, in the kingdom of the Two Sicilies, is situated near the head of the Bay of Naples, on the lower slopes of the Monte d'Auro (an offshoot of the limestone ridge of Monte Sant'Angelo), 18 miles by railway S.E. from Naples, and has a population of 18,000. It is connected by a branch railroad with the Naples-Nocera line, the first railway opened in Italy. The town stands on or near the site of the ancient *Stabiæ*, which was ruined by Sylla in the Social War, and afterwards covered by ashes from Mount Vesuvius in the eruption of A.D. 79. During this eruption Pliny the elder lost his life at Stabiæ. The hill above Castellammare is called Monte Qui-si-sana from its proverbial salubrity; it is covered with villas and casini; among the latter is the royal casino of Qui-si-sana, founded by Charles II. of Anjou, and now the property of the Russian prince Lieven. Behind the hill rises the imposing mass of Monte Sant'Angelo, which with its triple crest runs through the Sorrentine peninsula, and forms a conspicuous object between the bays of Salerno and Naples. The town derives its name (signifying 'castle by the sea') from its castle, which was erected by the emperor Frederick II., surrounded by walls and towers by Charles I. of Anjou in the 13th century, and subsequently strengthened by Alfonso I. of Aragon. The town was sacked by the army of Pius II. in 1461, and again in 1654 by the Duke of Guise. The harbour has a depth of three to four fathoms water; it is surrounded by spacious quays and protected by a mole. In connection with the harbour are a bagnio for galley slaves, and a royal arsenal and dockyard, where the ships of the Neapolitan navy are built. These establishments contribute materially to the prosperity of the town. Castellammare has been celebrated since the time of Galen for its mineral springs, which are very efficacious in gouty and rheumatic affections. There are twelve of these,—four chalybeate, four saline, and four sulphureous,—and they all rise at the base of the Monte d'Auro, within a short distance from one another. They are all of moderate temperature, seldom exceeding 65° Fahr. Great numbers of visitors frequent Castellammare and its delightful neighbourhood during the summer and autumn; the temperature is 8 or 10 degrees lower than that of Naples. The town, which gives title to a bishop, and has a handsome cathedral, is well built, partly on the lower slopes of Monte d'Auro, but chiefly along a sheltered beach commanding a view of the whole bay of Naples. Some wheat is exported; the chief imports are coal, timber, and machinery. Among the industrial products are maccaroni, silk and cotton goods, and sail-cloth. The fisheries along the coast employ a good many hands. Some excavations made among the ruins of Stabiæ in 1745 brought to light a few fragments of sculpture, some papyri, and paintings, which are now in the Museum of Naples.

There is another *Castellammare*, or *Castellamare*, in the province of Trapani in Sicily. It is situated on the southern shore of the Gulf of Castellamare, 22 miles E. from the town of Trapani, 27 miles W.S.W. from Palermo, and has about 6000 inhabitants. The town, which is ill-built and dirty, is named from its old decaying castle. It carries on a considerable trade by sea, and has large granaries; the exports are corn, wine, fruit, cotton, manna, shumac, &c. The remains of the ancient Segesta are near Castellamare: they consist of a Doric temple in tolerable preservation, the ruins of a theatre, and a part of the city walls. Castellamare is said to occupy the site of the port of Segesta. [Trapani.] The town was half destroyed by a waterspout in December, 1851.

CASTLE ACRE. [Norfolk.]

CASTLE BLAYNEY. [Monaghan.]

CASTLE CARY. [Somersetshire.]

CASTLE RISING. [Norfolk.]

CASTRÉN, MATTHIAS ALEXANDER, one of the heroes and martyrs of modern philology, was born on the 2nd of December 1813 in the province of Uleoborg in Finland, not far from the boundary between Finland and Lapland, a little north of the town of Torneo, the place to which travellers usually resort to witness the phenomenon of the midnight sun. He received his early education at Torneo, and afterwards went to Helsingfors to pursue his studies at the university, which had been removed there by the Russian government after the conflagration of Abo. One effect of the transfer of Finland from Sweden to Russia had been to lessen the importance of the Swedish language, which had up to that period occupied much the same position in Finland which the English does in Wales, but which then ceased to be the language of the government, though it continued to be that of the educated classes. A lively interest was awakened in the Finnish, the old language of the country, which is still spoken by the peasantry, and which some recent philologists have not hesitated to pronounce one of the finest languages in Europe. Of the students at Helsingfors who followed up this study none were more enthusiastic than Castrén. He made a resolution to devote his life to the language and literature of his native country. Nor was this an idle vaunt. He commenced a course of inquiries into the mythology of ancient Finland, and finding that to complete his views it was desirable to ascertain with more exactness than had hitherto been thought requisite the mythology of the Laplanders, he looked about him for the means of making a journey into Lapland, and studying the language and religion of the Laps. In 1838 an opportunity presented itself, and he set out with three companions on a tour, which before its completion took him to Uitzoki and the great lake of Enaré. The travellers had to carry their changes of clothing and all their stores on their backs, and their journey both out and home was an almost uninterrupted series of labours, hardships, and privations. Castrén could learn less of the Lapland mythology than he had expected, for although the conversion of many of the tribes from heathenism had only taken place in the 18th century, the Christian Laps were so devout that they often spent twenty-four hours in succession in religious exercises, and many of them knew the whole of the New Testament by heart; the ancient mythology being regarded with proportionate abhorrence. On his return he learned that the Imperial Academy of Sciences at St. Petersburg contemplated sending an expedition to Siberia to prosecute researches in ethnology, and he put himself in communication with his fellow-countryman and fellow-philologist Sjögrén to undertake the task. For the time he was disappointed; but the Literary Society of Finland raised a scanty subscription to send him on a mission to Russian Carelia, to collect ballads, legends, and traditions illustrative of his favourite Finnish mythology, and he was remarkably successful. Soon after his return in 1841, he published, at Helsingfors, a translation into Swedish, in the metre of the original, of the great Finnish poem 'Kalevala,' the discovery of which by Dr. Lönnrot, who first noted part of it down from the lips of the peasantry, has made an epoch in the history of Finnish literature. It was this translation that first brought the poem into general notice; and, certainly, since Macpherson's 'Ossian,' no discovery of the kind, real or supposed, has produced an equal sensation. 'Hiawatha,' the recent poem of Professor Longfellow, though purporting to be an embodiment of the traditions of the North American Indians, is borrowed from the 'Kalevala' in its general style, in its peculiar metre, and even in some of its more prominent passages. Soon after its publication Castrén set out on his third philological journey, which appears to have been made in its outset at the expense of Dr. Lönnrot, and afterwards at that of the Russian Academy of Sciences. It took him first to his old quarters at Enaré, then to Kola, the capital of Russian Lapland, and finally to the Samoyeds on the coast of the White Sea. Here, with only fifteen rubles to keep him from starvation, he struck up an acquaintance with some of the savage Samoyeds, or cannibals, one of whom for an occasional glass of brandy undertook to teach him the Samoyed language; and in the hut of this man he passed nearly the whole of a summer, engaged in the study. Towards the end of his travels, which lasted for four years, from 1845 to 1849, he crossed the Tundras, or deserts of European Russia, between the White Sea and the Ural, where not even the rein-deer can front the wintry blast and live. Philology has its martyrs as well as religion. Castrén returned with his constitution ruined.

While on his travels he had written most interesting and animated letters, descriptive of his adventures and discoveries, which were printed in the 'Suomi,' an excellent periodical in the Swedish language published at Helsingfors. Many communications from him on learned subjects, chiefly written in German, appeared at the same time in the 'Bulletin of the Academy of Sciences' at St. Petersburg. On his return his name was universally known as that of a philologist of the first rank, but it was not till March 1851, on the occasion of a visit of the Grand Duke Alexander, the present Emperor of Russia, to the University of Helsingfors, that he was raised from the position of a 'privat-docent,' or private tutor, to that of professor of the Finnish and old Scandinavian languages. One of his duties was to deliver a course of lectures on Finnish mythology, which he immediately commenced composing, but before they could be finished he was no more. He died at Helsingfors on the 7th of May, 1852, from the effects of his Samoyed journey.

The translation of the 'Kalevala,' and some of Castrén's other works, have been already mentioned. His lectures, 'Vorlesungen über Finnische Mythologie,' were published in German at St. Petersburg in 1853 under the editorship of Schiefner. A German version of his travels by Helms was published at Leipzig in 1853, and analysed at some length in the 'Quarterly Review.' His other works were mostly of a philological character:—'Elementa Grammatices Tcheremissæ,' Kuopio, 1845, 8vo; 'Elementa Grammatices Syrjanæ,' Helsingfors, 1844, 8vo; 'De Affixis Personalibus Linguarum Altaicarum,' Helsingfors, 1850, 4to. There is also an Ostiak Grammar in German, forming a portion of a work called 'Nordische Reisen und Forschungen,' which was commenced at St. Petersburg in 1849. It need hardly be added that all these works are of the highest value to those who take an interest in what is called the Ugrian family of languages, comprising the Finnish, the Hungarian, the Syryanian, and other dialects scattered over the surface of European Russia, to investigate which was the object of Castrén's devoted exertions. It is much to be regretted for the sake of learning, as well as on other accounts, that he was snatched away before he had time to communicate to the world the results of his dauntless and ingenious labours.

CATALYSIS. [Chemistry, *S.* 1.]

CATAMARCA, one of the upper provinces of the Argentine Confederation, South America, is bounded N. and N.E. by the province of Tucuman, E. by Santiago, S. by Cordova, and S.W. by La Rioja, and comprehends the little visited country between the mountain ranges of the Sierra of Aconquija and Ambato on the east, and the Andes on the west. The inhabitants do not exceed 30,000. The country consists of a principal valley, Catamarca, from which the province derives its name, and in which most of the inhabitants are settled; and of some other valleys, running between mountain ranges south-east and north-west, and terminating at their southern extremity on the borders of the Gran Salina, being thus separated from the other inhabited countries by high mountains and deserts. The rivers which water these valleys are lost in the Gran Salina. The climate is sultry, especially when the south winds blow, which come over the desert. Maize and wheat are raised to a considerable extent, but cannot be exported over the mountains. The province sends only cotton and red pepper (dried capsicums) to the adjacent countries, the latter chiefly to Buenos Ayres, where it is extensively used. The present capital is *Catamarca*, or *San Fernando del Valle de Catamarca*, in 27° 28′ S. lat., whose population is stated to be 4000. The first capital, called London, which was founded at the time when Philip II. of Spain married Queen Mary of England, was destroyed by the Indians.

CATHA, a genus of plants belonging to the natural order *Celastraceæ*. *C. edulis* is the Kat or Khât of the Arabs. "It would appear," says Dr. Lindley, "to be of a stimulating character. According to Forskähl the Arabs eat the green leaves with greediness, believing them to have the power of causing extreme watchfulness, so that a man may stand sentry all night long without drowsiness. They also regard it as an antidote to the plague, and assert that a person wearing a twig of it in his bosom may go among the infected with impunity; they even believe that the plague cannot appear in places where the tree is cultivated." ('Vegetable Kingdom,' p. 587.) At the same time Forskähl adds, "The taste of the leaves does not seem to indicate such virtues."

CATHARINE'S, ST. [Canada, *S.* 2.]

CATHCART, LIEUTENANT-GENERAL the **HON. SIR GEORGE, K.C.B.**, was born in London, on the 12th of May 1784, the third son of William Shaw, the first Earl Cathcart. He was educated at Eton, and at the University of Edinburgh; and in 1810 he began his military life by joining the 2nd Life Guards. In 1812, by which time he had been promoted to a lieutenancy, he accompanied as aide-de-camp his father, who was sent as plenipotentiary to Russia. When they arrived the French were in possession of Moscow, and when the Emperor Alexander took the field in person in 1813, Lieutenant Cathcart joined the imperial army. He was with the grand army throughout the campaigns of 1813 and 1814, witnessed the battles of Lutzen and Bautzen, those of Dresden and Leipzig, of Brienne, Bar-sur-Aube, Arcis-sur-Aube, and the taking of Paris. Of these campaigns, and more particularly of the strategy of Napoleon I. as displayed in the battles, he published a volume of Commentaries in 1850, from the facts noted at the time, accompanied with diagrams showing the position of the armies, with their movements. It is a valuable work; additional interest being given to it by an introduction explaining the different military systems of the Allied Powers, as well as of the French, and displaying the effects of national character under the different circumstances of attack and defence. In 1814 he again accompanied his father, who was one of the three plenipotentiaries sent to Vienna. On the return of Napoleon from Elba he was appointed aide-de-camp to the Duke of Wellington, and was present at Quatre Bras and Waterloo. He was continued in the appointment when the Duke became master-general of the Ordnance, and accompanied him on his mission to Aix-la-Chapelle, Verona, and Berlin. In 1828 he had arrived at the rank of Lieutenant-Colonel, and served for about eight years in Nova Scotia, Bermuda, and Jamaica. In 1834 he retired on half-pay; but in 1837 was recalled into active service on account of the outbreak in Canada, where he proved himself an active and efficient officer. After serving there for more than six years he returned home, and again retired on half-pay in 1844. In 1846 he was made Deputy-Lieutenant of the Tower, an office which he held till 1852, when he accepted the governorship of the Cape of Good Hope, with the command of the forces, and brought the Kaffir insurrection to a successful termination. On his return to England he was immediately sent as General of Division to the Crimea, where much was expected from a man so thoroughly acquainted with the practice and science of his profession. He however had short time to display his capabilities. In the battle of Inkermann, on the 5th of November 1854, where he displayed the most heroic bravery, but in which the attack he made on the left was met by a force so superior that it failed in the desired effect, he fell, together with the other leading chiefs. He was buried on the spot —Cathcart's Hill—with eleven other officers who had fallen.

CATLINITE, a form of argillaceous mineral called Pipestone by the North American Indians. It comes from the Coteau des Prairies, and is a red claystone or compacted clay. A similar material is now accumulating on the north shore of Lake Superior, at Nepigon Bay. Another variety is used by the Indians of the north-west coast of America. (Dana, *Mineralogy*.)

CAT-MINT. [Nepeta, *S.* 1.]

CAT'S-EYE, a form of Chalcedony, of a greenish-gray colour, having a peculiar opalescence, or glaring internal reflections, like the eye of a cat: the effect is owing to filaments of asbestos. It comes from Ceylon and Malabar, and possesses considerable value as a gem. (Dana, *Mineralogy*.)

CAT'S-TAIL GRASS, the common name of *Phleum pratense*, an agricultural plant, also called Timothy Grass. [Phleum.]

CAUCHY, AUGUSTIN LOUIS, mathematician, was born at Paris, Aug. 21, 1789. His father, Louis François Cauchy, was a poet, and became archiviste of the Chamber of Peers. The son was carefully and religiously educated. In 1804, while at the Écoles Centrales, he was crowned by the Institute as the pupil who had carried off most prizes, among which was the first in Latin poetry. In the following year he entered the Ecole Polytechnique as second scholar, and in 1806, when only in his seventeenth year, his solution of a difficult problem was printed in the 'Correspondance' of the school.

From the École Polytechnique, where he rose to the first place, M. Cauchy entered that of the Ponts et Chaussées, maintaining the same position. He was afterwards appointed engineer of the works for the port of Cherbourg; and from this date commences his long series of mathematical researches in questions previously unsolved. Among the first was his demonstration of Euclid's celebrated theorem on the polyedra. In 1813 he published his 'Méthode pour déterminer à priori le Nombre des Racines réelles négatives d'une Extraction d'un degré quelconque,' which was followed by papers on the properties of integrals, taking up questions started by Clairaut. In 1815 he received the grand mathematical and physical prize of the Institute for his paper 'Sur la Théorie des Ondes,' which became the basis of a theory of light.

In 1816 Cauchy was elected a member of the Academy of Sciences, and was appointed professor of mechanics in the École Polytechnique, and in the same year he published his demonstration of Fermat's theorem of the polygonal numbers. His lectures had a most salutary influence on the educational results of the school, and the progress of his pupils was materially aided by the works which he successively published: 'Cours d'Analyse,' 1821; 'Leçons sur le Calcul Différentiel,' 1826; 'Leçons sur les Applications du Calcul Infinitesimal à la Géometrie,' 2 vols. 4to, 1826-28. At the same time he continued his valuable series of papers for the Academy, among which are 'Sur les Intégrales définies entre les Limites Imaginaires,' 1825; 'Sur l'Application du Calcul des Residus à la Solution des Problèmes de Physique Mathématique,' 1827; 'Sur la Résolution d'Équations Numériques, et sur la Théorie de l'Elimination,' 1829; 'Sur la Théorie des Nombres,' and others. The last was presented in May 1830. The revolution which followed deprived M. Cauchy of his public employment, as his loyalty to the Bourbon dynasty prevented his taking the oath of allegiance to the government of Louis Philippe. Under these circumstances he accepted the offers of the King of Sardinia, who invited him to deliver a course of physico-mathematical lectures at the university of Turin. In 1832 the Royal Society of London elected Cauchy one of their fifty foreign members. In the following year he received an invitation from Charles X. to undertake the scientific education of the Duc de Bordeaux, who then resided at Prague; and he cheerfully devoted himself to the task. While thus engaged he resumed in 1835 the publication of his 'Exercises de Mathématiques,' which had been for some years interrupted. In 1836 he published his 'Mémoire sur la Dispersion de la Lumière.' In 1838, having terminated his work of instruction, he returned to Paris, and took part in a scheme for training a superior class of professors in the interests of legitimacy. He was chosen a member of the Bureau des Longitudes in 1839, but the minister refused to sanction the choice, remembering the refusal to take the oath of allegiance.

Cauchy's diligence appears to have increased with his years. The number and nature of his communications to the Academy may best be judged of by reference to the 'Comptes Rendus;' at one time they became so multiplied that their publication overstrained the Academy's funds. Concurrently he wrote papers which appeared in other scientific periodicals, chiefly in Liouville's 'Journal de Mathématiques,' among which his 'Note sur le Développement des Fonctions en Séries ordonnées suivant les Puissances ascendantes des Variables,' published in 1846, is especially remarkable.

In 1848 a professorship of mathematical astronomy having been created at the Faculty of Sciences of Paris, M. Cauchy was appointed to the chair; but, as had happened eighteen years before, his refusal to take the oath required in 1852 again lost him his public employments. He still continued his studies; adding every month to the number of his works. He treated of the higher branches of algebra, the theory of numbers, the infinitesimal calculus, mechanics, astronomy, and physics, exploring indeed every branch of mathematical analysis. Of him it has been said that he "threw back the limits of the integral calculus; and if showing a preference for abstract questions, he on the other band rendered important service to the elementary portions of science, by simplifying the theory of asymptotes, introducing the use of limits in all parts of geometry, and by giving an elegant demonstration of the fundamental theorem of the theory of equations."

M. Cauchy was a member of several scientific societies. Besides the works above mentioned, he published at Turin his 'Resumés Analytiques,' 4to. In 1836 appeared 'Sur la Théorie de la Lumière,' 8vo; 'Sur la Mécanique Celeste,' &c., 8vo, in 1831—and a large number of others in the 'Mémoires' of the Academy, in the 'Annales de Mathématiques,' and other scientific journals. He showed too, that he inherited his father's poetical ability and lively imagination, and relieved at times his severer studies by the composition of French and Latin poetry. In 1834 one of his poems 'Charles V. en Espagne' was published, which has much merit, and exhibits the monarchical predilections and religious opinions which actuated the whole life of the author. He died May 23, 1857.

CAVAIGNAC, GENERAL LOUIS EUGENE, son of Jean-Baptiste Cavaignac, member of the Convention and of the council of the Five Hundred, and brother of Godefroy Cavaignac, repeatedly prosecuted by Louis Philippe, was born at Paris on the 15th of December, 1802. In 1820, at the age of eighteen, he entered the École Polytechnique. In the years 1828-29 he served in the second regiment of Engineers as captain, and took an active part in the campaigns of the Morea. Like most of the sons of the noted republicans of the Great Revolution, he adopted early in life the principles of his father; he was consequently one of the first to adhere to the revolution of July, in 1830. But the free expression of his opinions having given offence to his superiors, he was sent in 1832 to join the army in Africa. Even there he could not control or conceal his republican opinions; but the brilliant courage he displayed, and the services he rendered, drew upon him the notice and the esteem of his commanding officers. He was employed in the expeditions of Medeyah, Bouffard, and Chirchell; and in the several battles and skirmishes of Ouara, Col de Moozaïa, &c., he gave proofs of that aptitude for war which bespoke the future general. But it was especially in the expedition against Tlemsen that he proved his capacity, and evinced his valour.

After the capture of Tlemsen, in January 1836, Marshal Clausel formed a battalion of volunteers to garrison the citadel of that town; and gave the command of the place to Captain Cavaignac. In this isolated position he maintained himself with great honour. Although frequently attacked by the Arabs, and blockaded by Abd-el-Kader, he held out, teaching his troops, both by his example and intrepidity, to endure the severest privations without a murmur. It was not however till May 1837 that he received further promotion. Shortly after the taking of Constantine, Cavaignac was transferred to the Zouaves; after which he had a battalion in the infantry of the line. In 1839 he published a work of considerable value, entitled 'De la Régence d'Alger.'

Although his health and constitution were at all times delicate, Cavaignac sustained with unfaltering resignation the trials and fatigues of a camp life; being remarked as constantly the first to meet the enemy, and the last to retire to his tent. At the same time his qualifications for providing resources and administering them when found, were of a high order. Having returned to the corps of Zouaves as lieutenant-colonel on the 21st of June 1840, he was created colonel the following year; but a short time before the battle of Isly, he joined the 32nd of the line. It was in the capacity of commander of the vanguard, in this memorable action, that he so ably supported General Bugeaud against the army of Marocco. For his behaviour in this battle he was made maréchal de camp on the 16th of September 1844. After suppressing several revolts among the tribes on the western frontier in 1845, he invaded Marocco in February 1846, at the head of 6000 men, driving before him the redoubtable Emir Abd-el-Kader.

In 1847 he succeeded Lamoricière in the government of Oran, and on the 24th of February 1848, he received his appointment as governor-general of Algeria, by a decree from the Provisional Government. Two months after this, Lamartine, having foreseen the impending dangers by which France was threatened, invited Cavaignac to the capital. His great ability, and his decision in quelling the insurrection of June, established his character both as a citizen and as a soldier. It was by far the most serious revolt which had occurred since 1789. Cavaignac met the threatened danger with promptitude. A force of 75,000 regulars and nearly 200,000 National Guards was collected in and near the metropolis. Several powerful barricades were approached, attacked, and carried in the regular order of battle, Cavaignac himself, accompanied by Lamartine, leading the attack of the one erected in the Faubourg du Temple. On the second day of the insurrection, Paris was declared in a state of siege, and General Cavaignac was appointed Dictator, all the civil and military powers being committed to his charge. After four days' hard fighting, the contest came to an end by the defeat of the anarchists. The loss on both sides was appalling: two generals were killed, four others mortally and five badly wounded. In all, some 8000 persons were killed and wounded, and 14,000 made prisoners. No sooner had he quelled this great revolt than the general laid down his authority. The National Assembly appointed him President of the Council, after which he became one of the candidates for the new office of President of the Republic. In this contest he failed, but was supported by 1,448,302 votes. On the 2nd of December 1851, he was arrested, but released after a short detention; and he was afterwards allowed to reside undisturbed in France, although he had not given his adhesion to the government of the Emperor. He died October 1, 1857.

CAWOOD. [YORKSHIRE.]

CEBADILLA. [CEVADILLA.]

CEDRELA. [CEDRELACEÆ, *S.* 1.]

CEDRIRET. [CHEMISTRY, *S.* 1.]

CELAKOWSKY, FRANTISEK LADISLAW, a Bohemian poet and philologist, was born at Strakonice, a small town about 60 miles W. from Prague, on the 7th of March 1799. When studying at the university of Prague, his enthusiasm for the long-neglected language of Bohemia was first aroused by the society of his friends and fellow-students Kamaryt, Chmelensky, and Vinaricky, all afterwards authors of some note. The first effect of it was that he made a grand auto-da-fè of all he had hitherto written, because it was in the German language. He then commenced an ardent study of the Slavonic languages, and made himself master of them all, as well as of Italian, French, and English, and at this time he made a list of four hundred English words "manifestly of Slavonic origin," says his biographer Maly, which would be of some interest, but does not appear to have been printed. His first publication was a volume of 'Poems,' which was soon followed by a Bohemian translation of Herder's 'Blätter der Vorzeit,' or 'Leaves of Antiquity.' We are told by Maly that the time of its appearance, about 1822, was "the period of transition from the old classic to the modern style" in Bohemian literature, and that the translation was "the earliest classical specimen of modern Bohemian prose." A more important production was a collection of Slavonic national songs, 'Slowanské národnj pjsni,' in three volumes (Prague, 1822-27), a publication somewhat resembling the 'Minstrelsy of the Scottish Border.' In 1828 Celakowsky published a translation of the 'Lady of the Lake,' into a new kind of poetical prose, somewhat of the Ossianic kind, but this attempt proved a total failure, and the only result of which the writer could be proud was that he received an autograph letter of thanks from Sir Walter Scott, to whom he had presented a copy. He was more successful in his next translation, the 'Ohlas pisni Ruskych,' a collection of Russian national songs, so beautifully rendered into the kindred Bohemian that they at once took a very high place in the literature of that country, and still retain it. Russian was at that time the favourite language of Celakowsky, and the Russian nation was high in his esteem, so much so that he lost the friendship of several of his Bohemian acquaintances on the outbreak of the Polish insurrection in 1831, from taking the part of the Russians against the Poles. He had then been for some time the editor of the leading Bohemian newspaper at Prague, a post to which he had been recommended by his patron, Count Chotck, and he was also professor of the Bohemian language at the university. When the Polish insurrection was suppressed however, he disapproved of the severity of the measures adopted by the Emperor Nicolas, and in an article of his paper compared the proceedings of the Czar to the tyranny of the Tartar khans of the Golden Horde over conquered Russia in the times of its humiliation under the Mussulmans. The article happened to pass the censorship, but did not elude the vigilance of the Russian embassy at Vienna; a complaint was made to the Austrian government, and the unfortunate writer was at once dismissed from his editorship and his professorship—or in other words was ruined. In a paroxysm of bitterness Celakowsky composed a volume of epigrams against his persecutors, but as might be expected, the permission to print them was refused. He obtained the place of librarian to the Princess Kinsky, and published some poems of a milder character, of which the 'Hundred-Leaved Rose' ('Ruze Stolista') is spoken of as the finest. His fame was at this time widely extended. Dr. Bowring, now Sir John, dedicated to him in 1832 his volume of 'Cheskian Anthology,' in some stanzas in which he spoke of the kindness Celakowsky had shown him on his visit to Bohemia, and the material assistance he had afforded him in the preparation of the volume. The present King of Prussia was soon after his accession induced, by a deputation of Poles, to found professorships of Slavonic literature at two of his universities, Berlin and Breslau, and Celakowsky was offered the choice of either. He selected Breslau, and removed there in 1842, to enjoy again a competence, but in what appeared to him exile, in a country which had ceased to be Slavonian. He was always eager to greet any Slavonians who came to Breslau, and the time of vacation always found him at Prague. At length the events of 1848, so disastrous to Bohemia, when the general meeting of Slavonic deputies at the capital led to its bombardment by Windischgratz, brought about Celakowsky's return to his native country. In the following year a Professorship of Slavonic Philology was instituted at Prague as a concession to the national party, and it was offered to Celakowsky, whose offences were probably considered as sufficiently expiated by his seven years' expatriation. He returned, but his friends perceived that he was not to remain long among them. Always of a somewhat moody character, he was now wild and eccentric; some domestic calamities, particularly the loss of his wife, who left him burdened with a large family of children, had shaken his mind. He died on the 5th of August 1852.

Some of Celakowsky's works have been already mentioned. The most important of his other publications, his 'Mudroslovi národu slovanského v prislovich' ('The Philosophy of the Slavonic nation in proverbs'), a valuable collection of that nature, attracted much attention on its appearance after his return to Prague, and to increase which he left large manuscript additions, which are likely to see the light under the editorship of a friend. He had also been for years engaged in collections for a supplement to the valuable Bohemian dictionary of Jungmann, but on an extended plan, embracing a comparison with the other Slavonic dialects, as in the great Polish dictionary of Linde. This work is also destined for publication, and, it is anticipated, will prove a contribution to Slavonic literature of the very highest value.

CELA'NO, the ancient *Fucinus*, a lake in the Abruzzo in Italy. It is remarkable as being almost exactly in the centre of the Italian peninsula and the only lake of any considerable extent in the Central Apennines. The lake is nearly oval in shape, about 20 miles round, 2176 feet above the level of the sea, and situated in a basin without visible outlet, and screened on all sides by mountains. To the north rises Monte Velino with its double peak to the height of 8180 feet. To the east and west are limestone ridges, steep and rocky, and of much inferior elevation. On the north-west a moderate acclivity separates the lake from the valley of the Salto, an affluent of the Tiber. The lake, it appears, was traversed in ancient times by a river, called Pitonius, which must be the Giovenco, the only perennial stream of any magnitude that now enters the lake; and its surplus waters were carried off by subterranean channels, the opening of one of which is still visible, and called La Pedogna, a name clearly derived from Pitonius. The outlets, however, being insufficient, the lake frequently overflowed the low grounds along its banks. To obviate the evil, Julius Cæsar designed to cut a tunnel from the lake into the valley of the Liris; his plan, however, was not carried into effect till the reign of Claudius, who celebrated the opening of the tunnel with great magnificence. In the middle ages the tunnel became obstructed by the falling in of stones and earth, and many attempts have been made since the year 1240 to render it efficient in preventing inundations of the lake, but without success. Between 1745 and 1830 the encroachments of the lake had swallowed up 10,000 acres of the best land in the Abruzzo. Important repairs, however, were made at the expense of the King of the Two Sicilies, under the direction of Signor de Rivera (who examined the tunnel in detail, and described it in 1825), and the ancient tunnel was so far rendered available as to carry off a constant, though not a large, stream of water into the Liris, or Garigliano. The area covered by the lake, according to a late official survey, is 36,315 acres. A company was formed at Naples in September 1852 to effect the complete drainage of the lake.

Considered as a remnant of antiquity, the tunnel of

Claudius is an exceedingly interesting object. At the opening of it, near the lake, the tunnel is about 30 feet high and 28 feet broad; but it contracts considerably as it advances through the mountain. Its whole length is three miles. It is in part cut through the solid limestone of Monte Salviano, and in part through a chalky earth that has little tenacity. Wherever the latter substance occurs, the tunnel is supported by masonry of admirable workmanship. To admit light and air the Romans sunk shafts from above. The entrance to this tunnel is about a mile and a half to the south of the town of Avezzano, on the north-west shore of the lake. [Abruzzo.]

CELBRIDGE. [Kildare.]

CELLS. The ultimate structure of animal and vegetable bodies consists of minute vesicles, which are called Cells. In both animal and vegetable structures these organs are not generally visible to the naked eye, as they vary from the 1-500th to the 1-10000th part of an inch in diameter. In all cases they consist of an enveloping membrane or cell-wall, which incloses in a space more or less enlarged certain constituents, called cell-contents. The nature of the substances which enter into the composition of the cell-walls and constitute the cell-contents, differs in the animal and vegetable kingdoms, but there are certain properties which all cells possess in common. Sometimes these properties are called vital, to distinguish them from the properties possessed by inorganic or mineral bodies, which are called physical. It will, however, be seen that, independent of the formative power by which particles of gelatine, cellulose, &c., arrange themselves in the form of cells, and again these cells arrange themselves into the forms of organs and beings of a specific form, there are few of the functions performed by cells that may not be referred to the action of physical forces. One of the first and most necessary conditions of the cell is, that it shall allow of the passage, through the membrane of which its walls are composed, of those substances by means of which it grows, and which it acts upon for the production of the peculiar secretions which characterise either specific beings or parts of their organisation. This function, which is called Absorption, seems referrible to the physical relations which exist between liquids and gases and the membrane of which the cell-wall is composed. [Absorption.]

The liquid or gaseous contents which are thus introduced into the interior of cells undergo a variety of changes, according to the position, age, or other circumstances of the cell. Sometimes the fluid that is absorbed appears to be transmitted in compound structures from cell to cell without undergoing any great amount of change. In other cases, the most decided chemical changes take place in the elements introduced. The cells of some parts of vegetable structures are an instance of the latter, in which carbonic acid and ammonia are absorbed with water, and converted, either during their passage through the cell-wall, or whilst in the interior of the cell, into cellulose, starch, sugar, protein, and other constituents of the cell. In other parts of plants the cells convey solutions of sugar and other substances without producing on them any change.

The constituents absorbed into the interior of the cell are the materials from which the cell-wall and all its contents are derived. The process by which the cell appropriates to itself these matters is called Assimilation. This function is supposed to be carried on by an independent force or power residing in the cell, or congeries of cells, which form an organ or a body, and has been called the 'assimilative force or property,' 'organising force,' 'plastic force.' It is necessary however in this process to separate between the changes by which one substance is converted into another, and which is probably the result of ordinary chemical force under other circumstances, and the power or force by which these substances are made to assume definite forms in cells and organs. The latter is a special force in the case of each cell, plant, or animal, and to which alone, of the changes involved in the function of assimilation, the term vital can be properly applied.

The result of the appropriation of the new matter absorbed from without in all cells is their enlargement or growth. This takes place in two ways: either the new matter is taken up into the interior of the substance of the cell-wall, which is always the case where the cell becomes augmented in size, or it is deposited in the form of layers in the interior of the cell. According as the first mode of growth is regular or irregular will be the form of the cell. The vegetable and animal kingdoms present almost all conceivable forms of cells, from the spherical and hexagonal cells observed in the lower forms of plants, and the less organised tissues of animals, as cartilage, up to the elongated vessels of the plant, and the irregular cells of bone or areolar tissue in animals. The animal kingdom presents by far the greatest variety in this respect, and so great are the changes that some of the animal cells undergo, that the terms Metamorphoses or Transformations have been applied to these changes. As examples of these cells we may quote—the horny scales of the epidermis, of the hair and the nails, and the laminated pavement, epithelium—in which the cells are flattened, polygonal, or fusiform, and the cell-wall is fused into one mass with the cell-contents; the contractile fibre-cells of the smooth muscles; the tubules of the lens; the prisms of the enamel; the various forms of bone-cells; and the transversely striated cells of muscular fibre.

All cells originate or are produced in the same way. Either they are developed free in vegetable or animal fluids, or they are produced in the interior of preceding cells. In all cases they originate in connection with a substance called protein, which exists in cells, either in the form of a small dark spot called a nucleus, or cytoblast, in the interior of which is a nucleolus, or of an expansion on the interior of the cell, when it is called the primordial utricle. Free cell-development has been observed to take place in plants, in saccharine and other liquids about to undergo the fermentation process, and amongst animals in the chyle, blood, and lymph. The exact mode of the development of cells under these circumstances has not been accurately observed, and the particles or granules of proteinaceous matter from which they are supposed to originate have not yet been proved to have had their origin independent of other cells. The most common form of cell-development is that in which the cell grows around or from the nucleus or primordial utricle. In the animal kingdom the development of the cell more frequently takes place around the nucleus, whilst in the vegetable kingdom its origin is more frequent from the folding in or contraction of the primordial utricle upon itself, by which means two cells originate in one.

Besides the development of cells around the nucleus and round the investing membrane, or primordial utricle, within the walls of the cell, a multiplication of cells frequently takes place by division of the whole cell. This takes place in many of the lower forms of animals and plants [Protozoa, *S.* 2], and also in the red blood-corpuscles of the embryoes of birds and mammalia, and in the colourless blood-corpuscles of the tadpole. It is probable that further observation will extend our knowledge of this mode of cell-multiplication.

One of the highest problems for the physiology of the present day to solve is, the efficient causes of the phenomena of cell-development. The following propositions have been laid down by Kölliker as an attempt to follow up Schwann's idea of the analogy between chemical changes in inorganic bodies and those which occur in cells:—

1. The nucleus of the cell arises in the first place as a precipitate in an organisable fluid, and afterwards becomes consolidated in such a manner that a special investment and contents with a nucleolus appear. Its development may in this case be compared to that of inorganic precipitates, yet the constantly globular figure and size of the nuclei which are just formed, indicate some essential though not yet recognised condition peculiar to them.

2. In the development of cells by division the cell-nucleus plays exactly the same part which was previously ascribed to the nucleolus, and the occurrence of the formation of cells in this manner demonstrates that chemical conditions are not necessarily concerned therein.

3. In cell-development around portions of contents, and in the cleavage process, the nuclei also operate as simple centres of attraction upon a certain mass of blastema, and then follows the formation of a membrane upon the surface of this mass, which is most simply understood as a condensation of the blastema.

4. In the cell-development directly around the nucleus the investment with blastema is wanting, and the nucleus develops the membrane immediately around itself.

From what has been previously said, it will be seen that the cells are the active seat of the functions of both animals and plants, and the most conspicuous results of organisation take place in consequence of their agency. They not only constitute the mass of the body, but by their agency alone all the special secretions and products of individual plants and animals are formed. The food is conveyed into the body by cells, the blood of animals is charged with cells, and the functions of locomotion and sensation are carried on by the agency of cells. Nor are these last functions peculiar to the animal kingdom. Contractility and sensibility seem to be the property of the substance (protein) of which the nucleus and primordial utricle are composed. To this substance Mr. Huxley proposes to give the name Endoplast, and thus concludes a lecture on the identity of structure of plants and animals :—

"In both plants and animals then there is one histological element, the Endoplast, which does nothing but grow and vegetatively repeat itself; the other element, the periplastic substance (the cell membrane) being the subject of all the chemical and morphological metamorphoses, in consequence of which specific tissues arise. The differences between the two kingdoms are, mainly, 1, that in the plant the Endoplast grows, and, as the primordial utricle, attains a large comparative size; while in the animal the Endoplast remains small, the principal bulk of its tissues being formed by the periplastic substance; and, 2, in the nature of the chemical changes which take place in the periplastic substance in each case. This distinction however does not always hold good, the Ascidians furnishing examples of animals whose periplastic substance contains cellulose.

"The plant then is an animal confined in a wooden case; and nature, like Sycorax, holds thousands of 'delicate Ariels' imprisoned within every oak. She is jealous of letting us know this; and among the higher and more conspicuous forms of plants reveals it only by such obscure manifestations as the shrinking of the Sensitive Plant, the sudden clasp of the *Dionæa*, or, still more slightly, by the phenomena of the *Cyclosis*. But among the immense variety of creatures which belong to the invisible world she allows more liberty to her Dryads; and the *Protococci*, the *Volvox*, and indeed all the *Algæ*, are during one period of their existence as active as animals of a like grade in the scale. True, they are doomed eventually to shut themselves up within their wooden cages and remain quiescent; but in this respect they are no worse off than the Polype, or the oyster even."

For further information on the subject of Cells, see the articles HISTOLOGY, *S.* 2; CILIA, *S.* 1; TISSUES, ORGANIC, *S.* 1.

(Sharpey, in Quain's *Elements of Anatomy;* Kölliker, *Handbook of Human Histology*, translated for the Sydenham Society by Huxley and Busk; Carpenter, *Manual of Human Physiology; Principles of Physiology;* Mohl, *On the Vegetable Cell*, translated by Henfrey; Schleiden, *Principles of Scientific Botany*, translated by Lankester; Schleiden, *On Phytogenesis;* Schwann, *On the Identity of Structure in Plants and Animals*, translated by H. Smith for the Sydenham Society; Quekett, *Lectures on Histology;* Hassall, *Microscopic Anatomy of the Human Body;* Todd and Bowman, *The Physiological Anatomy and Physiology of Man;* Quekett, *Catalogue of the Histological Series in the Museum of the Royal College of Surgeons, London; Quarterly Journal of Microscopical Science;* and *Transactions of Microscopical Society*, vol. i.)

CENSUS OF 1851. The Census of Great Britain in 1851 differed in several respects from any previous Census. In some points the range of its inquiries was more minute and precise; in many others wider and more comprehensive. The character of the previous inquiries and the extent to which they reached have been sufficiently indicated in former volumes of the 'Penny Cyclopædia;' here, therefore, before giving some of the principal results of the Census, it will be enough to state, in the words of the very elaborate Report of the Registrar-General, prefixed to the volumes of Population Tables, printed by order of Parliament, what the Census of 1851 sought to accomplish :—

"At the present Census it was resolved to exhibit not merely the statistics, as before, of parishes, and, more completely, of parliamentary and municipal boroughs, but also of such other large towns in England and Scotland as appeared sufficiently important for separate mention, and of all the ecclesiastical districts and new ecclesiastical parishes which, under the provisions of various Acts of Parliament have, during the last forty years, been created in England and Wales. In addition also to the inquiry concerning the occupation, age, and birthplace, of the population, it was determined to ascertain the various relationships (such as husband, wife, son, daughter)—the civil condition (as married, unmarried, widower, or widow)—and the number of persons blind, or deaf and dumb. Further, under the impression that the fifth section of the Act would authorise such an inquiry, the design was formed of collecting statistics as to the accommodation afforded by the various churches and other places of public religious worship throughout the country, and the number of persons generally frequenting them; and also as to the existing educational establishments, and the actual number of scholars under instruction. It was, however, subsequently considered doubtful whether, upon a rigid construction, the Census Act rendered it compulsory upon parties to afford information upon these particulars; and the inquiry was therefore pursued as a purely voluntary investigation. It was not deemed necessary to procure, as at former Censuses, any abstract of the parish registers for the ten preceding years; the general system of registration of births, deaths, and marriages, which had been for that period in full operation, affording more complete and trustworthy information as to changes in the aspect of the population referable to the operation of these events."

For obtaining these objects, the local machinery introduced in England and Wales by the Poor Law and Registration Acts was employed, the general direction of the Census, under the Secretary of State, being given to the Registrar-General. The 624 Registration Districts, into which England and Wales was divided by the Registration Act, each having a superintendant-registrar, are subdivided into 2190 Subdistricts, each having a local registrar of births and deaths. These subdistricts were, for the purposes of the Census, and under the supervision of the registrars and superintendent-registrars, again divided into 30.610 Enumeration Districts, each such district being assigned to one enumerator, who was required to complete his enumeration in *one day*. In Scotland, where no such local machinery existed, the Census was taken through the agency of the sheriffs of counties and chief officers of boroughs; the working of the Act being devolved chiefly on the sheriffs-substitute, "who appointed a fit person, generally the parochial schoolmaster, in each parish to divide it into convenient enumeration districts, and superintend the proceedings of the Census therein." The number of enumeration districts formed throughout Scotland, in 1851, was 7873; in the Islands of the British Seas, 257 enumeration districts were similarly formed. Of the mode of taking the Census, it will suffice to say, that blank-forms were left at every house and public institution, with minute directions, in order that they might be correctly filled up with the requisite information concerning every person who abode in the house or apartment on the night of March 30, 1851. These forms were collected by the enumerators on the 31st of March; each enumerator being directed to satisfy himself, as far as possible, of the accuracy of the entries, and where inaccurate to correct them. The vast importance of the method adopted, as a security for the accuracy and precision of the returns, will be best understood by a comparison with the method adopted in taking the Census of the United States in 1850. At that date the territory of the United States comprised an area of 3,300,000 square miles. To number the inhabitants occupying that vast space the entire staff of superior and subordinate officers employed numbered only 3276 persons, less than one-tenth of the number employed for enumerating the population of England and Wales, a territory of 58,320 square miles, or less than a fifty-sixth of the area of the United States. It is at once evident that the American enumeration could not be made on one day, and accordingly we find that though the schedules were directed to be filled up with 'reference to' a particular day, the officer did not call at the house, the inmates of which were to be numbered, till some days, weeks, or even months after the time specified; when—the careless way in which people are accustomed to treat such things being taken into account—it is scarcely possible that errors can in very numerous instances be avoided, even as regards the mere number of residents, while in respect of age and other more minute matters, the probability of error is of course largely increased. As far as provision could be made by the strength and careful appointment of the official staff, and the strictness with which their duties were defined, the arrangements for the British Census of 1851 were in all respects admirable, and probably the returns were as accurate as under existing circumstances are attainable. It may serve to show the amount of labour which devolved on this army of enumerators (including Scotland, nearly 39,000 in number), to state that the blank-forms for England and Scotland, issued from the Census Office, amounted in all to nearly 7,000,000, the weight of them being nearly 40 tons: the "weight of the schedules, blank enumeration books, and other forms, despatched from the central office, exceeded 52 tons." The schedules, after being duly filled in, were subjected to revision by the registrars and superintendent-registrars before transmission to the Census Office, there to undergo final revision and generalization. The enumeration of the persons on board vessels, either in harbour or at sea, was accomplished by the officers of the Customs, the Admiralty, and the Registrar of British Seamen; the enumeration of the army by the officers of the various branches, under the direction of the Commander-in-Chief. In these, as in other matters, the returns were much more minute and extensive than in any previous Census; while several collateral returns were at the same time obtained, such as of the latest population of the several colonies, the number of British subjects in various foreign states, the number and rank of half-pay officers of the army, navy, and marines, of Chelsea and Greenwich pensioners, of officers employed in the civil service of the Crown, &c.

We proceed now to the *results* of the enumeration of the population. The number of people in Great Britain, including the islands in the British seas, on March 31, 1851, was 20,959,477; and the men in the army, navy, and East India Company's service, abroad, on the passage out, or round the coasts, belonging to Great Britain, on the same day, was 162,490. The total population of Great Britain may therefore be set down at 21,121,967. Of these 16,921,888 were in England, 1,005,721 in Wales, 2,888,742 in Scotland, 143,126 in the Isle of Man, Jersey, Guernsey, Alderney, and other small islands in the British seas; and 162,490 were at sea or serving abroad in the army.

The *proportion of males to females* has been preserved with remarkable regularity during the half century. In 1851 the male population of Great Britain was 10,386,048, the female 10,735,919; being an excess of 349,871 females; the excess of females at home was 512,361. The proportion in 1851 was 103,369 females to every 100,000 males; in 1801 it was 103,353 females to 100,000 males. At both periods there were somewhat less than 30 males to 31 females. In 1851 there were 20 males at home to 21 females. The excess of births, however, is in the opposite direction. During the 13 years (1839-51) in which accurate registers of births have been kept, there have been born 3,634,235 males and 3,465,629 females, or about 105 males to every 100 females (104,865 to 100,000). The disparity in the sexes at home is greatest in Scotland—110 females to 100 males; in England and Wales it is only 104 females to 100 males. To what degree the change in the proportions and the subsequent disparity of the numbers in the two sexes is due to emigration, or to a difference in degree of the dangers and diseases to which they are respectively exposed, this is not the place to consider.

The *increase of population* in the last half century nearly represents a new nation equal to that which existed in Great Britain at its commencement, and that notwithstanding the vast numbers who have "annually left the United Kingdom, settled and multiplied in millions in the United States, in the colonies of North America, of Australia, and of South Africa." The aggregate increase in the fifty years is 93·470 per cent., or at the rate of 1·329 per cent. annually. "The annual increase, however, has varied in each decennial period; it increased from 1·274 per cent. on the population in 1801-11, to 1·489 (nearly 1½) in 1811-21, when it was at the *maximum;* the annual rate of increase in 1821-31 was 1·408; in 1831-41 it fell to 1·279; and in 1841-51 to 1·186 per cent. annually. The population therefore is increasing, but the rate of increase has declined since 1811-21, when there was little emigration, and the mortality in England was lower than it has ever been before or since, down to the two last decennaries; when the public health has suffered from epidemics of influenza, cholera, and other diseases; while emigration from the United Kingdom has proceeded at an accelerated rate from 274,300 in 1821-31, to 718,000 in 1831-41, and 1,693,000 in 1841-51." During the same period the proportion of land to each person has decreased in Great Britain from 5·4 acres in 1801, to 2·7 acres in 1851; from 4 acres to 2 acres in England and Wales.

If the rate in which the population has increased since 1801 continued to prevail uniformly, the population would double itself in Great Britain every 52½ years; in England and Wales every 51 years.

The number of *families* in Great Britain in 1801 was 2,260,802; in 1851 it was 4,312,388; being an increase of 2,051,586. The families in England and Wales in 1801 were 1,896,723; in 1851 they were 3,712,290. In Scotland they were 364,079 in 1801, and 600,098 in 1851. The average number of families to a house in Great Britain in 1801 was 1·209; and of persons in a family, 4·645; in 1851 there were 1·182 families to a house, and 4·825 persons in a family. In Scotland in 1851 the average of persons in a family was 4·814, or nearly that of the whole island; but the average of families in a house was somewhat higher—1·621. In Glasgow the number of families to a house is 5·4; of persons to a house, 27·5; in Edinburgh the corresponding numbers are 4·2 and 20·6; in Aberdeen, 3 and 12·3; in Dundee, 3·2 and 15·7; in Perth, 2·8 and 12. In London, on the other hand, the numbers are only about the average of Scotland—1·74 and 7·7; but in some districts they are as high as 10, 11, and even 12 persons to a house. This excess in the northern cities was caused by a real difference in the habits of the people. "The towns and cities of the two northern English counties and of Scotland are built in the continental style; and the families of the middle classes, as well as the poor, live in large flats, which constitute separate tenements." The term house, in many parts of Scotland, has been usually applied to these several flats or floors; and in every census from 1801 to 1841 'flats' in Glasgow and some other Scottish towns were returned as separate houses. In 1851 this was corrected, and the enumerators were instructed that flats and sets of chambers must not be returned as houses. The returns from Scotland, as from England, are now, therefore, made on a tolerably uniform principle, and are fairly available for comparison. The variations in the several English counties and in different districts with respect to the proportion of families to houses, is considerable; but it would require far more space than we can spare to enter upon it. As a rule, in England and Wales, a house is inhabited by one family, the excess in the proportion being mainly caused by the large number of public institutions, hotels, lodging-houses, &c. The following is an analysis of the families in connexion with the houses which they occupy in 14 subdistricts of England, containing 35,876 inhabited houses, in which were 48,985 families (1,608 of the houses having the families absent), comprising 242,164 persons, or, on an average, nearly 7 persons to a house—5 to a family. Of these houses, 26,309 contained one family; 4,789, two families; 1,523, three; 748, four; 425, five; 224, six; 118, seven; 62, eight; 32, nine; and 38, ten families and upwards. This analysis is in the Report carried out with great minuteness into a variety of particulars, but which it is impossible for us here to follow.

The *number of houses* in Great Britain in 1851 was—inhabited, 3,670,192; uninhabited, 166,735; building, 29,194. In 1801 there were 1,882,476 inhabited, and 67,320 uninhabited; the number building was not returned. The following tables show (1) the number of principal public institutions,—of their inmates 35,516 were officers and servants; and (2) the number of persons sleeping in barges, barns, tents, and vessels.

Institutions.	No.	Persons.	Males.	Females.
Barracks	174	53,933	44,833	9,100
Workhouses	746	131,582	65,786	65,796
Prisons	257	30,959	24,593	6,366
Lunatic Asylums . .	149	21,004	9,753	11,251
Hospitals for the Sick .	118	11,647	5,893	5,754
Asylums and other Charitable Institutions . .	573	46,731	27,183	19,548
Total . .	2,017	295,856	178,041	117,815

	Persons.	Males.	Females.
Persons in Barges	12,924	10,395	2,529
,, Barns	9,972	7,251	2,721
,, Open Air in Tents .	8,277	4,614	3,663
,, Vessels in the Ports, engaged in Inland Navigation . .	8,575	7,730	845
,, Sea-going Vessels in the Ports	43,173	41,165	2,008
Total	82,921	71,155	11,766

"The enumeration of the houseless population, unsettled in families, is, however, necessarily imperfect; and the actual number must exceed the 18,249 returned, namely 9,972 in barns, and 8,277 in the open air. It is mentioned in one instance that a tribe of gipseys struck their tents and passed into another parish in order to escape enumeration. In 1841 the number of the houseless class was 22,303: owing to the more advanced period of the year (June 7) at which the Census was taken, many Irish people and labourers were then engaged in the hay harvest."

From houses and families we ascend to *towns and corporations*. No attempt was made to classify the smaller aggregates of houses by defining villages, hamlets, &c.; but 17,150 places which have defined boundaries are separately returned in the Population Tables, and each of these is assumed to be a *village*, or an aggregation of families round a church or chapel: on an average these villages lie at a distance of about 2½ miles apart, so that the inhabitants of the country around them, distributed over an area of 5 miles, lie at the average limit of 1¼ mile from the centre, or at the mean distance of six-sevenths of a mile.

"Great Britain has *eight hundred and fifteen* towns of various magnitudes, either market towns, county towns, or cities, *five hundred and eighty* in England and Wales; *two hundred and twenty-five* in Scotland, and *ten* in the Channel Islands. To 21 of the preceding 'villages' there is on an average a town, which stands in the midst of 110 square miles of country, equivalent to a square of 10½ miles to the side, a circle having a radius of nearly 6 miles; so that the population of the country around is, on an average, about 4 miles from the centre.

"The population amounted to 10,556,288 in the 815 towns, which stand on 3,164 miles of area. An average town of 12,953 inhabitants stands on an area of nearly 4 square miles; equivalent to a square of 2 miles to the side, a circle 1$\frac{1}{10}$th mile to a radius, and the population is less than three-quarters of a mile from the centre.

"The population in the rest of Great Britain was 10,403,189; consequently if, for the sake of distinction, the detached houses, the villages, and small towns without markets, are called—country; at the present time the *town* and *country* populations of Great Britain differ so little in numbers, that they may be considered equal, for by the abstracts 10,556,288 people live in the towns, and 10,403,189 in the country. In the towns there were 5·2 *persons to an acre*, in the country 5·3 *acres to a person*. The density in the country was 120 persons—in the towns 3,337 persons—to a square mile. . . .

"The 815 towns are grouped around 87 county towns—52 in England, 32 in Scotland, and 3 chief towns, equivalent to county towns, in the Islands of the British Seas. Each of the central county towns was surrounded on an average by eight or nine other towns, extending over an average area of 1,067 square miles, equivalent to a square of 33 miles to the side; a circle of 18 miles radius: and without allowing for the extreme distance of the Islands in the British Seas, they were 35 miles apart. The population of the county towns of Great Britain, and the chief towns of the Channel Islands amounted to about 626,547 in 1801, and to 1,391,538 in 1851; in England and Wales the population of the county towns was about 473,239 in 1801, and 1,076,670 in 1851."

This equality of proportion between the town and country population of Great Britain is one of the 'great facts,' brought into prominent notice by the Census of 1851. The great relative increase of the population collected in the principal towns is another of the more important facts which point to a change in the habits and condition of the people. Thus, in the 61 principal towns in England and Wales, which in 1801 contained 2,163,698 inhabitants, the population had risen in 1851 to 6,254,251; in other words, in 1801, about 24 per cent. of the entire population resided in those 61 towns, while in 1851 very nearly 35 per cent. of the population resided in the same towns. In the seven principal towns in Scotland there resided in 1801, 271,486 out of the entire population of 1,608,420, or 16·8 per cent.; in 1851, 779,698 out of the entire population of 2,888,742, or 26·9 per cent.: or there occurred a relative increase in the 68 largest towns in Great Britain of upwards of 10 per cent., as compared with the increase of the entire population: that is, whereas then *two* of every *ten* persons in Great Britain resided in 68 of the principal towns, now *three* out of every *ten* persons reside in them. The increase of the population of London and the other great towns was 4,609,525, or 189 per cent. in the half-century; that of the smaller towns and the country was 5,770,996, or 71 per cent. The actual increase in some of the great towns was very remarkable. In London the population increased from 958,863 to 2,362,236, being an increase of 1,403,373, or 146 per cent.; Manchester (with Salford) from 94,786 to 401,326; Liverpool from 82,295 to 375,955, its opposite neighbour Birkenhead rising in the same time from 110 to 24,285; Birmingham from 70,670 to 232,841; Preston from 12.174 to 69,584; Bradford from 13,264 to 103,778; Plymouth from 16,040 to 52,221; Southampton from 7,913 to 35,305; Merthyr Tydfil from 10,127 to 63,080; Glasgow from 77,058 to 329,007; and other manufacturing, mining, and sea-port towns at a proportional rate. The increase in the population of the watering-places, or towns chiefly devoted to pleasure, meanwhile being at least commensurate with that of the towns devoted to business: thus Brighton increased from 7,440 in 1801 to 69,673 in 1851; and Cheltenham from 3,076 to 35,051.

Dividing the towns into classes, it appears that "the greater part (3,022,776) of the increase (5,363,650) in the six classes of towns was in London and in the manufacturing towns; the (1) sea-ports, the (2) towns which are in mining districts, or are engaged in hardware manufactures, and (3) the county towns, severally contributed more than three-quarters of a million to the increase; the increase of the people living in watering-places was 200,164. In the latter class the rate of increase was the greatest; it was 2·561 per cent. annually. The annual rate of increase was 2·380 in the manufacturing towns, 2·336 in the mining and hardware towns, 2·191 in the sea-ports, 1·820 in London, and 1·609 in the county towns. The annual rate of increase in Great Britain during the same half-century was 1·377. The towns have increased most rapidly in which straw-plait, cotton, pottery, and iron are manufactured."

The *density* and *proximity* of the population are elucidated in the Report and the Summary Tables in various ways, and at considerable length: here, however, the matter must be treated briefly. The density of population, or, as a recent French authority (Baron de Prony in the 'Annuaire') has proposed to term it, the "specific population," after the analogy of "specific gravity," varies in the 624 districts of England and Wales, from 185,751 persons on a square mile in the East London district, to 18 on a square mile in that of Bellingham, Northumberland. The greatest density of population out of London is in the Liverpool district, which is 74,446, and the next Birmingham, which is 41,853 on a square mile. Manchester has 11,577, which is less than Leeds, which has 30,886; Bristol, which has 22,858; Plymouth, which has 20,441; Nottingham, which has 19,994; East Stonehouse, which has 19,913; Brighton, which has 18,088; Hull, which has 17,750; Salisbury, which has 11,907; Greenwich, which has 11,849; and Exeter, which has 11,670. The smaller density of Manchester than such towns as Salisbury and Exeter is accounted for, in a great measure, by the large spaces covered by the numerous great factories and warehouses; yet the result is scarcely what would be generally expected, especially as both Exeter and Salisbury are cathedral towns, having considerable open spaces within the city boundaries. But the evidence of overcrowding in these two cities appears much stronger when they are compared with some of the other most populous manufacturing towns: Sheffield, for instance, which is among the densest, has 6,263, or little more than half as many on the square mile as Salisbury; Bradford, which has 2,887, or less than one-fourth; and Blackburn, which has 1,333, or only one eighth. As respects proximity of population, regarding it upon the same hypothesis of equal distribution, we find that the people of England were, in 1801, on an average 153 yards asunder, while in 1851 they were only 108 yards asunder; the mean distance apart of the houses in 1801 being 362 yards, and 252 yards in 1851. Or, as it may be otherwise expressed, on the same area the population has doubled; the proximity has increased—the separation has diminished—in the ratio of 3 to 2. In the London division the mean proximity has increased from 21 yards in 1801 to 14 yards in 1851.

The *Islands of the British Seas* are noticed more fully in this than any previous Census. Five hundred islands and rocks have been numbered; but inhabitants were only found on the morning of March 31st, 1851, on 175 islands, or groups of islands. Some of the others are, however, occasionally dwelt on by shepherds during summer. Passing over Ireland, which contained 6,553,178 inhabitants, we find that four of the larger islands have each upwards of 50,000 inhabitants:—Anglesey 57,318, Jersey 57,020, Isle of Man 52,344, Isle of Wight 50,324. Four others have each above

20,000:—Guernsey 29,757, Lewis 22,918, Skye 21,528, and Shetland 20,936. Two more number upwards of 10,000:—Orkney 16,668, and Islay 12,334. Twenty number between 1,000 and 10,000 inhabitants; fifteen between 500 and 1,000; thirty-seven between 100 and 500; fifteen between 50 and 100; forty-five between 10 and 50; seven number 10 inhabitants on each; and twenty-five under 10, two of them having only one inhabitant on each, Little Papa, one of the Shetlands, a woman, and Inchcolm, in Fifeshire, a man. Some of the more remote and smaller islands were now numbered for the first time, and much curious information has been collected. St. Kilda, one of the Hebrides, 70 miles from the mainland, is one of these. The population, now for the first time officially enumerated, consisted of 48 males and 62 females, all of whom were born on the island, except one female, aged 35, who was imported from Sutherlandshire. The excess of females is chiefly among children under 20, of whom there are 22 males and 30 females; and persons above 60, of whom 6 are females and 1 only is a male. The men are all farmers and bird-catchers, each "farmer" occupying about three acres of land. Eight females are described as "weaveress in wool." The great majority of children die of what is called the "eight days' illness;" several were born during the previous twelve months, but only two were living. There are a manse and a church on the island; but no resident clergyman or medical man.

The number of *boroughs* in England and Wales having municipal organisation according to the Municipal Reform Act, was 196, with a population of 4,345,269; of these boroughs 18 have had charters of incorporation granted since the passing of that Act. There are 89 unreformed boroughs. Of the reformed boroughs it is found that one-half of the population (2,220,542) is contained in 17 boroughs, each of which contains more than 60,000 inhabitants. It appears also that 102 boroughs, or more than half of the total number, contain less than 9,000 inhabitants in each; in the aggregate, 472,551 inhabitants. Eighty-seven boroughs have from 2,000 to 7,000 inhabitants; twenty-seven, from 20,000 to 40,000; eight, from 40,000 to 60,000; seven, from 60,000 to 80,000; two, from 80,000 to 100,000; and three have 200,000 and upwards.

The 83 royal and municipal burghs of Scotland contained 752,777 inhabitants; only three burghs contained more than 60,000 inhabitants; one, more than 40,000; three, from 20,000 to 40 000; fifteen, from 7,000 to 20,000; thirty-three, from 2,000 to 7,000; and twenty-eight under 2,000 inhabitants.

Several of the most populous and important places in England and Wales are still without a municipal organisation. Among these are the metropolitan parliamentary boroughs of the Tower Hamlets, population 539,111; Finsbury, 323,772; Marylebone, 370,957; Greenwich, 105,784; Lambeth, 251,345; and Westminster, 241,611; and the towns of Brighton, population, 69,673; Burnley, 20,828; Bury, 31,262; Chatham, 28,424; Cheltenham, 35,051; Dudley, 37,962; Huddersfield, 30,880; Merthyr Tydfil, 63,080; Rochdale, 29,195; Stroud, 36,535; and Stoke-upon-Trent, 84,027. In Scotland there are no towns containing a population of 10,000 which are not municipal burghs.

Additional abstracts, of a very valuable character, have been published subsequently to the General Report relating "to the ages, occupation, civil condition, and birth-places of the population; the numbers of the blind, and of the deaf and dumb; and the extent of the accommodation throughout the country for the purposes of education and religion;" but this is not the place to go into questions of so wide a nature. In another article will be found a notice of the OCCUPATIONS OF THE PEOPLE [*S.* 2] as exhibited in the Census returns.

With respect to *Ireland*, the circumstance brought out with most startling prominence was the remarkable decrease in the population since the previous Census. Up to that of 1841, each decennial Census of the half-century had shown a steady if not rapid increase of the population. That of 1851 showed that during the past ten years the gain of the previous twenty had been more than undone. In 1821 the total population of Ireland was 6,801,827; in 1851 it was only 6,551,970. And the returns further showed that this decrease was general as compared with 1841; and even as compared with 1821, the only exceptions were some two or three places in Ulster, in each of which, from causes easily understood, there had been a continuous increase of inhabitants during the half century. The large falling off of the population between 1841 and 1851 was mainly owing to the disastrous famine which afflicted Ireland in 1845–47, in consequence of the failure of the potato crop: partly, however, it was due to emigration, which, in its turn, had been greatly stimulated by the failure of the potato, and the consequent agricultural distress. The total emigration from Ireland during the ten years between 1841 and 1851 is estimated to have amounted to 1,289,133, "varying with considerable regularity according to the variations in the state of the labouring classes." For the sake of presenting in one view the increase and decrease of the population of Ireland, we append a table of the number of inhabitants in the four provinces at each decennial Census from 1821 to 1851.

Population.

Provinces.	Area in Acres.	1821	1831	1841	1851
Leinster . .	4,876,211	1,757,492	1,909,713	1,973,731	1,672,591
Munster . .	6,064,579	1,935,612	2,227,152	2,396,161	1,857,412
Ulster . .	5,475,438	1,998,494	2,286,622	2,386,373	2,011,756
Connaught .	4,392,043	1,110,229	1,343,914	1,418,859	1,010,211
Total of Ireland . .	20,808,271	6,801,827	7,767,401	8,175,124	6,551,970

The decrease of population was as might be expected most marked in the rural districts. In several of the large towns the Census of 1851 showed an actual increase of population, while scarce any showed a falling off, a circumstance arising no doubt from the famishing poor having crowded into them in the hope of obtaining employment or of finding relief. Dublin city, which in 1821 contained 185,881 inhabitants, had 232,726 in 1841, and 258,361 in 1851. Cork, though it showed a decline of nearly 15,000 between 1821 and 1851, showed an increase of above a thousand from 1841. Belfast had more than doubled in population between 1821 and 1851, and between 1841 and 1851 had increased from 75,308 to 100,300. Galway town, which between 1831 and 1841 had fallen in population from 33,120 to 17,275 had increased in 1851 to 23,695.

The two following tables will show in the readiest manner the general results of the enumeration of 1851.

Area, Houses, and Population, on March 31*st*, 1851.

	1851.						
	Area in Acres.	HOUSES.			POPULATION.		
		Inhabited.	Uninhabited.	Building.	Persons.	Males.	Females.
Great Britain and Islands in the British Seas	57,624,377	3,670,192	166,735	29,194	20,959,477	10,223,558	10,735,919
England and Wales . .	37,324,915	3,278,039	153,494	26,571	17,927,609	8,781,225	9,146,384
Scotland	20,047,462	370,308	12,146	2,420	2,888,742	1,375,479	1,513,263
Ireland	20,808,271	1,047,735	65,159	2,113	6,515,974	3,176,727	3,339,067
Islands in the British Seas	252,000	21,845	1,095	203	143,126	66,854	76,272

Town and Country Population in Great Britain.

	Number.		Population of Towns.	Population of Villages and Detached Dwellings of the Country.	Area in Acres of Towns.	Area in Acres of the Country surrounding the Towns.
	Of Counties.	Of Towns.				
England and Wales	52	580	8,990,809	8,936.800	1,724,406	35,600.509
Scotland	32	225	1,497,079	1,391,663	287,134?	19,760,328?
Channel Islands	3	10	68,400	74,726	13,108?	238,892?
Great Britain and Islands in British Seas	87	815	10,556,288	10,403,189	2,024,648	55,599,729

In the article GREAT BRITAIN of the 'Penny Cyclopædia' a table is given of the population of the counties of England, Wales, and Scotland, with the areas in square miles, according to the Census of 1831, and under the head IRELAND a similar table is given for that island. In the former Supplement, under the head CENSUS, tables are given of the population of the counties of Great Britain and Ireland, according to the Census of 1841. We now give tables of the population of Great Britain and Ireland, with the areas in acres, according to the Census of 1851, followed by a list of towns in Great Britain and Ireland, arranged under their respective counties, with the population of each in 1851.

Counties.	Acres.	Population.
ENGLAND.		
Bedfordshire	295,582	124.478
Berkshire	450,358	170,065
Buckinghamshire	464,930	163,723
Cambridgeshire	523,861	185,405
Cheshire	707,078	455,725
Cornwall	873,600	355,558
Cumberland	1,001,273	195,492
Derbyshire	658,803	296,084
Devonshire	1,657,180	567,098
Dorsetshire	632,025	184,207
Durham	622,476	390,997
Essex	1,060,549	369,318
Gloucestershire	805,102	458,805
Hampshire	1,070,216	405,370
Herefordshire	534,823	115,489
Hertfordshire	391,141	167,298
Huntingdonshire	230,865	64,183
Kent	1,041,479	615,766
Lancashire	1,219,221	2,031,236
Leicestershire	514,164	230,308
Lincolnshire	1,776,738	407.222
Middlesex	180,168	1,886,576
Monmouthshire	368,399	157,418
Norfolk	1,354,301	442,714
Northamptonshire	630,358	212,380
Northumberland	1,249,299	303,568
Nottinghamshire	526,076	270,427
Oxfordshire	472,887	170,439
Rutlandshire	95,805	22,983
Shropshire	826,055	229,341
Somersetshire	1,047,220	443,916
Staffordshire	728,468	608,716
Suffolk	947,681	337,215
Surrey	478,792	683,082
Sussex	934.851	336,844
Warwickshire	563,946	475,013
Westmoreland	485,432	58,287
Wiltshire	865.092	254,221
Worcestershire	472,165	276.926
Yorkshire, East Riding	768,419	220.983
York, City	2,720	36,303
Yorkshire, North Riding	1,350,121	215,214
Yorkshire, West Riding	1,708,026	1,325,495
WALES.		
Anglesey	193,453	57,327
Brecknockshire	460,158	61,474
Cardiganshire	443,387	70,796
Caermarthenshire	606,331	110,632
Caernarvonshire	370,273	87,870
Denbighshire	386,052	92,583
Flintshire	184,905	68,156
Glamorganshire	547.494	231,849
Merionethshire	385,291	38,843
Montgomeryshire	483,323	67,335
Pembrokeshire	401,691	94,140
Radnorshire	272,128	24,716
SCOTLAND.		
Aberdeenshire	1,260,625	212,032
Argyleshire	2,083,126	89,298
Ayrshire	650,156	189,858
Banffshire	439,219	54,171
Berwickshire	309,375	36,297
Buteshire	109,375	16,608
Caithness-shire	455,708	38,709
Clackmannanshire	29,744	22,951
Dumbartonshire	189,844	45,103
Dumfriesshire	722,813	78,123
Edinburghshire	254,300	259,435
Elginshire	340,000	38.959
Fifeshire	322,031	153,546
Forfarshire	568,750	191,264
Haddingtonshire	185,937	36 386
Invernesshire	2,723 501	96,500
Kincardineshire	252,250	34,598
Kinrossshire	49,531	8,924
Kirkcudbrightshire	610,734	43.121
Lanarkshire	631,719	530,169
Linlithgowshire.	64.375	30,135
Nairnshire	137,500	9 956
Orkney and Shetland.	988,873	62,533
Peeblesshire	226,488	10,738
Perthshire	1,814,063	138,660
Renfrewshire.	150,000	161,091
Ross and Cromarty	2,016.375	82,707
Roxburghshire	460 938	51,642
Selkirkshire	170,313	9,809
Stirlingshire	295,875	86,237
Sutherlandshire	1,207,188	25,793
Wigtonshire	326,736	43,389
IRELAND.		
Leinster:—		
Carlow	221,342	68,059
Dublin	222,714	146,731
Dublin city	3,700	258,361
Kildare	418.436	95.688
Kilkenny	508,811	138,773
Kilkenny city	921	19,973
King's County	493,985	112.080
Longford	269,409	82,350
Louth	201,434	90,812
Drogheda	472	16.845
Meath	579,899	140,750
Queen's County	424,854	111,623
Westmeath	453,468	111,409
Wexford	576,588	180,159
Wicklow	500,178	98,978
Munster:—		
Clare	827.994	212.428
Cork	1,843.650	563,326
Cork city	2 683	85 745
Kerry	1,186.126	238.239
Limerick	678 224	208,688
Limerick city.	2,618	53 448
Tipperary	1,061,731	331.487
Waterford	460,884	138.754
Waterford city	669	25,297
Ulster:—		
Antrim	743,881	251,381
Belfast	1,872	100,300
Carrickfergus	16,700	8,520

Counties.	Acres.	Population.
Armagh	328,076	196,085
Cavan	477,360	174,071
Donegal	1,193,443	255,160
Down	611,919	320 817
Fermanagh	457,195	116,007
Londonderry	518 595	191,868
Monaghan	319,757	141,813
Tyrone	806,640	255,734
Connaught :—		
Galway	1,565,726	298,136
Galway town	628	23,695
Leitrim	392,363	111,841
Mayo	1,363,882	274,612
Roscommon	607,691	173,417
Sligo	461,753	128,510
ISLANDS IN THE BRITISH SEAS :—		
Isle of Man	180,000	52,387
Island of Jersey	40,000	57,020
Island of Guernsey.	32,000	29,757
Islands adjacent to Guernsey :		
Alderney		3,333
Herm		46
Jethou		3
Le Marchant		—
Great and Little Serk		580

In the following list, the towns generally contain a population of 2000 and upwards, but several are also inserted which have a smaller population. The Parliamentary Boroughs are placed first; then follows the list of the towns, including the parliamentary boroughs, which are in many instances also Municipal Boroughs, having a population different from that of the Parliamentary Boroughs. The Burghs and Contributory Burghs of Scotland are arranged under their respective counties, but a list of the Parliamentary Districts of Burghs is given at the end of the list for Scotland.

The abbreviation *P.B.* signifies Parliamentary Borough; *C.P.B.*, Contributory Parliamentary Borough; *M.B.*, Municipal Borough, and includes the Scotch Royal Burghs. Sometimes P. and T. are inserted in the figure-column, and signify Parish and Township, where the returns of the census do not state the population of the town itself.

ENGLAND.

BEDFORDSHIRE.

Bedford, *P.B.*	11,693
Ampthill	1961
Bedford, *M.B.*	11,693
Biggleswade	3976
Dunstable	3589
Harrold	1083
Leighton Buzzard	4465
Luton	10,648
Potton	1922
Shefford	1052
Toddington	2438
Woburn	2049

BERKSHIRE.

Abingdon, *P.B.*	5954
Reading, *P.B.*	21,456
Wallingford, *P.B.*	8064
Windsor, *P.B.*	9596
Abingdon, *M.B.*	5954
Farringdon, Great	2456
Hungerford	2255
Lambourn	1258
Maidenhead, *M.B.*	3607
Newbury, *M.B.*	6574
Reading, *M.B.*	21,456
Wallingford, *M.B.*	2819
Wantage	2951
Windsor, *M.B.*	9596
Wokingham	2272

BUCKINGHAMSHIRE.

Aylesbury, *P.B*	26,794
Buckingham, *P.B.*	8069
Marlow, Great, *P.B.*	6523
Wycombe, High, *P.B.*	7179
Amersham	2093
Aylesbury	6081
Beaconsfield	1684
Buckingham, *M.B.*	4020
Chesham	2496
Eton	3666
Iver	1985
Marlow, Great	4485
Newport Pagnell	3312
Olney	2265
Prince's Risborough	2317
Slough about	2000
Stony Stratford	1757
Wendover	1937
Winslow	1889
Wolverton	2070
Wycombe, High, *M.B.*	3588

CAMBRIDGESHIRE.

Cambridge, *P.B.*	27,815
Cambridge Univ., *P.B.*	
Cambridge, *M.B.*	27,815
Ely	6176
Linton	2061
March	4171
Soham	2756
Thorney	2174
Upwell	2091
Whittlesey	5472
Wisbeach, *M.B.*	10,594

CHESHIRE.

Chester, *P.B.*	27,766
Macclesfield, *P.B.*	39,048
Stockport, *P.B.*	53,835
Altringham	4488
Birkenhead	24,285
Chester	27,766
Congleton, *M.B.*	10,520
Crewe	4491
Frodsham	2099
Hyde	10,051
Knutsford	3127
Macclesfield, *M.B.*	39,048
Middlewich	P. 1235
Nantwich	5426
Northwich	P. 1377
Over	P. 3167
Runcorn	8049
Sandbach	2752
Stalybridge	20,760
Stockport, *M.B.*	53,835
Tarporley	P. 2632
Tranmere	6519

CORNWALL.

Bodmin, *P.B.*	6337
Helston, *P.B.*	7328
Launceston, *P.B.*	6005
Liskeard, *P.B.*	6204
Penryn and Falmouth, *P.B.*	13,656
St. Ives, *P.B.*	9872
Truro, *P.B.*	10,733
Austell, St.	3565
Bodmin, *M.B.*	4327
Callington	P. 2146
Cambourne	6547
Camelford about	900
Falmouth, *M.B.*	4953
Germans, St.	P. 2967
Helston, *M.B.*	3355
Ives, St., *M.B.*	6525
Launceston, *M.B.*	3397
Liskeard, *M.B.*	4386
Penryn, *M.B.*	3959
Penzance, *M. B.*	9214
Redruth	7095
Truro, *M.B.*	10,733

CUMBERLAND.

Carlisle, *P.B.*	26,310
Cockermouth, *P.B.*	7275
Whitehaven, *P.B.*	18,916
Alston	2005
Brampton	3074
Carlisle, *M.B.*	26,310
Cockermouth	7275
Egremont	P. 2049
Keswick	2618
Longtown	2142
Maryport	5698
Penrith	6668
Whitehaven	18,916
Wigton	4244
Workington	5837

DERBYSHIRE.

Derby, *P. B.*	40,609
Alfreton about	1800
Ashbourne	2418
Belper	10,082
Chesterfield, *M. B.*	7101
Crich	T. 2562
Derby, *M. B.*	40,609
Dronfield	T. 2469
Melbourne	2227
Wirksworth	2632

DEVONSHIRE.

Ashburton, *P. B.*	3432
Barnstaple, *P. B.*	11,371
Dartmouth, *P. B.*	4508
Devonport, *P. B.*	50,159
Exeter, *P. B.*	40,688
Honiton, *P. B.*	3427
Plymouth, *P. B.*	52,221
Tavistock, *P. B.*	8086
Tiverton, *P. B.*	11,144
Totnes, *P. B.*	4419
Ashburton	P. 3432
Axminster	P. 2769
Barnstaple, *M. B.*	11,371
Bideford, *M. B.*	5775
Brixham	5627
Collumpton	2765
Crediton	3934
Dartmouth, *M. B.*	4508
Dawlish	2671
Devonport, *M. B.*	38,180
Exeter, *M. B.*	32,818
Exmouth	5123
Honiton, *M. B.*	3427
Ilfracombe	2919
South Molton, *M. B.*	4482
Newton Abbot	3147
Ottery St. Mary	2534
Plymouth, *M. B.*	52,221
Sidmouth	2516
Tavistock	8086
Teignmouth	5013
Tiverton, *M. B.*	11,144
Topsham	2717
Torquay	7903
Torrington, *M. B.*	3308
Totnes, *M. B.*	4919

DORSETSHIRE.

Bridport, *P. B.*	7566
Dorchester, *P. B.*	6394
Lyme Regis, *P. B.*	3516
Poole, *P. B.*	9255
Shaftesbury, *P. B.*	9404
Wareham, *P. B.*	7218
Weymouth and Melcombe Regis, *P.B.*	9458
Beaminster	2085
Blandford, *M. B.*	2504
Bridport, *M. B.*	7566
Dorchester, *M. B.*	6394
Lyme Regis, *M. B.*	2661
Poole, *M. B.*	9255
Shaftesbury, *M. B.*	2503
Sherborne	3878
Sturminster	1916
Swanage	2014
Wareham	7218
Weymouth, &c. *M.B.*	9458
Wimbourne	2295

DURHAM.

Durham, *P. B.*	13,188
Gateshead, *P. B.*	25,568
South Shields, *P. B.*	28,974
Sunderland, *P. B.*	67,394
Barnard Castle	4357
Bishop Auckland	4400
Darlington	11,228
Durham, *M. B.*	13,188
Gateshead, *M. B.*	25,568
Hartlepool, *M. B.*	9503
Houghton-le-Spring	3224
South Shields, *M. B.*	28,974
Stanhope	T. 2545
Stockton, *M. B.*	1867
Sunderland, *M. B.*	63,897

ESSEX.

Colchester, *P. B.*	19,443
Harwich, *P. B.*	4451
Maldon, *P. B.*	5888
Barking	4930
Braintree	2836
Brentwood	2205
Chelmsford	6033
Coggleshall	3484
Colchester, *M. B.*	19,443
Epping	1821
Halsted	5628
Harwich, *M. B.*	4451
Maldon, *M. B.*	4556
Romford	3791
Saffron Walden, *M.B.*	5911
Stratford	10,586
Waltham Abbey	2329

GLOUCESTERSHIRE.

BRISTOL, *P. B.*	137,328
CHELTENHAM, *P. B.*	35,051
CIRENCESTER, *P. B.*	6096
GLOUCESTER, *P. B.*	17,572
STROUD, *P. B.*	36,535
TEWKESBURY, *P. B.*	5878

Berkeley	949
Bristol, *M. B.*	137,328
Cheltenham	35,051
Cirencester	6096
Dursley	2617
Gloucester, *M. B.*	17,572
Stroud	36,535
Tetbury	2615
Tewkesbury, *M. B.*	5878
Winchcomb	2052

HAMPSHIRE.

ANDOVER, *P.B.*	5395
CHRISTCHURCH, *P.B.*	7475
LYMINGTON, *P.B.*	5282
NEWPORT, *P.B.*	8047
PETERSFIELD, *P.B.*	5550
PORTSMOUTH, *P.B.*	72,096
SOUTHAMPTON, *P.B.*	35,305
WINCHESTER, *P.B.*	13,704

Alton	2828
Andover, *M.B.*	5187
Basingstoke, *M.B.*	4263
Christchurch	7475
Cowes	4786
Fareham	3451
Gosport	7414
Lymington, *M.B.*	2651
Newport, *M.B.*	8047
Petersfield	5550
Portsmouth, *M.B.*	72,096
Ringwood	P. 3928
Romsey, *M.B.*	2080
Ryde	7147
Southampton, *M.B.*	35,305
Ventnor	2569
Winchester, *M.B.*	13,704

HEREFORDSHIRE.

HEREFORD, *P.B.*	12,108
LEOMINSTER, *P.B.*	5214

Bromyard	1394
Hereford, *M.B.*	12,108
Kington	1939
Ledbury	3027
Leominster, *M.B.*	5214
Ross	2674

HERTFORDSHIRE.

HERTFORD, *P.B.*	6605
ST. ALBANS, *P.B.*	7000

St. Albans, *M.B.*	7000
Baldock	P. 1920
Barnet	P. 2380
Berkhampstead	2943
Bishop Stortford	5280
Hemel Hempstead	2727
Hertford, *M.B.*	6605
Hitchin	5258
Royston about	2000
Tring	3218
Ware	4882
Watford	3800

HUNTINGDONSHIRE.

HUNTINGDON, *P.B.*	6219

Godmanchester, *M.B.*	2337
Huntingdon, *M.B.*	3882
St. Ives	3522
Kimbolton	P. 1653
St. Neots	2951
Ramsey	2641

KENT.

CANTERBURY, *P.B.*	18,398
CHATHAM, *P.B.*	28,424
DOVER, *P.B.*	22,244
GREENWICH, *P.B.*	105,784
HYTHE, *P.B.*	13,164
MAIDSTONE, *P.B.*	20,801
ROCHESTER, *P.B.*	14,938
SANDWICH, *P.B.*	12,710

Ashford	4092
Bromley	P. 4127
Canterbury, *M.B.*	18,398
Chatham	28,424
Dartford	5763
Deal, *MB.*	7067
Deptford	14,236
Dover, *M.B.*	22,244
Faversham, *M.B.*	4595
Folkestone, *M.B.*	6726
Gravesend, *M.B.*	16,633
Greenwich	18,125
Hythe, *M.B.*	2857
Maidstone, *M.B.*	20,740
Margate	9107
Milton	P. 2407
Ramsgate	11,838
Rochester, *M.B.*	14,938
Sandwich, *M.B.*	2966
Sevenoaks	1850
Sheerness	8549
Sittingbourne	P. 2897
Tenterden, *M.B.*	3901
Tunbridge	4539
Tunbridge Wells	10,587
Whitstable	3086
Woolwich	14,180

LANCASHIRE.

ASHTON-U-LYNE, *P.B.*	29,791
BLACKBURN, *P.B.*	46,536
BOLTON, *P.B.*	61,171
BURY, *P.B.*	31,262
CLITHEROE, *P.B.*	11,480
LANCASTER, *P.B.*	16,168
LIVERPOOL, *P.B.*	375,955
MANCHESTER, *P.B.*	316,213
OLDHAM, *P.B.*	72,357
PRESTON, *P.B.*	69,542
ROCHDALE, *P.B.*	29,195
SALFORD, *P.B.*	85,108
WARRINGTON, *P.B.*	23,363
WIGAN, *P.B.*	31,941

Accrington	7481
Ashton, *M.B.*	30,676
Atherton	4655
Blackburn, *M.B.*	46,536
Blackpool	2180
Bolton, *M.B.*	61,171
Burnley	20,828
Bury	31,262
Chorley, *M.B.*	8907
Clitheroe, *M.B.*	7244
Colne	6644
Eccles	4108
Fleetwood-on-Wyre	3121
Haslingden	6154
Heywood	12,194
Hindley	5285
Horwich	2104
Kirkham	2777
Lancaster, *M.B.*	14,604
Leigh	5206
Liverpool, *M.B.*	375,955
Manchester, *M.B.*	303,382
Middleton	5740
Oldham, *M.B.*	52,820
Ormskirk	5548
Over Darwen	7020
Prescot	7393
Preston, *M.B.*	69,542
Radcliffe	5002
Rochdale	29,195
Salford, *M.B.*	63,850
Southport	4765
St. Helens	14,866
Todmorden	4532
Tyldesley	3608
Ulverstone	3071
Warrington, *M.D.*	22,894
Wigan, *M.B.*	31,941

LEICESTERSHIRE.

LEICESTER, *P.B.*	60,584

Ashby-de-la-Zouch	3762
Castle-Donington	2729
Hinckley	6111
Leicester, *M.B.*	60,584
Loughborough	10,900
Lutterworth	2446
Melton Mowbray	4391
Market Harborough	2325

LINCOLNSHIRE.

BOSTON, *P.B.*	17,518
GRANTHAM, *P.B.*	10,873
GREAT GRIMSBY, *P.B.*	12,263
LINCOLN, *P.B.*	17,536
STAMFORD, *P.B.*	8933

Alford	2262
Barton-upon-Humber	3866
Boston, *M.B.*	14,733
Bourne	2789
Crowland	2466
Gainsborough	7506
Glanford Brigg	3097
Grantham, *M.B.*	5375
Grimsby, *M.B.*	8860
Holbeach	2245
Horncastle	4921
Lincoln, *M.B.*	17,536
Louth, *M.B.*	10,467
Sleaford	3729
Spalding	7627
Stamford, *M.B.*	8933

MIDDLESEX.

FINSBURY, *P.B.*	323,772
LONDON, *P.B.*	127,869
MARYLEBONE, *P.B.*	370,957
TOWER HAMLETS, *P.B.*	539,111
WESTMINSTER, *P.B.*	241,611

Acton	P. 2582
Brentfor	8870
Chelsea	P. 56,538
Chiswick	P. 6303
Edmonton	P. 9708
Enfield	P. 9453
Finchley	P. 4120
Fulham	P. 11,886
Hammersmith	P. 17,760
Hampstead	P. 11,986
Harrow-on-the-Hill	P. 4951
Hendon	P. 3333
Highgate	P. 4502
Hornsey	P. 7135
Hounslow	3514
Kensington	P. 44,053
London, *M.B.*	127,869
(Metropolis)	2,362,236
Staines	2430
Twickenham	P. 6254
Tottenham	P. 9120
Uxbridge	3236

MONMOUTHSHIRE

MONMOUTH DISTRICT	26,512

Abergavenny	4797
Caerleon	1281
Chepstow	4295
Monmouth, *C.P.B.*, *M.B.*	5710
Newport, *C.P.B.*, *M.B.*	19,323
Pontypool	3708
Tredegar	8305
Usk, *C.P.B.*	1479

NORFOLK.

LYNN, KINGS, *P.B.*	19,355
NORWICH, *P.B.*	68,195
THETFORD, *P.B.*	4075
YARMOUTH, GT., *P.B.*	30,879

Aylsham	2184
Brandon	2022
Dereham	3372
Diss	2419
Downham	2867
King's Lynn, *M.B.*	19,355
Norwich, *M.B.*	68,195
Swaffham	3858
Thetford, *M.B.*	4075
Wells	3633
Wymondham	2970
Yarmouth, *M.B.*	30,879

NORTHAMPTONSHIRE.

NORTHAMPTON, *P.B.*	26,657
PETERBOROUGH, *P.B.*	8672

Brackley	2157
Daventry, *M.B.*	4430
Kettering	5125
Northampton, *M.B.*	26,657
Oundle	2689
Peterborough	8672
Towcester	2478
Wellingborough	5061

NORTHUMBERLAND.

BERWICK ON-TWEED, *P.B.*	15,094
MORPETH, *P.B.*	10,012
NEWCASTLE, *P.B.*	87,784
TYNEMOUTH, *P.B.*, *M.B.*	29,170

Alnwick	6231
Berwick, *M.B.*	15,094
Blyth	2060
Hexham	4601
Morpeth, *M.B.*	4096
Newcastle, *M.B.*	87,784
North Shields	T. 8882
Tynemouth	T. 14,493
Wooler	P. 1911

NOTTINGHAMSHIRE.

NEWARK, *P.B.*	11,330
NOTTINGHAM, *P.B.*	57,407
EAST RETFORD, *P.B.*	46,054

Bingham	P. 2054
Mansfield	10,012
Newark, *M.B.*	11,330
Nottingham, *M.B.*	57,407
Retford, East, *M.B.*	2943
Southwell	3516
Worksop	6058

OXFORDSHIRE.

BANBURY, *P.B.*	8715
OXFORD, *P.B.*	27,843
OXFORD UNIV., *P.B.*	
WOODSTOCK, *P.B.*	7983

Banbury, *M.B.*	4026
Bicester	2763
Chipping Norton, *M.B.*	2932
Henley-on-Thames	P. 3733
Oxford, *M.B.*	27,843
Thame	2869
Witney	3099
Woodstock	7983

RUTLANDSHIRE.

Oakham	2800
Uppingham	2068

SHROPSHIRE.

BRIDGNORTH, *P.B.*	7610
LUDLOW, *P.B.*	5376
SHREWSBURY, *P.B.*	19,681
WENLOCK, *P.B.*	20,588

Bridgnorth, *M.B.*	6172
Ellesmere	2087
Ludlow, *M.B.*	4691
Newport	2906
Oswestry, *M.B.*	4817
Shrewsbury, *M.B.*	19,681
Wellington	4601
Wenlock, *M.B.*	18,728
Whitchurch	3619

SOMERSETSHIRE.

Bath, *P.B.*	54,240
Bridgewater, *P.B.*	10,317
Frome, *P.B.*	10,148
Taunton, *P.B.*	14,176
Wells, *P.B.*	4736

Bath, *M.B.*	54,240
Bridgewater, *M.B.*	10,317
Bruton	1885
Chard, *M.B.*	2291
Crewkerne	3303
Frome	10,148
Glastonbury, *M.B.*	3125
Sonth Petherton, *M.B.*	2165
Shepton Mallet	3885
Taunton	14,176
Wellington	3926
Wells, *M.B.*	4736
Yeovil	5985

STAFFORDSHIRE.

Lichfield, *P.B.*	7012
Newcastle-u-Lyne, *P.B.*	10,569
Stafford, *P.B.*	11,829
Stoke-upon-Trent. *P.B.*	84,027
Tamworth, *P.B.*	8655
Walsall, *P.B.*	25,680
Wolverhampton, *P.B.*	119,748

Burslem	T. 15,954
Burton-upon-Trent	7934
Cheadle	2728
Hanley	25,369
Leek	8877
Lichfield, *M.B.*	7012
Longton	15,149
Newcastle, *M.B.*	10,509
Rugeley	3054
Stafford, *M.B.*	11,829
Stoke-upon-Trent	T. 9207
Stone	3443
Tamworth, *M.B.*	4059
Tunstall	T. 9566
Uttoxeter	3468
Walsall, *M.B.*	25,680
Wednesbury	11,914
Wolverhampton, *M.B*	49,985

SUFFOLK.

Bury-St. Edmunds, *B.P.*	13,900
Eye, *P.B.*	7531
Ipswich, *P.B.*	32,914

Beccles, *M.B.*	4398
Bungay	3841
Bury-St. Edm., *M.B.*	13,900
Eye, *M.B.*	2587
Framlingham	2450
Hadleigh	3338
Halesworth	2529
Ipswich, *M.B.*	32,914
Lowestoft	6580
Mildenhall	1760
Southwold, *M.B.*	2109
Stowmarket	3161
Sudbury, *M.B.*	6043
Woodbridge	5161

SURREY.

Guildford, *P.B.*	6740
Lambeth, *P.B.*	251,345
Reigate, *P.B.*	4927
Southwark, *P.B.*	172,863

Battersea	P. 5512
Chertsey	2743
Clapham	P. 9320
Croydon	10,260
Dorking	3490
Epsom	3390
Farnham	3515
Godalming, *M B.*	2218
Guildford, *M.B.*	6740
Kingston, *M.B.*	6279
Putney	P. 2845
Reigate	4927
Richmond	9065
Wandsworth	P. 5094

SUSSEX.

Arundel, *P.B.*	2748
Brighton, *P.B.*	69,673
Chichester, *P.B.*	8662
Hastings, *P.B.*	17,011
Horsham, *P.B.*	5947
Lewes, *P.B.*	9533
Midhurst, *P.B.*	7021
Rye, *P.B.*	8541
Shoreham, *P.B.*	30,553

Arundel, *M.B.*	2748
Brighton	69,673
Chichester, *M.B.*	8662
Cuckfield	P. 3196
Eastbourne	P. 3433
Hastings, *M.B.*	16,966
Horsham	5947
Lewes	9533
Littlehampton	2436
Midhurst	P. 1481
Petworth	2427
Rye, *M.B.*	4071
Shoreham, New	P. 2590
Worthing	5370

WARWICKSHIRE.

Birmingham, *P.B.*	232,841
Coventry, *P.B.*	36,812
Warwick, *P.B.*	10,973

Alcester	2027
Atherstone.	T. 3819
Bedworth	3012
Birmingham, *M.B.*	232,841
Coventry, *M.B.*	36,208
Keuilworth	3140
Leamington	15,692
Nuneaton	4859
Rugby	6317
Stratford, *M.B.*	3372
Solihull	P. 3277
Sutton Coldfield	P. 4574
Warwick, *M.B.*	10,973

WESTMORLAND.

Kendal, *P.B.*	11,829

Ambleside	P. 1592
Appleby	1294
Kendal, *M.B.*	11,829
Kirkby Lonsdale	T. 1175
Kirkby Stephen	T. 1339

WILTSHIRE.

Calne, *P.B.*	5195
Chippenham, *P.B.*	6283
Cricklade, *P.B.*	35,503
Devizes, *P.B.*	6554
Malmesbury, *P.B.*	6998
Marlborough, *P.B.*	5135
Salisbury, *P B.*	11,657
Westbury, *P.B.*	7029
Wilton, *P.B*	8607

Bradford, Great	4240
Calne, *M.B.*	2544
Chippenham, *MB.*	1707
Cricklade	P. 1906
Devizes, *M.B.*	6554
Downton	2727
Malmesbury	P. 2443
Marlborough, *M.B.*	3908
Melksham	2931
Salisbury, *M.B.*	11,657
Trowbridge	10,157
Warminster	4220
Westbury, about	4000
Wilton	P. 1804
Wootton Basset	P. 2123

WORCESTERSHIRE.

Bewdley, *P.B.*	7318
Droitwich, *P.B.*	7096
Dudley, *P.B.*	37,962
Evesham, *P.B.*	4605
Kidderminster, *P.B.*	18,462
Worcester, *P.B.*	27,528

Bewdley, *M.B.*	3124
Bromsgrove	4426
Droitwich, *M.B.*	3125
Dudley.	37,962
Evesham, *M.B.*	4605
Hales Owen	2412
Kidderminster, *M.B*	18,462
Oldbury	5114
Pershore	2717
Stourbridge	7847
Worcester, *M.B.*	27,528

YORKSHIRE.

West Riding.

Bradford, *P.B.*	103,778
Halifax, *P.B.*	33,582
Huddersfield, *P.B.*	30,880
Knaresborough, *P.B.*	5536
Leeds, *P.B.*	172,270
Pontefract, *P.B.*	11,515
Ripon, *P.B.*	6080
Sheffield, *P.B.*	135,310
Wakefield, *P.B.*	22,057

Barnsley	13,437
Bingley	5019
Bradford, *M.B.*	103,778
Dewsbury	5033
Doncaster, *M.B.*	12,052
Goole	4722
Halifax, *M.B.*	33,582
Harrogate	3678
Huddersfield	30,880
Keighley	13,050
Knaresborough	5536
Leeds, *M.B.*	172,270
Otley	4522
Pontefract, *MB.*	5106
Ripon, *M.B.*	6080
Rotherham	6325
Selby	5109
Sheffield, *M.B.*	135,310
Skipton	4962
Sowerby Bridge	4365
Tadcaster	2527
Thorne	2820
Wakefield, *M.B.*	22,065

East Riding.

Beverley, *P.B.*	10,058
Hull, *P.B.*	84,690

Beverley, *M.B.*	8915
Bridlington	2432
Driffield, Great	3792
Howden	2235
Hull, *M.B.*	84.690
Pocklington	2546

North Riding.

Malton, *P.B.*	7661
Northallerton, *P.B.*	4995
Richmond, *P.B.*	4969
Scarborough, *P.B.*	12,915
Thirsk, *P.B.*	5319
Whitby, *P.B.*	10,989
York, *P.B.*	40,359

Guisborough	T. 2062
Malton.	,7661
Middleborough	7431
Northallerton	4995
Pickering	2511
Richmond, *M.B.*	4106
Scarborough, *M.B.*	12,915
Thirsk	5319
Whitby	10,989
York, *M.B.*,	36,303

WALES.

ANGLESEY.

Beaumaris District.	12,752

Amlwch, *C.P.B.*	3169
Beaumaris, *C.P.B. M.B.*	2599
Holyhead, *C.P.B.*	5622
Llangefni, *C.P.B.*	1362

BRECKNOCKSHIRE.

Brecknock, *P.B.*	6070

Brecknock, *M.B.*	5673

CARDIGANSHIRE.

Cardigan District.	11,760

Aberystwith, *C.P.B. M.B.*	5231
Adpar, *C.P.B.*	1746
Cardigan, *C.P.B. M.B.*	3876
Lampeter, *C.P.B.*	907

CAERMARTHENSHIRE.

Caermarthen Distr.	19,234

Caermarthen, *C.P.B. M.B.*	10,524
Llandovery, *M.B*	1927
Llanelly, *C.P.B.*	8710

CAERNARVONSHIRE.

Caernarvon District	22,210

Bangor, *C.P.B.*	6338
Caernarvon, *C.P.B. M.B.*	8674
Conway, *C.P.B.*	2105
Criccieth, *C.P.B.*	530
Nevin, *C.P.B.*	1854
Pwllheli, *C.P.B.M.B.*	2709
Tremadoc, about	1800

DENBIGHSHIRE.

Denbigh District.	16,614

Denbigh, *C.P.B. M.B.*	5498
Holt, *C.P.B.*	1029
Ruthin, *C.P.B.M.B.*	3373
Wrexham, *C.P.B.*	6714

FLINTSHIRE.

Flint District	18,818

Asaph, St., *C.P.B.*	2041
Caergwyle, *C.P.B.*	917
Caerwys, *C.P.B.*	635
Flint, *C.P.B. M.B.*	3296
Holywell, *C.P.B.*	5740
Mold, *C.P.B.*	3432
Overton, *C.P.B.*	1479
Rhuddlan, *C.P.B.*	1472

GLAMORGANSHIRE.

Cardiff District	20,424
Merthyr Tydfil, *P.B.*	63,080
Swansea District	45,123

Aberavon, *C.P.B.*	6567
Cardiff, *C.P.B. M.B.*	18,351
Cowbridge, *C.P.B.*	1066
Kenfig, *C.P.B.*	433
Llantrisaint, *C.P.B.*	1007
Loughor, *C.P.B.*	821
Merthyr Tydfil	63.080
Neath, *C.P.B. M.B.*	5841
Swansea, *C.P.B. M.B.*	31,461

MERIONETHHIRE.

Dolgelly	2041

MONTGOMERYSHIRE.

Montgomery District	17,887

Llanfyllin, *C.P.B.*	1116
Llanidloes, *C.P.B. M.B.*	3045
Machynlleth, *C.P.B.*	1673
Montgomery, *C.P.B.*	1248
Newtown, *C.P.B.*	6371
Welshpool, *C.P.B.*	4434
Welshpool, *M.B.*	6564

PEMBROKESHIRE.

HAVERFORDWEST DISTRICT	9729
PEMBROKE DISTRICT	16,700
Fishguard, *C.P.B.*	1757
Haverfordwest, *C.P.B. M.B.*	6580
Milford, *C.P.B.*	2837
Narberth, *C.P.B.*	1892
Pembroke, *C.P.B. M.B.*	10,107
Tenby, *C.P.B. M.B.*	2982
Wiston, *C.P.B.*	774

RADNORSHIRE.

RADNOR DISTRICT	6653
Cefnllys, *C.P.B.*	45
Knighton, *C.P.B.*	1388
Knuckles, *C.P.B.*	251
Presteigne, *C.P.B.*	1617
New Radnor, *C.P.B.*	2345
Rhayader, *C.P.B.*	1007

SCOTLAND.

ABERDEENSHIRE.

ABERDEEN, *P.B.*	71,973
INVERURY, *C.P.B.*	2264
KINTORE, *C.P.B.*	476
PETERHEAD, *C.P.B.*	7298
Aberdeen, *M.B.*	53,808
Fraserburgh	3093
Huntly	3131
Inverury, *M.B.*	2084
Peterhead, *M.B.*	4819

ARGYLESHIRE.

CAMPBELTOWN, *C.P.B.*	6880
INVERARY, *C.P.B.*	1064
OBAN, *C.P.B.*	1742
Campbeltown, *M.B.*	6880
Dunoon	2229
Inverary, *M.B.*	1164
Oban, *M.B.*	1742

AYRSHIRE.

AYR, *C.P.B.*	17,624
IRVINE, *C.P.B.*	7534
KILMARNOCK, *C.P.B.*	21,443
Ardrossan	2071
Ayr, *M.B.*	9115
Beith	4012
Dalry	2706
Galston	2538
Girvan	7319
Irvine, *M.B.*	4790
Kilbirnie	3399
Kilmarnock, *M.B.*	19,201
Kilwinning	3265
Largs	2824
Maybole	3862
Newmilns	2211
Old Cumnock	2395
Saltcoats	4338
Stewarton	3164
Stevenston	2095
Troon	2404

BANFFSHIRE.

BANFF, *C.P.B.*	6000
CULLEN, *C.P.B.*	1697
Banff, *M.B.*	3557
Buckie	2789
Cullen, *M.B.*	3165
Keith	2101
Portsoy	2062

BERWICKSHIRE.

LAUDER, *C.P.B.*	1105
Coldstream	2238
Dunse	2567
Lauder, *M.B.*	1105

BUTESHIRE.

Rothesay, *M.B.*	7104

CAITHNESS.

WICK, *C.P.B.*	6722
Thurso	2908
Wick, *M.B.*	1514

CLACKMANNAN-SHIRE.

Alloa	6676
Tillicoultry	3217

DUMBARTON-SHIRE.

DUMBARTON, *C.P.B.*	5445
Alexandria	3781
Bonhill	2327
Dumbarton, *M.B.*	4590
Duntocher	2440
Helensburgh	2841
Kirkintilloch	6342
Renton	2398

DUMFRIESSHIRE.

ANNAN, *C.P.B.*	3426
DUMFRIES, *C.P.B.*	13,166
LOCHMABEN, *C.P.B.*	1022
SANQUHAR, *C.P.B.*	2381
Annan, *M.B.*	4570
Dumfries, *M.B.*	11,107
Lochmaben, *M.B.*	1498
Sanquhar, *M.B.*	1884

EDINBURGH-SHIRE.

EDINBURGH, *P.B.*	160,302
LEITH, *C.P.B.*	30,919
MUSSELBURGH, *C.P.B.*	7092
PORTOBELLO, *C.P.B.*	3497
Dalkeith	5086
Edinburgh, *M.B.*	66,734
Leith, *M.B.*	30 919
Musselburgh, *M.B.*	7092
Portobello, *M.B.*	3497

ELGINSHIRE.

ELGIN, *C.P.B.*	6337
FORRES, *C.P.B.*	3468
Elgin, *M.B.*	5383
Forres, *M.B.*	3339

FIFESHIRE.

ANSTRUTHER EASTER, *C.P.B.*	1161
ANSTRUTHER WESTER, *C.P.B.*	365
BURNTISLAND, *C.P.B.*	2724
CRAIL, *C.P.B.*	1247
CUPAR-FIFE, *C.P.B.*	5686
DUNFERMLINE, *C.P.B.*	13,836
DYSART, *C.P.B.*	8041
INVERKEITHING, *C.P.B.*	1852
KILRENNY, *C.P.B.*	1862
KINGHORN, *C.P.B.*	1568
KIRKCALDY, *C.P.B.*	10,475
PITTENWEEM, *C.P.B.*	1450
ST. ANDREWS, *C.P.B.*	5107
St. Andrews, *M.B.*	4730
Anstruther East, *M.B.*	1161
Anstruther West, *M.B.*	365
Auchtermuchty, *M.B.*	2673
Burntisland, *M.B.*	2329
Crail, *M.B.*	1247
Cupar, *M.B.*	4005
Dunfermline, *M.B.*	8577
Dysart, *M.B.*	1610
Earlsferry, *M.B.*	436
Falkland, *M.B.*	1330
Ferryport-on-Craig	2051
Inverkeithing, *M.B.*	1497
Kilrenny, *M.B.*	1862
Kinghorn. *M.B.*	1377
Kirkcaldy, *M.B.*	5093
Leven	2083
Newburgh, *M.B.*	2638
Pittenweem, *M.B.*	1450

FORFARSHIRE.

ARBROATH, *C.P.B.*	16,986
BRECHIN, *C.P.B.*	6637
DUNDEE, *P.B.*	78,931
FORFAR, *C.P.B.*	9311
MONTROSE, *C.P.B*	15,238
Arbroath, *M.B.*	8302
Brechin, *M.B.*	4515
Broughtyferry	2772
Dundee, *M.B.*	61,449
Forfar, *M.B.*	9311
Kirriemuir	3518
Montrose, *M.B.*	14,328

HADDINGTON-SHIRE.

DUNBAR, *C.P.B.*	3038
HADDINGTON, *C.P.B.*	3883
NORTH BERWICK, *C.P.B.*	863
Dunbar, *M.B.*	2965
Haddington, *M.B.*	2887
North Berwick, *M.B.*	498
Tranent	2096

INVERNESS-SHIRE.

INVERNESS, *C.P.B.*	12,793
Beauly P.	3007
Inverness, *M.B.*	9967

KINCARDINE-SHIRE.

BERVIE, *C.P.B.*	934
Bervie, *M.B.*	878
Stonehaven	3240

KINROSS-SHIRE.

Kinross	2590
Milnathort	1605

KIRKCUDBRIGHT.

KIRKCUDBRIGHT, *C.P.B.*	2687
NEW GALLOWAY, *C.P.B.*	447
Castle Douglas	1992
Kirkcudbright, *M.B.*	2778
Maxwelltown,	3280
New Galloway, *M.B.*	447

LANARKSHIRE.

AIRDRIE, *C. B. P.*	14,435
GLASGOW, *P. B.*	329,097
HAMILTON, *C. P. B.*	9630
LANARK, *C. P. B.*	5008
RUTHERGLEN, *C. P. B.*	6514
Airdrie, *M. B.*	14,435
Calderbank	2872
Carluke	2845
Coatbridge	8564
Glasgow, *M. B.*	148,116
Govan	3131
Hamilton, *M. B.*	9630
Lanark, *M. B.*	5304
Rutherglen, *M. B.*	6947
Stonehouse	2086
Strathaven	4274
Wishawton	3373

LINLITHGOW-SHIRE.

LINLITHGOW, *C. P. B.*	4213
QUEENSFERRY, *C. B. P.*	1195
Bathgate	3341
Borrowstowness	2645
Linlithgow, *M. B.*	4071
Queensferry, *M. B.*	720

NAIRNSHIRE.

NAIRN, *C. P. B.*	2977
Nairn, *M. B.*	3401

ORKNEY and SHETLAND.

KIRKWALL, *C. P. B.*	3,451
Kirkwall, *M. B.*	2,448
Lerwick	2,904
Stromness	2055

PEEBLES-SHIRE.

Peebles, *M. B.*	1982

PERTHSHIRE.

CULROSS, *C. P. B.*	605
PERTH, *P. B.*	23,835
Auchterarder	2520
Blairgowrie	2914
Crieff	3824
Culross, *M. B.*	605
Cupar Angus	2004
Dunblane	1816
Kincardine	2697
Perth, *M. B.*	14,681

RENFREWSHIRE.

GREENOCK, *P. B.*	36 689
PAISLEY, *P. B.*	47,952
PORT GLASGOW, *C. P. B.*	6986
RENFREW, *C. P. B.*	2977
Barrhead	6069
Greenock, *M. B.*	36,689
Johnstone	5872
Kilbarchan	2467
Lochwinnoch	2271
Neilston	2075
Paisley, *M. B.*	31,752
Pollockshaws	6086
Port Glasgow, *M. B.*	6986
Renfrew, *M. B.*	2722

ROSS and CROMARTY.

CROMARTY, *C. P. B.*	1988
DINGWALL, *C. P. B.*	1990
FORTROSE, *C. P. B.*	1148
TAIN, *C. P. B.*	2049
Cromarty, *M. B.*	1988
Dingwall, *M. B.*	1990
Fortrose, *M. B.*	1148
Stornoway	2391
Tain, *M. B.*	2588

ROXBURGH-SHIRE.

JEDBURGH, *C. P. B.*	3615
Hawick	6683
Jedburgh, *M. B.*	2948
Kelso	4783

SELKIRKSHIRE.

Galashiels	5918
Selkirk, *M. B.*	3314

STIRLINGSHIRE.

FALKIRK, *C. P. B.*	8752
STIRLING, *C. P. B.*	12,837
Alva	3058

Bannockburn	2627
Denny	2446
Falkirk, *M. B.*	8752
Kilsyth	3949
Lennoxtown	3108
Stirling, *M. B.*	9361

SUTHERLANDSHIRE.

Dornoch, *C. P. B.*	599
Dornoch, *M. B.*	599

WIGTONSHIRE.

Stranraer, *C. P. B.*	5738
Whithorn, *C. P. B.*	1652
Wigton, *C. P. B.*	2121
Newton Stewart	2599
Stranraer, *M. B.*	3877
Whithorn, *M. B.*	1652
Wigton, *M. B.*	2232

DISTRICTS OF BURGHS.

Ayr District	34,844
Dumfries District	22,752
Elgin District	24,072
Falkirk District	42,038
Haddington District	12,504
Inverness District	20,386
Kilmarnock District	43,365
Kirkcaldy District	22,808
Leith District	41,508
Montrose District	49,106
St. Andrews District	16.878
Stirling District	30,325
Wick District	16,799
Wigton District	9,958

ISLANDS IN THE BRITISH SEAS.

ISLE OF MAN.

Castletown	2479
Douglas	9880
Peel	2342
Ramsey	2701

JERSEY.

St. Helier (Town and Parish)	29,133

GUERNSEY.

St. Peter Port (T. and P.)	16,778

IRELAND.

Parliamentary Boroughs.

Armagh	8856
Athlone	8014
Bandon	7942
Belfast	78,354
Carlow	11,587
Carrickfergus	8520
Cashel	9069
Clonmel	15,204
Coleraine	6517
Cork	114,232
Downpatrick	4854
Drogheda	19,829
Dublin	265,252
Dundalk	10,253
Dungannon	3854
Dungarvan	11,582
Ennis	10,519
Enniskillen	6094
Galway	34,146
Kilkenny	24,182
Kinsale	5565
Limerick	69,561
Lisburn	7673
Londonderry	19,973
Mallow	5683
New Ross	10,145
Newry	14,734
Portarlington	2964
Sligo	14,393
Tralee	13,759
Waterford	32,604
Wexford	12,863
Youghal	9653

Cities and Towns.

ANTRIM.

Antrim	2325
Ballycastle	1669
Ballymena	6136
Ballymony	2954
Belfast	100,300
Carrickfergus	3543
Larne	3076
Lisburn	6569
Whitehouse	2236

ARMAGH.

Armagh	8578
Lurgan	4205
Portadown	3091

CARLOW.

Bagenalstown	2292
Carlow	11,587
Tullow	2966

CAVAN.

Belturbet	2054
Cavan	3034
Cootehill	2105

CLARE.

Ennis	7843
Enistemon	1741
Killaloe	1818
Kilrush	4471

CORK.

Bandon	7942
Bantry	2943
Charleville	2662
Clonakilty	3297
Cork	85,732
Dunmanway	2212
Fermoy	5846
Kanturk	3152
Kinsale	5506
Macroom	3717
Mallow	5439
Middleton	3688
Mitchelstown	3084
Passage, West	2852
Queenstown	11,405
Skibbereen	4063
Youghal	7630

DONEGAL.

Ballyshannon	4032
Donegal	1582
Letterkenny	1940
Lifford	857
Raphoe	1491

DOWN.

Banbridge	3301
Bangor	2849
Comber	1790
Donaghadee	2821
Downpatrick	3845
Dromore	1862
Gilford	2814
Newry	13,473
Newtownards	10,074
Portaferry	2074
Rathfryland	2053
Warrenspoint	1769

DUBLIN.

Balbriggan	2309
Blackrock	2348
Donnybrook	1873
Dublin	258,369
Harold's Cross	2934
Kingstown	10,458
Ringsend	2064
Skerries	2327
Swords	1294

FERMANAGH.

Enniskillen	5949

GALWAY.

Ballinasloe	5751
Galway	23,787
Gort	2398
Loughrea	3621
Tuam	4940

KERRY.

Cahirciveen	1862
Dingle	3254
Killarney	5901
Listowel	2134
Tralee	13,759

KILDARE.

Athy	3877
Kildare	1275
Maynooth	1696
Naas	3010

KILKENNY.

Callan	2351
Castlecomer	1694
Graigue	1710
Kilkenny	19,975
Thomastown	1794

KING'S COUNTY.

Banagher	1846
Birr, (Parsonstown)	5480
Tullamore	4630

LEITRIM.

Carrick-on-Shannon	1244
Manorhamilton	1230
Mohill	1217

LIMERICK.

Askeaton	1957
Ballingarry	1451
Limerick	53,448
Newcastle	2719
Rathkeale	2988

LONDONDERRY.

Coleraine	6262
Londonderry	20,187
Magherafelt	1390
Newtownlimavady	3205

LONGFORD.

Granard	1805
Longford	5276

LOUTH.

Ardee	2752
Drogheda	16,847
Dundalk	9842

MAYO.

Ballina	5985
Ballinrobe	2162
Castlebar	4016
Clare	1560
Westport	4370

MEATH.

Kells	3660
Navan	3979
Trim	1905

MONAGHAN.

Ballybay	1617
Carrickmacross	2529
Castleblaney	2077
Clones	2319
Monaghan	3328

QUEEN'S COUNTY.

Maryborough	2078
Mountmellick	3657
Mountrath	2079
Portarlington	2730

ROSCOMMON.

Boyle	2727
Roscommon	3086

SLIGO.

Sligo	11,047

TIPPERARY.

Cahir	3694
Carrick-on-Suir	6211
Cashel	4798
Clonmel	15,204
Fethard	2767
Nenagh	7349
Roscrea	3389
Templemore	4372
Thurles	5985
Tipperary	7001

TYRONE.

Cookstown	2993
Dungannon	3835
Omagh	3054
Strabane	4326

WATERFORD.

Cappoquin	2144
Carrickbeg	2108
Dungarvan	6865
Lismore	2319
Portlaw	4351
Tallow	1986
Tramore	1882
Waterford	25,297

WESTMEATH.

Athlone	6218
Moate	1977
Mullingar	4817

WEXFORD.

Enniscorthy	6010
Gorey	2972
New Ross	7903
Wexford	12,471

WICKLOW.

Arklow	3300
Bray	3152
Wicklow	2946

CENTROPUS (Illiger), a genus of birds belonging to the order *Scansores*. The species are natives of India and Africa. They have a long pointed thumb-nail, the same as the larks. Their plumage is rigid and spinous. They build their nests in the holes of trees, and lay white eggs. They feed chiefly on grasshoppers, and dwell amongst reeds and other herbage, and do not often take to wing. Their flesh is not pleasant eating.

CERADIA, a genus of plants belonging to the Corymbiferous division of the natural order *Compositæ*. *C. furcata* is a half-succulent plant, inhabiting the most sterile regions of south-western Africa. It yields in some abundance a brittle resin-like substance, which gives out a fragrant odour when burnt, and has been called African Bdellium; it is however a very different thing from the true Bdellium. [Bdellium.]

CEREUS, a genus of plants belonging to the natural order *Cactaceæ*. It is characterised by its sepals being very numerous, imbricate, adnate to the base of the ovarium, united into an elongated tube, outer ones shorter and like a calyx, middle ones longer and coloured, innermost ones petaloid; the style multifid at the apex; the berry areolate, tubercular, or scaly from the remains of the sepals. The species are fleshy grotesque shrubs, with a woody axis and soft interior. They possess angles which are vertical and covered with bundles of spines. The flowers are large, arising from the angles of the spines. They are called Torch-Thistles.

C. senilis, the Old Man Torch-Thistle, is an erect plant, having a stem with 20-25 vertical ribs, covered with fascicles of bristles, each fascicle containing from 15-20 radiating hair-formed curled bristles. Its long gray bristles give it the appearance of the head of an old gray-haired man. It is a native of Mexico.

C. flagelliformis, the Creeping Cereus, has prostrate stems with about 10 angles. It is very common in our gardens, and its trailing stems require the support of trellis-work. It bears an abundance of beautiful red and pink flowers. It is a native of South America, though now naturalised in Asia and Africa.

C. grandiflorus, the Night-Flowering Cereus, has rooting stems, with 5 or 6 angles and fascicles of bristles, with 5-8 in each fascicle. It is a native of the West India Islands, and is found in many parts of the mainland of South America. This plant when cultivated produces very large beautiful sweet-scented flowers. They are however of short duration, remaining open not more than six hours. They generally begin to open between seven and eight o'clock in the evening, and are fully expanded by eleven or twelve, and before the next morning they are quite faded.

C. speciosissimus is an erect plant, 3-4 angled, the angles toothed, the prickles subulate, straight, rising from a white tomentum. It is a native of Mexico, but is very commonly cultivated in our gardens, on account of its large flowers, which are of a beautiful scarlet, the inner petals having a violaceous colour. Nearly 100 species of this beautiful genus of plants have been described, and a fine collection of them exists in the Royal Gardens at Kew. They are of easy culture, and require the same general treatment as the order to which they belong. [Cactus.]

CERNE ABBAS. [Dorsetshire.]

CERNUA, a genus of Fishes belonging to the section *Acanthopterygii* and the family *Percidæ*. It includes the Ruffe or Pope, a British fish, which has also been named *Acerina vulgaris* and *Perca cernua*. The generic character of *Acerina*, as given by Yarrell in his 'British Fishes,' is as follows:—"Dorsal fin single, elongated, the rays of the first portion spinous, the others flexible; branchiostegous rays seven; teeth very small, uniform, numerous; head without scales; suborbital bone and pre-operculum indented; operculum ending in a single point."

In *Acerina vulgaris*, the Ruffe or Pope, the prevailing colour of the upper part of the body and head is a light olive-brown, passing into a yellowish-brown on the sides, and becoming almost silvery-white on the belly. The lateral line prominent and strongly marked. Small brown spots are disseminated over the back, dorsal fin, and tail, assuming on the latter, from their arrangement, the appearance of bars; pectoral, ventral, and anal fins, pale-brown. This fish is an inhabitant of fresh waters, and closely allied to the perch. It was first described by Dr. Caius, who called it *Aspredo*, being a translation of our word Ruffe (rough), which is applied to this fish on account of the harsh feel of its denticulated scales. It is common in all the rivers of England, especially the Thames, the Isis, and Cam, and is found in the colder parts of the European continent. It is like the perch in its habits. (Yarrell, *British Fishes.*)

CERTHILAUDA. [Alaudinæ, *S.* 2.]

CERVANTESIA, a name given by Ruiz and Pavon to a genus of plants, in honour of their immortal countryman Cervantes. One of the species, *C. tomentosa*, is a native of Peru, and yields seeds which are eaten in the same manner as almonds in Europe, or the Quandary Nut (*Fusanus acuminatus*), another Santalaceous plant, in Australia.

CESSIO BONORUM. The proceedings of the trustee in a *Cessio* have been subjected to the control of the Court, and an Accountant in Bankruptcy, in the same way as those in Bankruptcy. When a bankrupt's assets do not exceed 100*l.*, he is entitled only to the advantages of the judgment in a *Cessio* (19 & 20 Vict. c. 79).

CHALCEDONY. [Agate.]

CHALCIS, the ancient name of the town of Egripos. [Eubœa.]

CHALK FORMATION. [Cretaceous Group.]

CHALMERS, THE REV. DR. THOMAS, was born at Anstruther, in Fifeshire, on the 17th of March 1780. He was the sixth child of a family of fourteen, born to Mr. John Chalmers, a dyer, shipowner, and general merchant in Anstruther, by his wife Elizabeth Hall. Educated first at the parish school of Anstruther, and next at the University of St. Andrews, he very early displayed powers of no common order—less however in the formal business of the classes, than in his general intercourse with his fellow-students. Having chosen the clerical profession, and gone through the usual theological studies at St. Andrews, he obtained, when yet not past his nineteenth year, a preacher's or probationer's 'licence' in the Scottish Church. His first sermon, however, was preached in England, in the Scotch church in Wigan, on the 25th of August 1799, during a visit to an elder brother. The winter of that year and also that of the next were spent by him in Edinburgh, where he occupied himself in teaching, and also in attending the classes of Dugald Stewart, Robison, Playfair, and Hope, then in the height of their fame. It was at this time that his passion for mathematics and natural science, as well as his tendency to original speculation on moral and social subjects, first conspicuously revealed themselves. After a period of desultory occupation, first as assistant to the clergyman of Cavers in Roxburghshire, and then as assistant to the mathematical professor at St. Andrews, he was nominated to the living of Kilmany, in his native county of Fifeshire; into which parish he was inducted on the 12th of May 1803. He was then twenty-three years of age, and he continued in the position of parish clergyman of Kilmany till July 1815. These twelve years formed a very eventful period in his mental history. On adopting the clerical profession he had brought into it no very decided views in doctrinal theology. He was attached to what was called the 'Moderate,' as distinct from what was called the 'Evangelical' party of the Scottish Church. He was of opinion too, that by devoting a day or two each week to the preparation of his sermons and to official clerical acts, a clergyman could amply discharge all his proper duties, so as to have the rest of his time at his disposal for whatever other occupations interested him. He carried this view into practice. During the first year of his incumbency he varied his professional work at Kilmany by courses of lectures on mathematics and chemistry at St. Andrews. His preference at this time for professorial over clerical work, and for natural science over theology was indicated by his being candidate in 1804 for the chair of Natural Philosophy at St. Andrews. With even less chance of success he offered himself in the following year as a candidate for the mathematical chair in Edinburgh, vacant by the transference of Mr. Playfair to the Natural Philosophy chair on Robison's death. Mr. Leslie, afterwards Sir John Leslie, obtained the post, and it was with reference to an argument in Leslie's favour urged at the time by Playfair, to the effect that "the vigorous prosecution of mathematical or natural science was incompatible with clerical duties and habits" that Mr. Chalmers made his first literary appearance. In reply to Playfair he published an anonymous pamphlet, vehemently defending the clergy against what he regarded as a "cruel and illiberal insinuation"—a pamphlet, the main tenor of which, if not its specific statements, he lived to disown. His next publication was in 1807, when, his thoughts on political economy receiving a stimulus from the agitation caused by Napoleon's decrees against British commerce, he issued a pamphlet, entitled 'Inquiry into the Extent and Stability of National Resources.' This publication had success sufficient to inspire him for a time with the idea of coming to London to increase his literary connections. Circumstances preventing him from realising this idea, he continued at Kilmany, with a growing reputation for various attainments, as well as for extraordinary energy, accompanied with some eccentricity, of character and manner. In 1809 he made his first speech in the General Assembly of the Scottish Church—the scene of so many of his oratorical triumphs in after life. In the same year he became a contributor to the 'Edinburgh Encyclopædia,' under the editorship of Dr. Brewster, now Sir David; and it was partly to his studies while preparing an article on 'Christianity' for that work, and partly to the solemnising effects of a severe illness which, during the winter of 1809–10 brought him to the very brink of the grave, that he attributed the great moral and spiritual change of his life. Then, for the first time, as he thought, he saw Christianity in its true light; and then for the first time also were his views of the duties of the clerical office, as he thought, sufficiently deepened and enlarged. Externally the change exhibited itself in this, that whereas hitherto he had belonged to the 'Moderate' party in the Scotch Church then in the majority, he now ranked with the 'Evangelical' party, which formed but a minority. But the fruits of the change were more immediately visible in his own altered manner of performing his clerical duties. Not giving up his studies in natural science and in political economy, but carrying them on with the same zeal as before; contributing also to the 'Christian Instructor,' the 'Eclectic Review,' and other periodicals—it was now observed that in all that Mr. Chalmers did the influence of a deep sense of religion, and a conviction of the paramount claims of Christian faith on the thoughts of man, were discernible. Always eloquent in the pulpit, his eloquence now burst forth in strains of such passion and fervour as had never been heard from him before; and from far and near people went to hear the wonderful minister of Kilmany. Bible and missionary societies, for which he had formerly cared but little, now occupied much of his attention; and, instead of confining his ministerial studies to his weekly sermons from the pulpit, he began a regular organisation of his parish with a view to make himself familiar with the interests of every individual in it, and to provide for all its spiritual as well as intellectual and economic wants. In the midst of these new occupations, which he prosecuted with his constitutional enthusiasm, he married, in 1812, Miss Grace Pratt, the daughter of a retired captain in the army. In 1813 his article on 'Christianity' appeared in the 'Edinburgh Encyclopædia;' and in the same year it was published, with additions, in a separate volume as a treatise on 'The Evidences of Christianity.' The following two years were spent in assiduous parochial work, in theological studies, and in the composition of occasional works on various topics, including one on the reconciliation of scripture and geology.

The name of Mr. Chalmers was pretty well known over the south of Scotland as that of a man of powerful mind and extraordinary eloquence when, in 1815, or in the thirty-sixth year of his age, he was called from his quiet country parish to assume the pastoral care of Tron parish in the city of Glasgow. He remained in Glasgow in all eight years. In 1816 the degree of D.D. was conferred on him by the University of Glasgow. From 1815 to 1819 he was minister of Tron parish. From 1819 to 1823 he was minister of the newly-constituted parish of St. John's. These eight years were the period of his highest celebrity as a pulpit-orator. In this capacity, all Glasgow, and soon all Scotland rang with his fame. One of the most enthusiastic descriptions in Mr. Lockhart's account of Scottish celebrities at that time, published under the title of 'Peter's Letters to his Kinsfolk,' is that given of Chalmers in his Glasgow pulpit. A picture so elaborate and glowing from such a pen of a man whose professed position was simply that of a Presbyterian clergyman of a Glasgow parish, proves that already he was no longer thought of only in that capacity, but as a man of truly great genius. "I know not what it is," said Jeffrey, in 1816, "but there is something altogether remarkable about that man. It reminds me more of what one reads of as the effect of the eloquence of Demosthenes than anything I ever heard." The same impression was afterwards produced on men of all kinds in England, as well as in Scotland—on Hazlitt, Canning, Wilberforce, Hall, and Foster. Part of the secret was that Chalmers was not one of those orators whose power evanesces in the moment of their actual utterance, but a man of massive, large, and substantial thought, whose every speech was the enunciation and illustration of some principle or generalisation, and whose language was full of extraordinary felicities, memorable turns of phrase, and gleams of poetic conception. Perhaps the first exhibition of his oratory in which this union in him of high intellectual attainments and general literary genius with the specific qualities of the orator, was conspicuously brought out, was on the occasion of the delivery, in 1816, of a series of week-day lectures on Astronomy in its connection with Religion. The excitement caused by these 'Astronomical Discourses' was unprecedented; and their popularity, when published in the same year, rivalled that of the contemporary 'Waverley Novels.' But his regular pulpit sermons were no less extraordinary as displays of mental and oratorical power; and on his occasional visits to Edinburgh, London, and other places, his fame as an orator preceded him, and drew crowds to hear him. At Edinburgh his oratory was exhibited not only in the pulpit, but also in debate in the General Assembly, or annual ecclesiastical parliament of Scotland. Here as a leader of the 'Evangelical' party, then gradually attaining numbers and influence, he took a polemical part in some of the Scotch ecclesiastical questions of the time, and always with the effect of a man at once great in wisdom and resistless in speech. His speeches, like his sermons, were generally read; and very rarely indeed did he speak extempore. With all his extraordinary popularity as an orator, however, no man better appreciated than he did the exact value of such popularity—"a popularity," which, in his own characteristic language, "rifles home of its sweets, and by elevating a man above his fellows, places him in a region of desolation, where he stands a conspicuous mark for the shafts of malice, envy, and detraction; a popularity which, with its head among storms, and its feet on the treacherous quicksands, has nothing to lull the agonies of its tottering existence but the hosannahs of a drivelling generation." Far more important in his own eyes than these pulpit services which brought him such hosannahs, were his practical schemes for showing the social efficacy of Christianity. It was Dr. Chalmers's fixed and lifelong belief that in religion alone was there a full remedy for the evils of society, and that all schemes of social amelioration would be futile which did not aim at working Christianity through the hearts of the people down into their habits and households. Subordinate to this belief was his attachment to the parochial system of social organisation—that system which divides a community into small manageable masses, marked out by local boundaries, and each having a sufficient ecclesiastical and educational apparatus within itself. Disliking with his whole heart the English Poor-Law system, he was of opinion that, if the parochial system were properly worked, pauperism could be provided for without a poor-law at all, by the judicious direction, under clerical and lay superintendence, of private benevolence. In order practically to illustrate these views, he undertook a vast experiment, first with Tron parish, and then with that of St. John's. The population of this latter parish (in which Edward Irving was for some time Dr. Chalmers's assistant) was upwards of 10,000, including perhaps the poorest part of the operative population in Glasgow; but such was his zeal, such his practical sagacity, and such his power of influencing persons fit to be his agents, that in a short time the parish was organised both for economical and educational purposes in a manner unknown before, schools being set up in every part of it, and the poorest lanes visited periodically each by its own special teacher and inspector. The results of his experiment, with his speculations in connection with it, were published by him (1819-1823) in a series of quarterly tracts, on the 'Christian and Civic Economy of Large Towns;' which, with two volumes of 'Sermons,' published respectively in 1818 and 1820, two articles on 'Pauperism' contributed to the 'Edinburgh Review' in 1817, and a sermon in the same year on the death of the Princess Charlotte, formed along with the 'Astronomical Discourses' already mentioned, his chief literary exertions during his residence in Glasgow.

In the midst of the bustle and fatigue of his life in Glasgow, increased ten-fold by the hospitality which his celebrity obliged him to exercise, Dr. Chalmers had never ceased to sigh for the academic quiet of a professor's chair in one of the Scottish universities; and in January 1823, much to the surprise of the public, he resigned his charge, and accepted the chair of Moral Philosophy then vacant in his native University of St. Andrews. The new post was one of much less emolument, and of far less publicity than that which he had resigned; but even had his tastes not disposed him to accept it, he had paramount reasons in the state of his health, which was giving way under the wear and excitement of city-life. Forty-three years old when he accepted the chair, he retained it till his forty-ninth year, or from 1823 to 1828. The winters of these five years were spent by him in the preparation and delivery of his class-lectures, and in the genial society of many of his old friends; but he carried with him to St. Andrews those notions and schemes of Christian philanthropy which he had matured in Glasgow, and the little Fifeshire town felt during these five years the vivifying influence of his spirit and enthusiasm. Occasionally he preached in

St. Andrews and in the neighbourhood round; annually in May he visited Edinburgh to take part in the business of the General Assembly, where his eloquence as before was felt as a conquering force on the 'Evangelical' side in all the great ecclesiastical controversies of the time; and excursions in Scotland and Ireland, and journeys as far as London, varied his summer. It was proposed at one time to elect him to the Moral Philosophy chair in the newly-established University of London; but this proposal, which might have altered the whole tenor of his future career, was not carried out. The literary results of his five years' sojourn at St. Andrews were courses of 'Lectures on Moral Philosophy,' and on 'Political Economy,' prepared for his class and reserved for publication; a third volume of his 'Christian and Civic Economy of Large Towns,' published in 1826; and a treatise on 'Ecclesiastical and Literary Endowments,' published in 1827.

Dr. Chalmers's next appointment was to the chair of Divinity in the University of Edinburgh. The duties of this office he assumed in 1828, and he discharged them during fifteen years—*i. e.* from 1828 to 1843, or from his forty-ninth to his sixty-third year. His activity during these fifteen extraordinary years of his life (not taking account of his occasional sermons) was made up of three distinct kinds of work—his duties as theological professor; his continued exercises in literature, speculation, and schemes of Christian philanthropy; and his controversial energy in connection with the serious ecclesiastical struggle which during that time convulsed Scotland. 1. *His Labours as Theological Professor.*—In this important capacity, which involved the theological instruction and training of between one and two hundred young men annually for the Scottish Church, Dr. Chalmers exerted a vast influence, less as a man learned in theological lore, than as a man of noble purpose and burning enthusiasm, with whom no young man could come in contact without love and veneration, and who was in the habit not only of communicating massive thoughts of his own on almost all subjects, but also of stirring up thought in others. His class-room was truly a centre of life and intellectual influence; and those who went forth from it carried with them perforce much of his spirit and many of his views. 2. *His independent labours in literature, speculation, and Christian philanthropy.* Of these it is impossible to take full account; suffice it to say that in 1831 he published his treatise on 'Political Economy,' and in 1833 his Bridgewater treatise 'On the Adaptation of External Nature to the Moral and Intellectual Constitution of Man;' that in 1838 he delivered in London, and afterwards published, a series of 'Lectures in Defence of Church Establishments;' that in the following year he made a tour through Scotland to advocate the cause of church extension; that in 1841 he published a volume on 'The Sufficiency of the Parochial System without a Poor-Rate for the right Management of the Poor;' that during the same period he delivered, during the summer vacations various lectures to popular audiences on topics of natural science; and that he gave much of his time to the superintending of an attempt to carry out his notions of proper parochial management in one of the poorest districts of Edinburgh. Some of the labours here mentioned received public recognition, in the form of honours conferred upon him. Thus in 1830, he was appointed one of the king's chaplains for Scotland; in 1834 he was elected a Fellow of the Royal Society of Edinburgh, and a corresponding member of the French Institute; and in 1835 he received the distinction of Doctor of Laws from the University of Oxford. 3. *His connection with the Scotch Church Controversy.*—The 'Evangelical' party with which, since 1810, Dr. Chalmers had been so permanently connected, had gradually increased in the church, so as at last to attain the majority; and in 1832 Dr. Chalmers was elected to the moderatorship, or presidency, of the General Assembly of that year. In 1834 the Assembly, under the auspices of the ruling party, and with his advice and sanction, passed the famous 'Veto Act,' the design of which was to modify the action of the system of patronage of livings in the Church of Scotland, by enabling the Church Courts to reject any nominee of a patron on the ground of his being displeasing to the majority of the congregation or parishioners over whom he was appointed. Several nominees having in immediately subsequent years been rejected in accordance with this act, appeals were made to the Civil Courts of Scotland and to the House of Lords, and the result was that the Veto Act was declared to be contrary to the law of the land, and that not only were nominees rejected by it pronounced to be entitled to all the emoluments of the livings, but it was pronounced illegal in the church to appoint any other clergymen to the spiritual cure of the parishes in question. Thus arose a controversy which agitated Scotland throughout its whole extent for ten years; and in which the original question of the 'Non-Intrusion' of clergymen upon unwilling congregations was merged in the question of the proper relations between Church and State. Of this controversy Dr. Chalmers was, on one side, the chief champion; and for several years he was incessantly occupied in defending his view of the questions in dispute in speeches and through the press, both against the 'Moderate' party in the church itself, who had from the first opposed the Veto Act, and also against the civil courts and the government. More than once it seemed as if the legislature was on the point of devising some means of healing the breach which had been made, and restoring quiet to Scotland; but at last, these hopes being over, the struggle was ended at the meeting of the General Assembly on the 18th of May 1843, by the so-called 'Disruption'—*i. e.* by the voluntary secession of upwards of 400 clergymen, followed by a large portion of the people of Scotland from the Established Church, and the institution of a new ecclesiastical body called 'The Free Church.' At the head of this secession was Dr. Chalmers, who was nominated moderator of the first General Assembly of the new church.

The last four years of Dr. Chalmers's life were spent by him as Principal and Professor of Divinity in the New College founded by the adherents of the Free Church for the theological education of its ministers (his chair in Edinburgh University having been necessarily vacated by him on his secession from the establishment). During these years, too, he exerted himself prodigiously in arranging the organisation of the new church, and in raising funds for its support; and probably at no period of his life was the statesman-like character of his intellect, his power of dealing with new social emergencies, and of leading men, more conspicuously shown. He had seen the foundations of the new church laid very much to his mind, and was preparing to resign the farther work of completing its organisation into the hands of his many able and younger colleagues, and to devote the rest of his days to his labours as a theological professor, to Christian and philosophical literature in connection more immediately with the 'North British Review,' then started under his superintendence, and to a new experiment of Christian philanthropy which he had begun in one of the most wretched quarters of the old town of Edinburgh, when death removed him. He had just returned from a visit to England in apparently excellent health and spirits, to take part in the proceedings of the General Assembly of the Free Church, when on the morning of the 31st of May, 1847, he was found dead in his bed at his house at Morningside, near Edinburgh. His death was felt throughout Scotland like a national shock; and all ranks and parties joined in doing honour to his memory as one of the greatest men that Scotland had produced. He left a widow who did not survive long, and six daughters, one of them married to the Rev. Dr. Hanna, under whose superintendence a new issue of the collected works of Dr. Chalmers has been put forth in twenty-five volumes, and who has also written his life in four volumes, and edited much of his correspondence.

Dr. Chalmers was a man of powerful frame, not tall, but massively built; his head was very large. It was remarkable in a man so celebrated over Britain as an orator, that he always spoke not only in a broad Scottish, but also in a broad provincial Scottish accent, mispronouncing almost every word. Personally he was a man of most simple, bland, and sociable manners, with a great fund of anecdote and broad humour. His works, notwithstanding the force of intellect that they show (and his speculations in social and political economy, in particular, are valued by many of the best thinkers of the day who have no sympathy with his theological or ecclesiastical opinions), but faintly convey an idea of what the man was while he lived, and of what he still is in the memory and imagination of the Scottish people.

CHAMÆLAUCIACEÆ, Fringe Myrtles, a small natural order of Polypetalous Exogenous Plants. They are characterised by having a 1-celled ovary, ascending ovules, dotted leaves, and the embryo fused into a solid mass. They are small bushes with evergreen leaves, and in external appearance have a close resemblance to heaths. All their parts abound in glandular oily cavities. They are mostly regarded as belonging to *Myrtaceæ*, and there is no doubt of their affinity to that order. Their peculiar aspect, abortive stamens, simple ovary, and pappose calyx sufficiently distinguish them. They have the fragrance of *Myrtaceæ*. Fifteen genera and fifty species are included in this order, all natives of Australia. Their position, according to Lindley, is between *Asteraceæ* and *Combretaceæ*, near to *Myrtaceæ*. (Lindley, *Vegetable Kingdom*.)

CHANCERY, COURT OF. There are now three Vice-Chancellors (5 Vict. c. 5; 15 Vict. c. 4), before whom and the Master of the Rolls all suits in this Court are originally heard. An appellate tribunal has also been constituted by the stat. 14 & 15 Vict. c. 83, which consists of two Lords Justices; who may either themselves, or conjointly with the Lord Chancellor, exercise all the appellate jurisdiction of the Chancellor, the Chancellor still constituting in himself a Court of appeal. The Masters in Chancery, with whom the whole delay which has always been the standing reproach of this Court was thought to rest, have been abolished, their functions being now performed by the Master of the Rolls and Vice-Chancellors, assisted by their chief clerks, in their own chambers (15 & 16 Vict. c. 80). The procedure of this court generally and its jurisdiction in many respects have been subjected to great changes of late years, as to which see Equity, Bankruptcy, Uses, Trusts, Charities, Lunacy, Joint-Stock Companies, all in *S.* 2.

CHAODINEÆ, Chaotic Plants, a family invented by Bory, for the purpose of placing a number of the lower forms of plants or organic beings of uncertain character, which could not be placed amongst other well-defined groups of *Cryptogamia*. To this family were at one time assigned forms of *Diatomaceæ*, *Desmideæ*, *Nostoc*, and others.

CHAR, or **CHARR,** one of the British species of the genus *Salmo*, of the Salmon Tribe (*Salmo salvelinus*).

CHARD. [Somersetshire.]

CHARITIES. [Uses, *S.* 2; Trusts, *S.* 2.] By the Charitable Trusts Act 1853, a body of commissioners has been created for England and Wales, with power to inquire into all charities, their nature, objects, and administrations, and the condition of the property belonging to them; to require the production of accounts and documents from the Trustees of Charities, and to cause inspectors to visit and report on their management. No proceeding with reference to any charity can be taken by any relative, without the sanction of this board, which is called 'The Charity Commissioners for England and Wales.' The Attorney-General alone may proceed by ex officio information. The board may direct in what court proceedings for the administration of any charity are to be taken; but where the income is under 30*l.*, the County Court of the district, or the Court of Bankruptcy of the district in which the charity is situated has jurisdiction. In other cases the Court of Chancery must be resorted to. The statute does not extend to Scotland or Ireland, to the Universities, or the City of London. A report of the proceedings of the Board must be annually laid before Parliament.

CHASSÉ, DAVID HENRY, BARON, the resolute defender of Antwerp, was born at Thiel, in Gueldre, March 18, 1765. In 1775, he entered the Dutch army as a cadet, but he left that service after the revolution in Holland in 1787, and attached himself to the French army, in which he continued for many years. He became a lieutenant-colonel in 1793. In the fierce war with Prussia in 1806, he greatly distinguished himself under the Dutch general Dumorceau, and was made general of brigade. He afterwards took part in the Peninsular War, and displayed so much intrepidity that the soldiers nicknamed him 'General Bayonet,' from his constant use of that weapon. In 1811 Napoleon created him a baron of the empire. He was frequently wounded, and during the campaigns of 1813 and 1814 he had several horses killed under him. He fought likewise at Waterloo. Soon after the peace he was made governor of Antwerp, and his admirable defence of the citadel in 1832, with a garrison of 6,000 troops, against an army of 75,000 French soldiers commanded by Marshal Gérard, attracted general attention throughout Europe, and made the brave old soldier very popular. He died on the 2nd of May 1849. (*Biogr. des Contemporaines*; Campo, *Life of Chassé*.)

CHATEAUBRIAND, FRANÇOIS RENÉ, VISCOUNT DE, the most celebrated French writer of the Napoleon era, was born at St. Malo on September 4th, 1768, being the youngest of ten children. He was at first intended for the church, but after a careful education for that calling, he entered the army as sub-lieutenant in 1786. After various adventures he appears to have visited Paris shortly before the Revolution, and to have witnessed the capture of the Bastile in 1789. His erratic disposition took him to America in 1791, to look for the North-West Passage. He spent several months in the States, had an interview with Washington, visited the falls of Niagara, and roamed through those virgin forests and wild scenes of primitive life which he has described so vividly in 'Réné' and 'Atala.'

On his return home he joined the army of Condé for a short time in 1792, and the next year he began a life of great misery as an emigrant in London, amidst a group of exiled nobles, equally wretched. The picture of his sufferings and privations at this time, as he relates them in his 'Memoirs,' is almost incredible. Nevertheless he continued in England nearly eight years, maintaining himself by translating for the booksellers, and giving lessons in French and Latin. In 1797 he published in London his 'Essay on Revolutions,' a work full of scepticism: but the death of his mother in 1798 gave a new turn to his thoughts, and restored his faith.

In the spring of 1800 he went to Paris, and his excellent friend, M. Fontanes, whose influence was already strong, had been appointed one of the editors of the 'Mercure,' in the columns of which 'Atala' appeared for the first time. This romance was followed by the 'Génie du Christianisme' in 1802, which made a deep impression on the public mind. The First Consul was so pleased with this work that he took the author into favour, and strove to bend him to his service by two successive employments. Unfortunately the execution of the Duke d'Enghien, on the 21st of March 1804, furnished the inflexible Breton with too just an excuse, and he resigned his appointment the same day. Fontanes, Madame Bacciochi, and even Josephine herself, could scarcely prevent the consequences of this rash act from falling upon the Viscount.

The reign of Napoleon, which lasted ten years (1804-14) was not favourable to literature, and during this period Chateaubriand produced nothing of note, save the 'Martyres' in 1807, and the 'Itinéraire à Jerusalem' in 1811: the latter was the account of his own visit to the Holy Land in the autumn of 1806. The fall of the empire in 1814 released his pen, and he produced his famous pamphlet, 'De Bonaparte et des Bourbons,' the influence of which in disposing the public mind to welcome the returned family was so powerful, that "it was equal," said Louis XVIII., "to an army of 100,000 men." The Viscount was now received with great favour at the Tuileries, but he refused office as a colleague with Fouché; and other circumstances delayed his entrance into public life until 1822, when he was sent as ambassador to the British court, and most honourably greeted by all classes of people. The next year he was appointed Minister of Foreign Affairs, which office he held during the war in Spain conducted by the Duke of Angoulême. In 1824 the minister Villèle dismissed him rather abruptly. Then, and for the next three years, Chateaubriand led the opposition against the government with merciless rancour both in pamphlets and newspapers, never desisting till it crumbled beneath his blows. In 1828 M. de Martignac gave him the embassy to Rome; but no sooner had the Polignac ministry been formed (August 8) than he resigned.

In 1830, after the fall of the monarchy, which he had assisted to destroy, this inexplicable man, whom the people claimed as their leader, and followed with acclamations, deliberately resigned his titles, his offices, his very means of subsistence, to rally to that cause which had no other supporter. A singular change came over his spirit; he sank into despondency, and a gloom, which deepened every year, almost extinguished his noble mind. This *ennui* was so contagious that his most faithful friends shrank from it. This sad state of mind is very visible in the last of his works, which appeared about the time of his death—'Les Mémoires d'Outre Tombe'—the reading of which is most painful. He died July 4, 1848. His character has been well summed up by a recent French writer:—"It was almost invariably the fate of M. de Chateaubriand to lead a party whose ruling principle was not his; so that at the very time he was crushing his adversaries, he had no influence over his friends."

(*Mémoires d'Outre Tombe; Biographie Universelle; Dict. de la Conversation.*)

CHATHAM. [Canada, *S.* 2.]

CHEMISTRY. Although the original articles on Chemistry in the 'Penny Cyclopædia' were written up to the time they were produced, the progress of this science was so rapid that a large addition was made to them in the first supplementary volume in that work, under the head of Chemistry. In this second supplement an addition of the like kind was found necessary, and the same plan has been pursued of adding the additional matter in an alphabetical form.

In the original articles in the 'Penny Cyclopædia' it was not thought necessary to represent the various compounds by means of symbols. The study of the science is however so much facilitated by the use of symbols, and the progress of organic chemistry so comparatively unintelligible without them, that we here subjoin a list of symbols most commonly used by the chemists of this country and the continent. To each of the symbols there is also added the equivalent or atomic number, an explanation of which will be found in the 'Penny Cyclopædia' article Atomic Theory.

Name of Element.	Symbol.	Equivalent.
Aluminum	Al.	13·69
Antimony, or Stibium	Sb.	129·03
Arsenic	As.	75·00
Barium	Ba.	68·64
Bismuth	Bi.	70·95
Boron	B.	10·90
Bromine	Br.	78·26
Cadmium	Cd.	55·74
Calcium	Ca.	20·00
Carbon	C.	6·00
Cerium	Ce.	46·00
Chlorine	Cl.	35·50
Chromium	Cr.	28·15
Cobalt	Co.	29·52
Copper	Cu.	31·66
Didymium	D.	—·—
Fluorine	F.	18·70
Glucinum	Gl.	26·50
Gold (Aurum)	Au.	98·33
Hydrogen	H.	1·00
Ilmenium	Il.	—·—
Iodine	I.	126·36
Iridium	Ir.	98·68
Iron (Ferrum)	Fe.	28·00
Lanthanum	La.	48·00
Lead (Plumbum)	Pb.	103·56
Magnesium	Mg.	12·67
Lithium	Li.	6·43
Manganese	Mn.	27·67
Mercury (Hydrargyrum)	Hg.	100·70
Molybdenum	Mo.	47·88
Nickel	Ni.	29·57
Niobium	—	—·—
Nitrogen, or Azote	N. or Az.	14·00
Osmium	Os.	99·56
Oxygen	O.	8·00
Palladium	Pd.	53·27
Pelopium	Pe.	—·—
Phosphorus	Ph.	32·02
Platinum	Pt.	98·68
Potassium (Kalium)	K.	39·00
Rhodium	R.	52·11
Ruthenium	Ru.	52·11
Selenium	Se.	39·57
Silicon	Si.	21·35
Silver (Argentum)	Ag.	108·00
Sodium (Natrium)	Na.	22·97
Strontium	Sr.	43·84
Sulphur	S.	16·00
Tantalum, or Columbium	Ta.	92·30
Tellurium	Te.	66·14
Terbium	Tb.	—·—
Thorium	Th.	59·59
Tin (Stannum)	Sn.	58·82
Titanium	Ti.	24·29
Tungsten, or Wolfram	W.	94·64
Uranium	U.	60·00
Vanadium	V.	68·55
Yttrium	Y.	32·20
Zinc	Zn.	32·52
Zirconium	Zr.	33·62

In the following articles the number of atoms of each element in a compound body is added. In order to ascertain the relative weight of any element in a compound, the number of atoms of each must be multiplied by its equivalent weight, and thus the quantity of each element in a given weight of a compound may be ascertained. Most of the references refer to other names, given in the present article; where they refer to previous articles in the Penny Cyclopædia, P. C. is added.

Absinthine, is an active or bitter principle found in *Artemisia Absinthium*. It belongs to the class of non-azotised vegetable secretions. It is neutral in its relations to acids and forms a semicrystalline mass which is insoluble in alcohol. It is intensely bitter to the taste. The same principle is also probably present in the other species of *Artemisia*, which have to a certain extent the bitter taste of *A. Absinthium*.

Acetonitryle, $C^4 H^3 N$, is one of the compounds obtained from methyle. It is procured by distilling the double sulphate of potash and methyle with cyanide or ferrocyanide of potassium. It is a colourless volatile liquid, has a slightly alliaceous odour, and is somewhat stupifying in its effects. It is very combustible, and when heated with potash it yields ammonia and acetate of potash. Its elements may also be arranged in the form of a cyanide of methyle $C^2 H^3 + C^2 N$, and this compound is usually placed by chemists in the series of methyle compounds. [Chemistry, P. C., *S.* 1.]

Acetyle, $C^4 H^3$. The first effect of the oxidation of ether or alcohol is to produce a compound radical which is acetyle. It is however unknown in a separate form, but is easily obtained in the form of a hydrated protoxide which is called Aldehyde, $C^4 H^3 O + H O$ (Chemistry, P. C., *S.* 1.), or in the form of the hydrated peroxide, which is acetic acid $C^4 H^3 O^3 + H O$. [Acetic Acid, P. C.]

Hyduret of Acetyle. Acetyle may be regarded as the base of other compounds than those of aldehyde and acetic acid; thus olefiant gas or ethylene, $C^4 H^4$, may be expressed as $C^4 H^3 + H$, or a hyduret of acetyle. [Hydrogen, P. C.]

Oxychloride of Acetyle. When ether and dry chlorine are acted on by the sun's rays several compounds are formed, and amongst others this substance. Its composition is $C^4 H^3 + O + Cl^2$. It has in fact the same composition as acetic acid, but two equivalents of the oxygen of that compound are supplanted by two of chlorine.

Perchloride of Acetyle,, $C^4 H^3 + Cl^3$. This compound is also formed by the action of chlorine on ether, and has the same composition as acetic acid, the whole of the oxygen being supplanted by chlorine.

Acids, Organic. The acids met with amongst organised bodies differ in their elementary constitution from the inorganic acids, but are generally formed on the same plan. They are mostly composed of the three elements, Carbon, Hydrogen, and Oxygen, to which Nitrogen is not unfrequently added. The proportions in which these elements unite render the atomic numbers of the organic acids much higher than those of the inorganic acids, in which the distinguishing element, as in the case of Sulphuric Acid and Nitric Acid, unite in but one single proportion with several proportions of oxygen. The organic acids are easily decomposed by heat, whilst the inorganic acids resist this agency much more. Thus, oxalic acid and citric acid are easily decomposed by heat, but sulphuric and nitric acids resist its action.

There are two theories of the nature of organic acids, by which they are made to harmonise with the constitution of inorganic acids. In the first place, like sulphuric and nitric acids, they are regarded as oxygen acids. In this case, a compound radical is assumed which combines with the oxygen, and forms the acid which, to constitute the ordinary liquid acid, must unite with water. Thus, to take sulphuric acid. One part of sulphur combines with three of oxygen to form the dry acid, which must unite with water to form the liquid acid. Thus $S O^3 + H O$ represents the common hydrated sulphuric acid, or oil of vitriol. We may take acetic acid as an example of the organic acid. The compound radical which represents the sulphur of the sulphuric acid is acetyle ($C^4 H^3$). This combines with three parts of oxygen and forms the dry acetic acid. But in order to have the liquid acid there must be an equivalent of water. The two may be thus compared:—

Sulphuric acid, $S O^3 + H O$.
Acetic acid $(C^4 H^3) O^3 + H O$.

This analogy between the organic and inorganic acids may be pursued very consistently through the whole series. There are, however, many cases in which this theory cannot be proved to be true, in which, in fact, the water cannot be withdrawn and replaced with the facility which the above theory requires.

This has led to a second theory, which is becoming more generally adopted at the present day. It applies equally, however, to the inorganic as to the organic acids. It is very obvious that the compound SO^3+HO may be arranged as $SO^4 + H$, and that such a change may be effected in the expression of any of the acids. In this view of the composition of the acids, the hydrogen, not the water, is the removeable element; and it would appear from experimental researches, more especially on the organic acids, that such a theory is more compatible with the real condition of the acids than the first. This constitution is as easily applied to the organic acids as the other. Thus, instead of the above formulary, we have the following:—

Sulphuric acid, $SO^4 + H$.
Acetic acid $(C^4 H^3) O^4+H$.

It has been objected to this theory that it assumes the existence of compound radicals which have not been demonstrated to exist, but many which were formerly only hypothetical have now been separated, and no argument against the theory can be successfully urged on this ground.

The advantage of this theory is, that the formation of salts is easily explained, on the supposition that the metal replaces the hydrogen of the acid. Thus, in the first system, sulphate of soda was formulated as SO^3+NaO, and no account was taken of the water lost by the sulphuric acid. But under the new theory the oxygen of the metal needs not to be taken into the account, as it already exists with the sulphuric acid, and the change from sulphuric acid to sulphate of soda is seen as follows:—

Sulphuric acid, $SO^4 + H$.
Sulphate of soda, $SO^4 + Na$.

The sodium simply takes the place of the hydrogen.

In the constitution of the polybasic acids this theory is more strongly confirmed. Thus phosphoric acid was supposed to assume three forms, according as it united with one, two, or three atoms of water, and these were called monohydrated, bihydrated, and terhydrated acids. But Professor Graham showed that it would be better to regard these acids as combined with one, two, and three atoms of hydrogen, and proved that the phosphoric acid in its three forms united with metals by their taking the place of the hydrogen of the acid.

That the old formulæ for the organic acids may be easily reduced to the new is seen in the following examples:—

	OLD.	NEW.
Tartaric acid . .	$C^8 H^4 O^{10}+2HO$	$C^8 H^4 O^{12}+H^2$
Malic acid . . .	$C^8 H^4 O^8 +2HO$	$C^8 H^4 O^{10}+H^2$
Citric acid. . .	$C^{12} H^5 O^{11}+3HO$	$C^{12} H^5 O^{14}+H^3$
Meconic acid. . .	$C^{14} H O^{11}+3HO$	$C^{14} H O^{14}+H^3$
Saccharic acid . .	$C^{12} H^5 O^{11}+5HO$	$C^{12} H^5 O^{16}+H^5$

In such acids there is always some hydrogen in the radical, of which it is a constituent, and some combined with the radical, which may be replaced by the metals. Amongst the organic acids, there are some facts which seem to show that this replaceable hydrogen exists. "Thus, meconic acid, which is tribasic, forms like tribasic phosphoric acid three series of salts, in which one, two, or three equivalents of the hydrogen are replaced by the metal. But while the meconic acid, as well as the tribasic phosphoric acid, readily forms with oxide of the silver, the salt in which all the hydrogen is replaced by silver; it cannot form, or forms with difficulty, a similar salt with potash, with which it forms very easily salts with one and two equivalents of metal, and two or one equivalents of hydrogen." (Gregory). This fact is difficult to be accounted for on the old theory, whilst it meets with an easy solution on the new. The oxide of silver easily parts with its oxygen, and there is no difficulty with it in substituting three atoms of silver for three atoms of hydrogen, but the potash does not part with its oxygen easily, and therefore will not form the compound with three equivalents of potassium.

Acroleine, $C^6 H^4 O^2$. A substance obtained by Redtenbacher by the distillation of glycerine with phosphoric acid. The operation must be carried on in vessels charged with carbonic acid gas, as acroleine is so rapidly oxidised in atmospheric air, that it cannot be obtained where it is present. It is a very pungent and suffocating substance, attacking the eyes and nose of the operator if care is not taken. It is composed of carbon, hydrogen, and oxygen, and may be regarded as the hydrated oxide of a radical called *acryle*. This substance resembles acetyle, and represents in acroleine the position of acetyle in aldehyde. Thus, $C^6 H^3 O+HO$ is the atomic constitution of acroleine. But this substance becomes oxidised in the atmosphere, and is then converted into *acrylic acid*, $(C^6 H^3) O^3 + HO$, a substance perfectly analogous to acetic acid. Acroleine is often formed as the result of the distillation of oils and fats. Thus, castor oil yields acroleine, and some other peculiar products on distillation. Glycerine may in fact be regarded as an hydrated oxide of acryle with three additional equivalents of water, as follows:—

Glycerine, $C^6 H^7 O^5$.
Hydrated oxide of acryle, $C^6 H^3 O+4HO$.

Acryle. [Acroleine.]

Acrylic Acid. [Acroleine.]

Adipic Acid, $C^6 H^4 O^3 HO$. When oleic acid is acted on by nitric acid, several new acids are formed, and amongst them adipic acid. It occurs in round radiated masses, fusible and volatile.

Alanine, $C^6 N H^7 O^4$. When aldehyd-ammonia [Chemistry—Aldehyde, *S.* 1,] is acted on by hydrocyanic acid, and an excess of hydrochloric acid, a crystalline body, soluble in water, is formed, to which Strecker has given the name alanine. It is homologous with *glycocoll* and *leucine*, and isomeric with *lactamide*, *urethane* and *sarcosine*. When acted on by hyponitrous acid, it is converted into lactic acid, as follows:—

$$\underbrace{C^6 N H^7 O^4}_{\text{alanine.}} + NO^3 = HO + N^2 + \underbrace{C^6 H^6 O^6}_{\text{lactic acid.}}.$$

Nitrogen is given off during the decomposition.

Aldehyd-ammonia. [Aldehyde, *S.* 1.]

Allantoine. [Allotoin—Chemistry, *S.* 1.]

Alituric Acid, $C^6 N^2 H^3 O^4$. This acid was discovered by Schlieper, and is formed by the action of boiling hydrochloric acid on alloxantine. It is soluble in 15 to 20 parts of hot water, and on cooling it is deposited as a crystalline powder. When heated with potash it gives out ammonia.

Allophanic Acid, $C^4 N^2 H^3 O^5 + HO$. This acid is unknown in the hydrated or separate state. It forms crystallisable salts with baryta, potash, and soda. It is produced by the action of hydrated cyanic acid on alcohol. The water of the alcohol unites with the cyanic acid and forms the new compound which unites with the oxide of ethyle and forms an allophanate of the oxide of ethyle.

$$\text{Thus, } 2\,(\underbrace{C^2 NO + HO}_{\text{cyanic acid.}}) + \underbrace{C^4 H^5 O + HO}_{\text{alcohol.}}$$

$$= \underbrace{C^4 H^5 O}_{\text{oxide of ethyle.}} + \underbrace{C^4 N^2 H^3 O^5}_{\text{allophanic acid.}}.$$

Allyle, $C^6 H^5$, a compound radical, regarded as the base of oil of mustard. This oil is composed of carbon, hydrogen, nitrogen, and sulphur, which may be arranged as follows, $C^6 H^5 + C^2 N S^2$. The last part of this compound is sulphocyanogen, so that oil of mustard is a sulphocyanide of allyle. Oil of garlic (*Allium sativum*) has been demonstrated by Wertheim to be a sulphuret of allyle, $C^6 H^5 + S$. The oil of assafœtida is composed apparently of several oils, and Dr. Douglas Maclagan has pointed out that one of these is sulphuret of allyle. Wertheim has shown that allyle is capable of entering into numerous combinations, in the form of the sulphuret, forming double salts with the sulphurets of palladium, platinum, silver, and other salts.

Althionic Acid is produced when oil of vitriol in great excess is heated with alcohol. It has the same composition as sulpho-vinic acid, but its compounds differ in crystalline form. It is highly probable that the althionates are compounds of the sulphovinates and isethionates.

Aluminium, the metallic base of the earth Alumina, which is composed of oxygen and the metal aluminium. Its equivalent or atomic weight is 13·7, and its specific gravity 2·6. The metal is procured by decomposing the chloride of aluminium by means of potassium or sodium. The theory of the decomposition is that the chlorine unites with the potassium or sodium, and leaves the aluminium free. The metal is procured by washing away the chloride. Till very recently aluminium, although well known, had been procured only in very small quantities, and was regarded rather as a chemical curiosity than a substance of any value. It differed however from the other earthy and alkaline metals by its not being readily acted on by the oxygen of the atmosphere or water. In 1856, however, it was announced that M. St. Clair Deville, chemist to the Emperor of the French, had succeeded in obtaining this metal in very considerable quantities, and so readily as to lead to the supposition that it might be employed in the arts. The method employed by M. Deville is precisely the same as that pursued by earlier experimenters. This metal, on account of its lightness, and not being acted on by oxygen, would undoubtedly be valuable for a great variety of purposes, provided it could be obtained at a low price. Its cost however has been very considerable on account of the price of the metals by which it is obtained. Sodium is preferred by M. Deville in preference to potassium, but this metal has first to be obtained by costly processes. These last have been greatly diminished, so that sodium has been recently sold for 10*s.* a pound. This still renders the price of aluminium a barrier to the general use of that metal. Nevertheless it has been extensively manufactured in Paris into spoons, tea-pots, coffee-pots, and other articles of use. In order to obtain aluminium, the chloride is introduced into iron tubes and heated with the sodium.

The chloride of aluminium, from which the metal is prepared, is not a natural compound, but has to be made from the earth alumina. It is prepared by mixing this earth, freshly precipitated with some form of carbon or carbonaceous substance, as charcoal, sugar, tar, &c., and the whole is made into a paste with oil. This is then dried and calcined in a crucible, and placed in a tube and exposed to the action of dried chlorine gas, when the chloride of aluminium is sublimed and collected by condensation. It has a straw colour, is solid and crystalline at ordinary temperatures, and combines readily with water, from which it is not separated by any means.

Amaphenase, another name for *Aniline.* [Aniline.]

Amarine, $C^{42} H^{18} N^{2}$, is one of the bases obtained from oil of bitter almonds. It is formed from hydrobenzamide ($C^{42} H^{18} N^{2}$), with which it is isomeric, by boiling the latter with potash. Amarine forms fine white needles; it is insoluble in water, but soluble in hot alcohol. It has the properties of a powerful organic base.

Amarythrine, $C^{34} H^{24} O^{20}$, is one of the products found in the colouring matter of lichens.

Amasatine, $C^{16} H^{5} N$, one of the numerous bodies formed by the decomposition of indigo.

Ambreine is a fat, analogous to cholesterine, found in ambergris. When treated with nitric acid it yields *ambreic acid.*

Amyle, $C^{10} H^{11}$. A compound radical, discovered by Frankland. It is procured by the action of zinc on iodide of amyle. It is an oily liquid, boiling at a temperature of 311° Fahr., and is homologous with methyle, ethyle, &c. It combines with oxygen and the other compound radicals, and forms a series of highly interesting compounds resembling those of ethyle and methyle.

Oxide of Amyle = Amylic Ether, $C^{10} H^{11} O$, is obtained from the chloride of amyle by acting on it with an alcoholic solution of potash. It boils at a temperature of 233° Fahr. This oxide is, like those of ethyle and methyle, capable of combining with almost all acids, and acting as a metallic base.

Hydrated Oxide of Amyle = Amylic Alcohol = Fusel Oil, $C^{10} H^{11} O + HO$. This substance is a true alcohol, the representative of the hydrated oxide of ethyle or common alcohol ($C^{4} H^{5} O + HO$). It is formed along with common alcohol during the fermentation of potato starch, and the starch of common grains. The process of its formation under these circumstances is not well understood, although it undoubtedly depends on the peculiar condition of the sugar during fermentation. It is on account of its being obtained from the decomposition of starch (*Amylum*) that it has obtained its name. This fermentation in which it is produced is called the amylic. It is the occurrence of this fermentation in grain used for obtaining distilled spirits that gives them a part of their noxious qualities, and it is the object of the distiller to prevent the development of fusel oil. It is a colourless somewhat oily liquid, almost insoluble in water, and boiling at a temperature of 270°. It has a powerful odour, which is very unpleasant, and produces when inhaled a sense of suffocation. Its taste is nauseous, acid, and unpleasant. When heated in contact with potash hydrogen is given off, and valeric acid is formed, which unites with the potash. When heated with dry phosphoric acid it yields the carbo-hydrogen $C^{10} H^{10}$, which is isomeric with olefiant gas, and which is known by the name of *Amylene* or *Valerene*. This substance has lately obtained some repute, as it has been administered in common with chloroform and ether as an anæsthetic (Anæsthetics—Materia Medica, *S.* 2). The compounds of the oxide of amyle are very similar to those of the oxide of ethyle, but of course are not so volatile. These other compounds of amyle are very numerous, but as their composition is easily understood by their formulæ, we need not describe them more particularly :—

Sulphanylic acid	$C^{10} H^{11} O + S O^{3}$.
Carbamate of oxide of amyle	$C^{12} N H^{13} O^{4}$.
Amylamine	$C^{10} H^{13} N$.
Amylo-urea	$C^{12} N H^{14} O^{2}$.
Diamylamine	$C^{20} H^{23} N$.
Triamylamine	$C^{30} H^{33} N$.
Tetramylium	$C^{40} H^{44} N$.
Triethylamylium	$C^{22} H^{26} N$.
Diethylamylamine	$C^{18} H^{21} N$.
Methylodiethylamylium	$C^{20} H^{24} N$.
Methylethylamylamine	$C^{16} H^{19} N$.

Amylamine. [Amyle.]

Amylene. [Amyle.]

Amylo-urea. [Amyle.]

Anchusine, the red colouring matter which gives to *Anchusa tinctoria*, the alkanet, its dyeing properties. It is resinous in its character, and neutral in its properties, and gives out violet vapours when heated.

Anemonine, $C^{5} H^{2} O^{2}$, a volatile crystallisable solid, obtained from various species of *Anemone*. It unites with bases yielding *anemonic acid.*

Angelicine, a non-azotised vegetable substance found in Angelica root (*Angelica Archangelica.*)

Anilic Acid = *Indigotic acid = Nitro-salicylic acid*, $C^{14} H^{4} N O^{9} + H O$. This acid is one of the numerous substances formed by the decomposition of indigo. It is procured by the long continued action of weak nitric acid on that substance. It is also formed in the preparation of Isatine (Chemistry—Isatine, *S.* 1.) It is identical with nitro-salicylic acid, which is formed by the action of nitric acid on salicine. It is a solid, fusible, and volatile substance, forming fine yellowish white prisms, which shrink in drying. It combines with bases forming anilates. The anilate of the oxide of methyle may be obtained by the action of nitric acid on the oil of gaultheria, which is a salicylate of the oxide of methyle.

Aniline = *Kyanole = Crystalline = Amaphenase, Phenylamene, Phenamine, Phenamide, Benzidam.*

Hofmann has recently demonstrated that the base obtained by Unverdorben, under the name of *crystalline*, from the products of the distillation of animal matter or coal tar, is identical with aniline. The same distinguished chemist has added largely to our knowledge of this substance. He has shown that *Isatine*, which is oxidised blue indigo when treated with potash, yields aniline, and that chlorisatine and bromisatine when treated in the same way, yield products of the type of aniline, in which hydrogen is replaced by chlorine, bromine, or both. Aniline assumes a deep violet colour when brought into contact with chloride of lime. It is remarkable for its power of entering into combination with other substances. Hofmann has obtained it from other substances besides isatine. When anthranilic acid is treated with powdered glass, it is resolved into carbonic acid and aniline.

Salicylamide and *Nitrotoluole* both yield this substance when exposed to heat with the bases lime, or baryta. The first yields little, but the last compound is entirely resolved into aniline and carbonic acid. The following is a list of substances which are formed by the simple substitution of other elements for atoms of hydrogen in the aniline base :—

Aniline	$C^{12} H^{7} N$.
Chloraniline	$C^{12} H^{6} Cl N$.
Dichloraniline	$C^{12} H^{5} Cl^{2} N$.
Trichloraniline	$C^{12} H^{4} Cl^{3} N$.
Bromaniline	$C^{12} H^{6} Br N$.
Dibromaniline	$C^{12} H^{5} Br^{2} N$.
Tribromaniline	$C^{12} H^{4} Br^{3} N$.
Chlorodibromaniline	$C^{12} H^{4} Cl Br^{2} N$.
Nitraniline	$C^{12} H^{6} N O^{4} N$.
Nitrodibromaniline	$C^{12} H^{4} Br^{2} N O^{4} N$.

Chemically, these compounds are of the highest interest. In the case of aniline, bromaniline, and chloraniline, chlorine and bromine are substituted for hydrogen, and this was one of the first instances known of the substitution of other elements for hydrogen in a basic compound, although many instances have since occurred. It will also be seen from these compounds that aniline has a close resemblance to ammonia. This is seen also in the fact, that just as ammonia forms the compounds carbamide and oxamide, so aniline will yield under the same circumstances *carbanilide* and *oxanilide.* It also forms acid anilides, as carbanilic acid, analogous to carbamic acid. Hofmann has also made the discovery that just as cyanate of ammonia passes into urea, and the cyanate of methylamine into *methylo-urea*, so cyanate of aniline passes spontaneously into *anilo-urea*. For a full account of the chemistry of this highly interesting compound, the reader should consult the papers of Dr. Hofmann.

Anilocyanic Acid, $C^2 N O C^{12} H^5 O$, a compound of aniline and cyanic acid.

Anilomellone, $C^{18} H^4 N^4$, a compound of aniline and mellone, obtained by the heating of melaniline.

Anisoine, a substance obtained by acting on the oil of anise by strong acids, or the chlorides of tin or antimony. It is analogous to benzoine.

Anisole = *Phenomethole* = *Carbolate of oxide of Methyle*, $C^{14} H^8 O^2$. This is one of the many compounds of the oxide of methyle ($C^2 H^3 O$). It is obtained by heating *anisic acid*, which is itself obtained by oxidising the stearoptene of oil of anise with nitric acid. *Anisyle* is the radical of anisic acid, which is thus composed, $C^{16} H^8 O^6$.

Anisyle. [Anisole.]

Aricine, $C^{20} H^{12} N O^3$? An alkaloid found in a cinchona bark from Arica in Peru. It is similar in its properties to Cinchonine.

Asarone, $C^{20} H^{13} O^3$, is a volatile principle, obtained from the *Asarum Europeum*. It has a remarkable tendency to crystallise in beautifully definite forms. It however readily assumes an amorphous condition, from which it is again easily restored to its crystalline condition. The facility which this circumstance affords for the study of crystallisation in general, has been taken advantage of by Schmidt, who has published a paper on the microscopic appearances of this substance during its crystallising condition in the 'Annalen der Chemie und Pharmacie,' for February, 1845.

Athamantine, $C^{24} H^{15} O^7$, is a crystalline, fatty body, obtained from the root of *Athamanta oreoselinum*. It contains valerianic acid, united to a base called *Oreoselone*. Athamantine combines with hydrochloric acid, and the compound, when boiled, deposits crystals of oreoselone combined with water ($C^{14} H^6 O^4$), a compound that is isomeric with benzoic acid.

Atropine, $C^{34} H^{23} NO^6$. This substance is an alkaloid, and is found in the *Atropa Belladonna*. It crystallises in white silky prisms, which are sparingly soluble in water and ether, but more so in alcohol. It is very bitter, acrid, and poisonous, and, like the extract and juice of the plant, dilates the pupil of the eye when taken or applied to the eye externally. It is fusible and volatile, and forms salts with the acids, which are bitter and poisonous. This alkaloid, like many others, is much the most certain form in which the belladonna can be applied for medical uses.

Azedirine, an alkaloid found in *Melia Azedirachta*. It forms a crystallisable salt with sulphuric acid, and is said to be a powerful febrifuge.

Azobenzoyle, $C^{42} H^{15} N^2$, a compound obtained by Laurent from the oil of bitter almonds. Its base is benzoyle combined with nitrogen.

Azolkic Acid, one of the acids formed by the action of nitric acid on oleic acid.

Balenic Acid, $C^{38} H^{37} O^3 HO$. A fatty acid melting at 164°.

Bassic Acid, $C^{36} H^{35} O^3 HO$. This acid combines like the other fatty acids with oxide of glyceryle, or lipyle, and in this state is present in the butter of *Bassia latifolia*, one of the butter trees of Africa, and in the fat of *Cocculus Indicus*. It is a crystalline fatty acid, melting at 159° Fahr. It forms soaps with the alkalies. With chlorine it forms chlorobassic acid.

Beebeerine, $C^{38} H^{21} O^6$, is an alkaloid, and the active principle of the bark of the Beebeeru tree of Guiana. The bark of this tree has been found an excellent substitute for cinchona, and the beebeerine itself has been employed as a substitute for quinine. Planta obtained it in the form of a snow-white uncrystallisible powder. Its salts are not crystallisable, and they all act as febrifuges.

Benzamide, $C^{14} N H^7 O^2$. This is a compound of benzoyle [Chemistry—Benzule, *S.* 1.] and amide. It is formed when dry ammonia acts on chloride of benzoyle, also when hippuric acid is boiled with peroxide of lead. It forms fine soft needles or pearly scales, very fusible and volatile. It yields ammonia when boiled with the alkalies, and a benzoate is formed.

Benzile = *Benzoyle* = *Benzule*. [Chemistry—Benzule, *S.* 1.]

Benzimide, $C^{28} N H^{11} O^4$. This is one of the numerous compounds described by Laurent as the result of the study of hyduret of benzule, the oil of bitter almonds. It is found in the oil in a crude state. It is crystallisable, and is decomposed by acids into benzoic acid and ammonia.

Benzoene, a name synonymous with *Toluole*. [Toluole.]

Benzoglycolic Acid, $C^{18} H^7 O^7 + HO$. This acid is formed when hippuric acid is exposed to the action of hyponitrous acid. It is crystalline, soluble in alcohol and ether, less soluble in cold water. When heated with acids it is decomposed, yielding benzoic acid and glycolic acid.

Benzoine, $C^{28} H^{12} O^4$, a product belonging to the benzoyle series. It is procured by acting on crude oil of bitter almonds containing hydrocyanic acid with an alcoholic solution of potash or sulphuret, or cyanide of potassium. It occurs in the form of small crystals, insoluble in water, and soluble in alcohol. It dissolves in sulphuric acid with a violet colour. When passed through a red-hot tube it is converted into hyduret of benzoyle ($C^{14} H^6 O^2$).

Benzoinam, $C^{86} N^2 H^{24} O^2$. When a mixture of ammonia, alcohol, and benzoin is left closed for some months, several new products are formed, amongst which is *Benzoinam*. It occurs in the form of small white needle-shaped crystals. It dissolves in acids, and is precipitated by alkalies.

Benzoinamide = Hydrobenzoinamide, is formed by exposing a mixture of benzoine and ammonia. It is a white, tasteless powder, and volatilises without decomposition.

Benzolone, $C^{11} H^4 O$. When *Hydrobenzamide* ($C^{42} H^{18} N^2$) is heated with potash till it becomes blackish brown, this compound is formed. The mass when washed with water yields benzolone in the form of small crystals. It gives a bright red colour when acted on by sulphuric acid.

Boloretine, $C^{40} H^{32} + 3HO$, is the name of one of four resinous compounds found in the peat of Denmark on the remains of pine trees. It is a fusible compound, but not crystalline.

Bromal, $C^4 Br^3 O + HO$. This compound is analogous to chloral ($C^4 Cl^3 O + HO$), and is formed by the action of bromine on alcohol. It is resolved into formic acid, and perbromide of formyle by the action of caustic alkalies.

Bromaniline. [Aniline.]

Bronaphtase, $C^{20} (H^7 B^2)$, is one of the numerous compounds obtained from naphthaline. It is formed by the direct action of bromine on naphthaline, care being taken not to add the bromine in excess, which would produce *bronaphtese*. Bronaphtase is a colourless oil, decomposed by chlorine and bromine.

Bronaphtese, $C^{20} (H^5 Cl^3)$, is formed by the action of bromine on naphthaline, or on *bronaphtase*. It is a crystallisable solid, and forms several compounds with bromine.

Bronaphtise, $C^{20} (H^5 Br^3)$, is obtained by heating the bromide of *bronaphtese*.

Bronaphtose, $C^{20} (H^4 Br^2)$, a compound with the above formula, has been obtained in two forms, both crystallisable.

Butyle = *Valyle*, $C^8 H^9$. This compound was discovered by Kolbe, as the result of the decomposition of valerianic or valeric acid ($C^{10} H^{10} O^4$) by the action of the galvanic current. It is a transparent, colourless liquid, insoluble in water, and soluble in alcohol and ether. It has an agreeable smell, and a slightly acid briny taste. It is combustible, and burns with a bright but smoky flame. By the action of oxygen it is converted into butyric and nitropropylic acid. Kolbe has obtained a substance, which he calls *butylene*, and which is homologous with olefiant gas and with propylene. It has the formula $C^8 H^8$. It is found in oil gas.

Butylamine, $C^8 H^{11} N$, has been discovered by Anderson in Dippel's animal oil in company with ethylamine, methylamine, propylamine, and other bases. It is a volatile, oily, and powerfully basic substance.

Butyryle, $C^8 H^7$, belongs also to the butyle series with C^8. It has not yet been obtained separate, but its hydrated oxide *butyral* or *butyraldehyde*, is known.

Hydrated Oxyde of Butyryle, $C^8 H^7 O + H O$, was originally obtained by Guckelberger, amongst the products of the oxidation of fibrine, &c., by sulphuric acid and peroxide of manganese, or bichromate of potash.

Butyric acid, $C^8 H^7 O^3 + H O$. This acid is the hydrated teroxide of butyryle, and perfectly homologous with other acids with a compound radical, as acetic acid. It exists in butter in small quantities, and is combined in them with oxide of glyceryle. It is to this acid that the flavour of butter is mainly due. It can be obtained by fermentation from sugar or starch. The acid may be obtained from butyrate of lime by the action of sulphuric acid. It is an oily liquid substance, having a rancid smell. The rancidity of butter is due to this acid escaping, from its combination with the oxide of glyceryle. The butyrate of lime can be obtained in any quantity by fermenting sugar with cheese and adding chalk. Carbonic acid and hydrogen gases are set free.

Butyro-nitryle = Cyanide of Propyle, $C^8 H^7 N$. It is a question whether this compound is a true cyanide, or a nitryle. It is formed among the products of the oxidation of albuminous compounds.

Butyramide, $C^8 H^7 O^2 N H^2$. This substance is produced by heating the butyrate of the oxide of ethyle with ammonia in closed tubes.

Butyrone, $C^7 H^7 O$. This substance is homologous with acetone and propione. It is less volatile than propione. It is procured by heating the butyrate of baryta.

Butyrate of the Oxide of Ethyle, or *Butyric Ether*, $C^4 H^5 O + C^8 H^7 O^3$. This is a very fragrant and delicious ether, and is the principal element of the flavour found in the pine-apple, the melon, and some other fruits. It is this substance which is developed during the fermentation of the sugar from which rum is procured, and which appears to have got for this form of ardent spirits the name of pine-apple rum. This ether dissolved in alcohol, is sold in the shops under the name of essence of pine-apple, and is used for flavouring confectionary, &c. It is developed in rum more fully after long keeping. It is also found in some wines, and with acetic ether is one of the principal sources of their flavour.

Butyral. [Butyle.]

Butyramide. [Butyle.]

Butyric Acid. [Butyle.]

Butyrone. [Butyle.]

Butyronitryle. [Butyle.]

Butyryle. [Butyle.]

Camphogen, $C^{20} H^4$. This substance is obtained when common camphor ($C^{10} H^8 O$) is distilled with dry phosphoric acid. It is found also in the oil of cumin. It forms with sulphuric acid a compound, called sulphocamphic or hyposulphocamphic acid, $C^{20} H^{15} S^2 O^5 + H O$.

Camphoric acid, $C^{10} H^7 O^3 + H O$. This acid is formed by the action of nitric acid on camphor. It occurs in the form of crystalline scales, which fuse at a temperature of 158°, and are very soluble in alcohol and ether, but sparingly soluble in cold water. When distilled these scales are resolved into anhydrous camphoric acid and water. This acid combines with the oxide of ethyle, and forms two compounds:

1. *Camphoric ether*, an oily liquid, with a bitter taste and a nauseous smell.
2. *Camphovinic acid*, which has the power of forming soluble salts.

Anhydrous camphoric acid, $C^{10} H^7 O^3$, forms a different series of salts from those constituted by the hydrated acid, It is a solid crystalline and volatile body, and yields an acid amide called *camphoric acid*.

Sulphocamphoric acid is formed by the action of sulphuric acid on anhydrous camphoric acid with the disengagement of carbonic oxide.

Camphovinic Acid. [Camphoric Acid.]

Camphrone, $C^{30} H^{21} O$. This substance is formed when camphor is passed over red-hot lime.

Caoutchine, $C^{10} O^8$. When caoutchouc (Indian rubber) is exposed to the action of heat, it first melts and then distils, and yields several oils which, like caoutchouc itself, are compounds of carbon and hydrogen. One of these is caoutchine, which combines with chlorine, forming an oil $C^8 H^5 + Cl$.

Capral (Caproic Acid), Capramide, is produced by the action of ammonia on the caprate of the oxide of ethyle. It occurs in the form of shining scales, which are fusible below 212° Fahr., soluble in alcohol, and insoluble in water.

Capric Acid, $C^{20} H^{19} O^3 + H O$. This acid is formed with many others from butter and goat's fat. It is also produced by the oxidation of the oil of rue. It has also been found in the oil of grain. It is a solid, fatty body, melting at a temperature of 80°, and giving out a rancid odour similar to human perspiration. Like the other acids of the series to which it belongs, it unites with oxide of ethyle, an exceedingly fragrant compound, having a smell closely resembling pine-apples.

The base of this acid, *capryle* ($C^{20} H^{19}$), unites with oxygen to form the oxide of capryle, which again unites with water, forming the *hydrated oxide of capryle*, a substance homologous with the alcohols of the other compound radicals. Its composition is $C^{20} H^{19} + O + H O$. It constitutes the chief part of the oil of rue. When nitric acid is added to it and heated, it is converted into capric and pelargonic acids.

Caprone. [Caproic Acid.]

Caproic Acid, $C^{12} H^{12} O^4$. This is the hydrated teroxide of *caproyle*, and is almost the only compound yet known of that radical. It is found in goat's fat and goat's butter, also in cow's butter and cocoa-nut oil. It can be best obtained from the *cyanide of amyle* or *capronitryle* by boiling it with an alcoholic solution of potash. Caproate of potash is obtained, which, on being distilled with sulphuric acid, yields caproic acid, which is an oily liquid, with a strong smell of perspiration. When united with the oxides of methyle or ethyle it produces fragrant ethers, having the smell of melons, pine-apples, and other delicious fruits.

Caprone, $C^{11} H^{11} O$, is formed from caproic acid, by heating the caproate of baryta. It is accompanied by *capraldehyde* or *capral*, $C^{12} H^{12} O^2$.

Capronitryle. [Caproic Acid.]

Caprotyle, $C^{12} H^{13}$. This substance is obtained when œnanthylic acid is decomposed by galvanism. It is a base similar to ethyle, and probably capable of similar combinations.

Caprylic Acid, $C^{16} H^{15} O^3 H O$. This acid is the hydrated teroxide of *caprilyle*. It is found combined with oxide of lipyle in butter. It is one of the compounds which gives flavour to this substance. It is an oily acid liquid smelling rancid, and having an odour of sweat. It boils at a high temperature. Its salts have a soapy character. When caprylate of baryta is heated it yields *caprylone*, $C^{15} H^{15} O$.

Caprylone. [Caprylic Acid.]

Capsicine is an alkaloid found in the capsules of *Capsicum annuum* and other species of *Capsicum*, which are used in the manufacture of cayenne pepper. It has a burning taste, and may be crystallised. It is insoluble in water and ether, soluble in alcohol. It forms crystallisable salts with sulphuric, nitric, and acetic acids.

Caramel is a name given to cane-sugar when it has been exposed to a temperature of 420°. The sugar loses three equivalents of water, and becomes converted into a brown tasteless mass.

Carapine, an alkaloid found in the *Carapus guianensis*. It forms crystallisable salts with hydrochloric and acetic acids.

Carbamide, $C O N H^2$. This substance is produced by the action of chloro-carbonic acid gas on ammonia. Sal ammoniac is also formed at the same time. Under the influence of the mineral acids carbamide yields ammonia and carbonic acid.

Carbanalide, $C^2 O C^{12} H^6 N$. This substance is urea ($C^2 O^2 H^4 N^2$), in which two atoms of hydrogen are replaced by *phenyle* ($C^{12} H^5$). There is also a *carbanilic acid* ($C^{14} N H^6 O^4 + H O$).

Carbolic Acid = *Hydrated Oxide of Phenyle*, $C^{12} H^5 O + H O$, is one of the products of coal tar, and is found amongst those portions which boil between the temperature of 300° and 400°. It is procured by taking this peculiar product with twice its weight of potash ley. On the addition of an acid to this mixture hydrated carbolic acid may be obtained in the form of a heavy oil. When pure it is a heavy transparent oil, refracting light very strongly, neutral to test paper, and having a specific gravity of 1·062 to 1·065. It has the taste and odour of creosote, which it is very much like. They are probably identical, or have the same base. According to Laurent carbolic acid is the hydrated oxide of phenyle. [Phenyle.]

Carotine, the colouring matter of the common carrot, *Daucus Carota*.

Catechine = Tanninoenic Acid, $C^{15} O^6 H^6$, is that portion of catechu which is insoluble in cold water. It is soluble in hot water, and crystallises in the form of a white silky powder. When heated with caustic potash it yields a black acid called *japonic acid*. Carbonate of potash produces with it *rubinic acid* ($C^{18} H^6 O^4$), which has a red colour.

Cathartine, the active principle of the various species of *Cassia*, which are used under the name of Senna.

Cedriret, one of the products of the distillation of coal tar discovered by Reichenbach. It is a volatile solid, and is obtained from creosote by the action of potash and acetic acid. It crystallises in a solution of sulphate of iron, forming orange red crystals, which dissolve with a blue colour in sulphuric acid. The colour of oil of tar seems to be owing to this substance.

Cerasine is that part of the gum of the cherry-tree which is insoluble in cold water. It is probably some transitionary form between starch and gum.

Cerebric Acid is a substance said to exist in the fatty matter of the brain. It is accompanied by another acid, the *oleo-phosphoric acid*, which is supposed to be united to a compound radical *cerebroleine*, in the manner of the fatty acids. These substances are of a very doubtful nature, and the chemistry of the nervous system is at present in a very imperfect state.

Cerebroleine. [Cerebric Acid.]

Cerene, $C^{54} H^{54}$, is a solid wax-like body. It has been obtained as a compound of sulphuric acid with cerotine, $C^{54} H^{55} O + H O + S O^{3}$.

Cerosine, $C^{48} H^{50} O^{2}$, is a waxy substance found on the surface of the sugar-cane. It is not saponifiable.

Cerotic Acid, $C^{54} H^{53} O + H O$. This compound was discovered by Brodie as an ingredient of bee's-wax in a free state. It may be procured by dissolving wax in hot alcohol, and dissolving the residue deposited on cooling till its melting point rises to 162°. It is then purified by ether till its melting point is 171°, which is that of the acid. This substance was formerly called *cerine*. It has, however, acid properties, and combines readily with bases. It combines with oxide of ceryle, forming the cerotate of that substance, $C^{54} H^{55} O + C^{54} H^{53} O^{3}$, which is called *cerotine*. When heated with potash, it produces cerotate of potash and the *hydrated oxide of ceryle*, or *ceric alcohol*.

Ceryle, $C^{54} H^{55}$, the base of cerotic acid. [Cerotic Acid.]

Cetine. [Cetyle.]

Cetyle, $C^{32} H^{33}$, a compound radical of the series C^{32}. It forms the following compounds:—

Cetylic Alcohol = Ethal, $C^{32} H^{33} O H O$. When spermaceti or cetine are treated with an alkali, a cetylate of the alkali is formed, and the *hydrated oxide of cetyle* is left. Although a true alcohol, it is not liquid, but a fat, melting at a temperature of 118°. The crystalline part of spermaceti is called *cetine*, and is a cetylate of the oxide of cetyle.

Oxide of Cetyle, $C^{32} H^{33} O$, is procured by the action of sodium on cetylic alcohol, when hydrogen escapes, and the remainder being heated with iodide of cetyle, yields iodide of sodium and oxide of cetyle.

Sulphocetylic Acid, $2 S O, H O, C^{32} H^{33} O$, is perfectly homologous with sulphovinic acid: chloride, bromide, and iodide of cetyle are also known.

Cetylic Acid = Ethalic Acid, $C^{32} H^{31} O^{3} + H O$, is obtained from spermaceti by saponification, and adding some stronger acid to the compound. Its salts with the alkalies form soaps. It melts at the temperature of 131°.

Tricetylamine, $C^{96} H^{99} N$, is formed when dry ammonia acts on iodide of cetyle.

Palmitic Acid is isomeric with cetylic acid, but melts at a temperature of 140°. It is the chief solid acid of palm oil.

Chelerythrine, an alkaloid found in company with *Chelidonine* in the celandine (*Chelidonium majus*). It forms a gray powder, which excites violent sneezing. It forms red salts with the acids, which are narcotic and poisonous. *Chelidonine* is a bitter substance, insoluble in water, and forming crystallisable salts.

Chiococcine, an alkaloid very similar to *Violine*. The first is found in the snowberry (*Chiococca racemosa*), and the second in the violet (*Viola odorata*). Their action on the human system is precisely similar to that of *Emetine* obtained from ipecacuanha. On this account it has been supposed that they are emetine disguised with foreign matters.

Chlonaphtase, $C^{20} H^{7} Cl$. This is the first of a series of compounds formed from Naphthaline, and described by Laurent. Naphthaline is composed of $C^{20} H^{8}$. Laurent has shown that various elements will supplant the hydrogen, and that not only in one, but in several proportions. He has therefore proposed to give names to these compounds, according to the quantity of the element supplanting the hydrogen. Thus, it will be seen that in Chlonaphtase one atom of chlorine supplants one of hydrogen. According to the number of atoms supplanted, Laurent employs the vowels a, e, i, o, u, in the last syllable of the name. Thus, Chlonaphtase has one atom of chlorine, but *Chlonaphtese* ($C^{20} H^{6} Cl^{2}$) has two atoms, *Chlonaphtise* ($C^{20} H^{5} Cl^{3}$) has three atoms, *Chlonaphtose* ($C^{0} H^{4} Cl^{4}$) has four atoms, *Chlonaphtuse* ($C^{20} H^{3} Cl^{5}$) has five atoms. When the vowels are exhausted, Laurent adds a syllable, so that the compound $C^{20} H^{2} Cl^{6}$ is *Chlonaphtalose*, the compound $C^{20} H^{1} Cl^{7}$, is *Chlonaphtalise*. The same plan is pursued with bromine. But in all these cases the hydrogen may be replaced by atoms of both chlorine and bromine. In the same way the vowels are made to do duty for these compounds, as follows: chlonaphtose, $C^{20} H^{4} Cl^{4}$; chloribronaphtose, $C^{20} H^{4} Cl^{3} Br$; chlorabronaphtose, $C^{20} H^{4} Cl Br^{3}$; chlorebronaphtise, $C^{20} H^{5} Cl^{2} Br$; chlorebronaphtose, $C^{20} H^{4} Cl^{2} Br^{2}$; chloribronaphtuse, $C^{20} H^{3} Cl^{3} Br^{2}$. All these compounds are capable of acting as bases and combining with elements. Thus we have *chloride of chlonaphtose* and *chloride of chlonaphtese*, &c., *bromide of chlorabronaphtese*, &c.

Chloroform. [Formyle.]

Cholachole, $C^{8} N^{2} H^{5} O^{13}$, one of the products of the action of nitric acid on *choloidic acid*.

Cholalic Acid, $C^{45} H^{40} O^{1}$, one of two products formed by boiling cholic acid with potash. The other substance is *glycocine*. The cholalic acid occurs in very fine and regular crystals. Its salts form soaps. It is easily convertible by acids into choloidic acid.

Choleic Acid, $C^{52} N S^{2} H^{43} O^{14}$, is an acid found in combination with soda in human bile. When boiled with potash it yields cholalic acid, and a substance called *taurine*, $C^{4} N S^{2} H^{7} O^{6}$, in which it will be seen are contained all the sulphur and nitrogen of the acid.

Cholic Acid, $C^{52} N H^{43} O^{12}$, was first discovered in the bile by Gmelin. It is prepared by allowing a solution of dry bile in alcohol to be mixed with ether, when it deposits cholate of soda. If this is decomposed by sulphuric acid, groups of radiated crystals are deposited, which are cholic acid. It is decomposed when heated with mineral acids and potash.

Choloidic Acid, $C^{48} H^{39} O^{9}$, is procured from the decomposition of cholic acid when boiled with acids. It is cholalic acid with one equivalent less water. Choloidic acid is uncrystallisable, and its salts are amorphous. This substance was formerly called resin of bile. When choloidic acid is boiled with hydrochloric acid, it becomes converted into a neutral substance, *Dyslysine*, $C^{48} H^{36} O^{6}$, by the loss of three equivalents of water.

Chromocyanogen, $6(C^{2} N) + Cr^{2}$, is a compound of chromium and cyanogen. It combines with potassium, forming a yellow crystallisable salt.

Chrysene, $C^{3} H$, is one of the numerous compounds formed in coal tar. It is a yellow crystalline solid, melting at a temperature of 455°.

Chrysophanic Acid, $C^{10} H^{8} O^{3}$, is found in the *Parmelia varietina*. It occurs in the form of golden yellow crystals, and with solutions of potash and ammonia, in alcohol, yields a beautiful red colour.

Cinnamyle, $C^{18} H^{8} O^{2}$, the hypothetical radical of essence of cinnamon.

Hyduret of Cinnamyle, $C^{18} H^{8} O^{2} + H$, is the purified essence or oil of cinnamon. It is a fragrant oil, and forms with nitric acid a crystalline compound, $C^{18} H^{9} O^{2} + N O^{5}$, which, when mixed with water, is resolved into its original constituents, hyduret of cinnamyle and nitric acid. When it is exposed to the air it absorbs oxygen, and becomes converted into *cinnamic acid*, $C^{18} H^{7} O^{3} + H O$. This acid is also easily obtained by dissolving oil of Balsam of Peru in a solution of potash in alcohol, evaporating to dryness, dissolving in hot water, and adding to the cinnamate of potash then formed, hydrochloric acid. *Nitric* acid converts it into hyduret of benzoyle. When added to cold nitric acid it is converted into *nitro-cinnamic acid*. The salts of this acid detonate when heated. When oil of cinnamon is poured upon fusing sulphuric acid, *sulpho-cinnamic acid* is formed.

Cinnameine, $C^{36} H^{18} O^{4}$, is found in Balsam of Peru. It contains cinnamic acid united to an ether.

Cinnamile, $C^{16} H^{8}$, is formed when cinnamic acid is distilled with baryta.

Citraconic Acid, $C^{5} H^{2} O^{3}$, is formed from *Itaconic acid*, $C^{5} H^{2} O^{3} H O$, which is again formed from *Aconitic acid*, $C^{4} H O^{3}$. The last acid is found in the *Aconitum Napellus*, and *Equisetum fluviatile*.

Cnicine $C^{28} H^{15} O^{10}$, an active principle found in the group *Cynarocephalæ* of the compositous order of plants. It is neutral and bitter.

Colchicine, the active principle of the meadow saffron (*Colchicum autumnale.*) It was at one time regarded as identical with veratrine. It is soluble in water, alcohol, and ether. It forms salts with the acids, which are bitter, acrid, and poisonous. In small doses it causes purging.

Compound Radical, a term applied to those combinations of the elements which act towards oxygen, hydrogen, and acids, as simple elements. Examples of such compound bodies will be found under the heads, ***amyle, butyle, cetyle, cinnamyle***, &c.

Collodion. [Gun Cotton.]

Creatine, $C^8 H^9 N^3 O^4$. This body, originally discovered by Chevreul, occurs in transparent very brilliant crystals. It has a bitter strongly pungent taste, and irritates the pharynx. It dissolves in 74 parts of cold water, and in boiling water in such quantity that on cooling the solution becomes consolidated into a mass of glistering needles. It dissolves sparingly in alcohol, and not at all in ether. It forms no definite salts with acids. According to Liebig it is best obtained from finely chopped flesh that has been well kneaded with water, and the fluid removed by pressure. The coagulable matters are then removed by boiling, and the phosphates by caustic baryta. The fluid left is then evaporated till the creatine is deposited in the form of needles. Creatine can also be obtained from the urine. It appears to be produced in the flesh of animals as the result of a process of retrogressive change in the elements of the tissues in which it is found. It is in fact a product of excretion.

Creatinine, $C^8 H^9 N^3 O^2$, was discovered by Liebig. It is obtained from creatine by the action of hydrochloric acid. It is found also in the muscles and the urine, with creatine, whilst these bodies are in their normal condition. But in putrid flesh and urine no creatine is found. Hence creatinine may be regarded as the result of the decomposition of creatine.

Cumidine, $C^{18} H^{13} N$, is obtained from the oil of cumin. It is a crystalline base, resembling *aniline;* and like that base it combines with chlorine, bromine, &c. *Cumole*, $C^{18} H^{12}$, is found in the oil of cumin and in the oil of coal-tar. *Cymidine*, $C^{20} H^{15} N$, and *cymole*, $C^{20} H^{14}$, are found in company with the above compounds in the same oil.

Cyamelide, $C^2 O^2 + N H$. This substance is formed by the decomposition of cyanic acid when left to itself. It is an opaque white solid body, which has no acid properties. It dissolves in liquor potassæ with disengagement of ammonia, and the solution yields cyanurate of potash.

Dadyle, $C^{20} H^{16}$, is obtained by heating oil of turpentine with lime. It is a pure oil.

Diamylamine. [Amyle.]

Dibromaniline. [Aniline.]

Dichloraniline. [Aniline.]

Diethylamine. [Aniline.]

Dyslysine. [Choloidic Acid.]

Elaidic Acid, a fatty acid, obtained by the action of nitric acid on oleic acid.

Elaldehyde. When aldehyde is kept for some time in sealed tubes, it is converted into two polymeric bodies, *metaldehyde*, a hard crystalline inodorous solid, and *elaldehyde*, which is a liquid.

Erythric Acid = *Orcinolecanoric acid*, $C^{34} H^{19} O^{15}$. One of the acids found in the *Parmelia roccella* and *Roccella tinctoria*, lichens which yield the commercial substance archil. This acid is the most important of all the principles found in lichens. It yields ether when boiled with alcohol. Besides erythric acid, *lecanoric, alpha orcellic, beta orcellic,* and *evernic acids* have been found in lichens. They yield red dyes with ammonia, and are employed extensively in the dyeing of cotton and woollen cloth. These acids have been investigated by Schunck and Stenhouse, and the latter recommends that these acids, which are the valuable substances in dyeing, and which are not possessed by lichens in larger quantities than 2 to 12 per cent., should be separated on the spot where they grow, and thus spare the expense of the carriage of the useless parts. These acids are extracted by the following process:—"The lichens cut in small pieces are moistened with water, and after standing half an-hour slaked lime is added, and the mixture allowed to stand for a time. It is then placed in a vessel with a double bottom, the upper being perforated and the liquid displaced by cautious addition of water, as long as that which drops gives a deep purple red colour with bleaching liquor, a character belonging to all the acids which yield archil. The solution is then supersaturated with hydrochloric acid, and a gelatinous precipitate falls, which is washed and dried. The acids are extracted from it by weak alcohol without boiling, which would form ether compounds." (Gregory.) Besides the acids there are three other compounds found in the lichens used for dyeing.—***Orcine, Picroerythrine***, and ***Erythromannite.***

Orcine, $C^{16} N H^9 O^7$, occurs in the form of large transparent crystals. It has a sweetish taste, and is very soluble in water. When mixed with ammonia and exposed to the air, it assumes gradually a deep red colour, and when mixed with the fixed alkalies it has a rich violet colour.

Picroerythrine = *Erythrin—bitter* = *Amarythrine*, $C^{34} H^{23} O^{20}$, is formed when erythric acid, or the lichens containing it, are boiled in water.

Erythromannite, $C^{11} H^{14} O^{11}$, is formed when picroerythrine is boiled with baryta. It is dissolved by water and alcohol. It forms large colourless crystals, which have a sweet taste.

Ethal. [Cetyle.]

Ethalic Acid. [Cetyle.]

Ether, Butyric. [Butyle.]

Ether, Camphoric. [Camphoric Acid.]

Ether, Amylic. [Amyle.]

Ethylamine. [Ethyle.]

Ethyle, $C^4 H^5$. One of the earliest known of the compound radicals, and the base of the well-known substances ether and alcohol. It was for a long time unknown except in combination. Frankland, however, at last succeeded in separating it by the action of zinc in closed tubes upon the iodide of ethyle. The following equation expresses this result: $C^4 H^5 I + Zn = Zn I + C^4 H^5$. Part of the ethyle, however, is converted into zincethyle, $C^4 H^5 + Zn$, and another part into methyle and eloyle. In the latter case $C^4 H^5$ becomes $C^2 H^3 + C^2 H^2$. Ethyle is a colourless gas, having a faint smell like ether, and burning with a bright flame. It has a specific gravity of 2·00394, and is condensed into a liquid with 2½ atmospheres. It is perfectly analogous to methyle ($C^2 H^3$), and according to the law which regulates these compounds, its density is higher whilst its volatility is less.

Oxide of Ethyle* = *Ether* = *Sulphuric Ether, $C^4 H^5 + O$. This ether is occasionally found in nature combined with acetic, butyric, and other ethers, which are found giving flavours to such fruits as melons, pine-apples, &c. This compound is obtained from alcohol by acting on it with sulphuric acid. [Æther.] Ether is now known to be perfectly analogous to the metallic oxides, its compound base ethyle taking the part of the metal. Thus, as $K O + \overline{A}$ represents acetate of potash, and $K O \overline{Bz}$ represents benzoate of potash, so $C^4 H^5 + O + \overline{A}$, and $C^4 H^5 + O + \overline{Bz}$ represent acetate and benzoate of ethyle.

Hydrated Oxide of Ethyle* = *Alcohol, $C^4 H^5 + O + H O = C^4 H^6 O^2$. This substance is formed when ether and water meet in their nascent state, as when some of the acid salts of ethyle are decomposed by heat. It is however produced during the fermentation of glucose or grape sugar, which is composed of $C^{12} H^{12} O^{12}$. During fermentation this compound loses 4 atoms of carbonic acid and leaves behind 2 atoms of the hydrated oxide of alcohol. Thus,

	C	H	O
Glucose	12	12	12
2 atoms of alcohol	8	12	4
4 atoms of carbonic acid . .	4	0	8

[Alcohol, P. C.]

Chloride of Ethyle, $C^4 H^5 Cl$, is formed by saturating alcohol with hydrochloric acid, and distilling the mixture in a vapour-bath, when the chloride of ethyle passes over.

Bromide, Iodide, and Sulphide of Ethyle, are analogous compounds, consisting of one atom of ethyle and one of the other element.

Hydrosulphuret of Sulphuret of Ethyle = *Mercaptan*, $C^4 H^6 S^2$, or $C^4 H^5 S + H S$, is formed when the double sulphate of lime and oxide of ethyle is distilled with its own bulk of a solution of potash saturated with sulphuretted hydrogen, and converted into $K S + H S$. It has a powerful and penetrating odour, smelling like the essence of onions concentrated. It adheres to the hands and clothes most pertinaciously, and is a most offensive subject to operate upon.

Zeise has described a persulphuret of ethyle, $C^4 H^5 + S^3$.

Seleniuret of Ethyle is formed when sulphuret of ethyle and potash is distilled with seleniuret of potassium. It is a volatile liquid, having an offensive alliaceous odour.

Cyanide of Ethyle, $C^4 H^5 + Cy = C^6 H^5 N$, is procured by heating cyanide or ferrocyanide of potassium with the double sulphate of potash and ethyle. It is a very offensive compound, smelling like putrid fish. It produces stupefaction when inhaled.

Oxide of Ethyle unites with sulphuric and phosphoric acids, forming sulphates and phosphates. *Nitrate of the oxide of Ethyle*, $C^4 H^5 + O + N O^5$, is the *Nitric Ether* of chemists, but the *Sweet Spirit of Nitre*, or *Spiritus Ætheris Nitriosi* of the London Pharmacopœia, is an impure hyponitrite of the oxide of ethyle, $C^4 H^5 + O + N O^3$, dissolved in alcohol.

Carbonate of Oxide of Ethyle = Carbonic Ether, $C^4 H^5 + O + C O^2$, is an aromatic liquid, boiling at a temperature of 260°. It unites with carbonate of potash, forming a double carbonate of ethyle and potash, $C^4 H^5 + O + C O^2 + K O + C O^2$.

Carbamate of Oxide of Ethyle = Carbamic Ether = Urethane, $C^6 H^7 N O^4$, is formed by the action of ammonia or *Chlorocarbonic Ether*, $C^6 H^5 Cl O^4$, with sal-ammoniac. It is distilled over, and crystallises on cooling. *Lactamide, Sarcosine*, and *Alanine*, are substances having the same composition, but assuming very different forms. The following is a list of other compounds formed from ethyle, or having this substance as their base. This list not only indicates the relations of ethyle, but of several other compound radicals which may be substituted for it.

Oxalate of Oxide of Ethyle = Oxalic Ether, $C^4 H^5 + O + C^2 O^3$.

Acid Oxalate of Ethyle = Oxalovinic Acid, $C^4 H^5 + O + C^2 O^3 + C^2 O^3 + H O$.

Oxamate of Oxide of Ethyle, $C^4 H^5 + O + C^4 N H^2 O^5$.

Benzoate of Oxide of Ethyle = Benzoic Ether, $C^4 H^5 + O + C^4 H^5 O^3 + H O$.

Hippurate of Oxide of Ethyle = Hippuric Ether, $C^4 H^5 + O + C^{18} N H^8 O^5$.

Salicylate of Oxide of Ethyle, $C^4 H^5 + O + C^{14} H^5 O^5$.

Cyanate of Oxide of Ethyle = Cyanic Ether, $C^4 H^5 O + C^2 N O^2$.

Ethylo-urea, $C^6 N^2 H^8 O^2$.

Ethylamine, $C^4 H^7 N$.

Diethylamine, $C^8 H^{11} N$.

Triethylamine, $C^{12} H^{15} N$.

Tetrethylium, $C^4 H^5 N$.

Methylotriethylium, $C^{14} H^{18} N$.

When ethyle in the form of its oxide ether, or the hydrated oxide, alcohol, is exposed to the air, they become converted into aldehyde, acetic acid, formic acid, oxalic acid, and finally carbonic acid and water. In this way the radicals *acetyle*, $C^4 H^3$ and *formyle*, $C^2 H$, are produced. [ACETYLE; FORMYLE.]

EUGENINE, a product obtained from the oil of cloves, having the same composition as Eugenic acid, $C^{20} H^{12} O^4$.

Eupion, one of the products of the destructive distillation of wood, discovered by Reichenbach, in company with creosote.

EXCRETIN, a substance discovered by Dr. Marcet in the excretions from the human bowels.

FICHTELITE, a fusible volatile crystalline substance, found in the submerged pine-trees of the Fichtel-gebirge. It is probably derived from the essence of turpentine, and has a composition $C^{20} H^{15}$.

FORMIC ACID. [FORMYLE.]

FORMYLE, $C^2 H$, is a compound radical unknown in its separate condition. When hydrated oxide of methyle is distilled with sulphuric acid, water, and peroxide of manganese, a liquid is produced which contains a formiate of the oxide of methyle, and a liquid called methylal, $C^6 H^8 O^4$. The latter is regarded as a hydrated oxide of formyle, and it is found that this hypothetical base is capable of entering into combinations in the same way as ethyle, acetyle or methyle.

Formic Acid, $C^2 H O^3$, is a teroxide of formyle. It originally obtained its name from having been found present in the red ant, (*Formica rufa*). Hence also the name of the base formyle. This acid may be procured from pyroxilic spirit, $C^2 H^3 O + H O$, by the loss of two equivalents of hydrogen, and the addition of two of oxygen, $C^2 H O^3 + H O$. It may also be procured by mixing starch or sugar with peroxide of manganese, water, and sulphuric acid, and distilling. It is found also under a great variety of circumstances. It unites with lead, forming a formiate of lead, and from this formiate of soda may be procured by the addition of carbonate of soda. It unites freely with most of the metals, and the salts when heated in closed vessels give off carbonic acid and carbonic oxide, leaving the pure metal. It unites also with ammonia, the salt containing the elements of hydrocyanic acid and water.

Chloroform = Terchloride of Formyle, $C^2 H Cl^3$. Chlorine combines with formyle and forms a very interesting series of compounds, none of more importance than that with three atoms of chlorine, a substance which has been extensively employed as one of the least injurious of the various anæsthetic agents which have been recently employed in medicine. It is a liquid, having a specific gravity of 1·50, and is transparent, colourless, and volatile. It is best obtained by distilling pure alcohol with water and bleaching powder (chlorinated lime). It is then well washed with water and redistilled, and washed with sulphuric acid to remove the water and other adulterations. [ANÆSTHETICS—MATERIA MEDICA, *S.* 2.]

FUMARAMIDE, $C^4 H O^2 + N H^2$. When the *fumarate* of oxide of ethyle, which is a heavy oily liquid, is acted on by *aqua ammoniæ*, it forms a white insoluble powder, which is *fumaramide*, and possesses all the characters of a compound amide.

FUSEL OIL. The oils which contaminate potato and grain spirit are called by the Germans under the common name *fuseloel*, and the same term translated is applied by English chemists to these oils. Potato spirit is accompanied by the hydrated oxide of amyle, or oil of potato spirit [AMYLE], whilst grain spirit is accompanied by an oily matter consisting of margaric, capric, and œnanthic acids, which probably, with the spirit form their corresponding ethers. Dr. Gregory suggests that this is probably the composition of the oil of grain, the *Oleum siticum* of Professor Mulder.

GEINE, a name given to *humus* in common with *ulmine, humic acid, ulmic acid, humine* and *geic acid*. This substance is obtained from common mould, which when boiled with alkalies, and the solution filtered and treated with acids, yields a brown deposit, which has the above names. Mulder states that the substance contains two and a half to seven per cent. of nitrogen. These substances appear to be vegetable matters in a state of decay.

GEIC ACID. [GEINE.]

GENTIANINE, a non-azotised vegetable compound, obtained in the form of yellow needles from the *Gentiana lutea*.

GLAUCINE, an alkaloid found in the leaves and stem of *Glaucium luteum*. It forms salts with the acids, and has a bitter acrid taste. It occurs in the form of pearly scales. *Glaucopicrine*, found in the same plant, differs from the above compound. The composition of both is doubtful.

GLYCERYLE, $C^6 H^7$, is the hypothetical radical of the substance called Glycerine, which is the hydrated oxide of Glyceryle, $C^6 H^7 O^5 + H O$. [GLYCERIN—CHEMISTRY, *S.* 1.] By the action of heat Glycerine is decomposed, and a volatile principle is produced, which is called *Acroleine*. [ACROLEINE.] Glycerine is the substance that combines with the fatty acids, forming the various oils and fats. Berzelius, however, has suggested that this compound is not present in some fats, but that a body having the composition $C^3 H^2 O$ occurs, and which he calls *oxide of lipyle*. Two atoms of this substance with three of water is equal to one atom of the hydrated oxide of glyceryle; thus, $C^6 H^7 O^5 = 2 (C^3 H^2 O) + 3 H O$.

GLYCOCINE = *Glycocoll* = *Sugar of Gelatine*, $C^4 N H^5 O^4$, is a compound found amongst the products of boiling gelatine with potash or acids. It may also be prepared by heating hippuric acid with hydrochloric acid, when benzoic acid, water, and glycocoll are produced. It forms transparent crystals, which are soluble in water and sweet to the taste. It combines with acids and bases. Its easy formation from the animal compound gelatine, has led to the supposition that it may play an important part in the animal body.

GUAIACYLE, $C^{14} H^7 O^4$, the theoretical base of the resin called guaiacum. If this resin is distilled, an oily liquid is obtained, which is regarded as a hyduret of guaiacyle, $C^{14} H^7 O^4 + H$.

GUANINE, $C^{10} N^5 H^5 O^2$, a compound discovered by Unger in guano. It resembles urea in its properties, forming crystallisable salts with hydrochloric, sulphuric, and nitric acids. It is a white powder, and insoluble in water. Its salts are all neutral or acid, none basic.

GUARANINE, $C^{16} H^{10} O^4 N^4$, a substance identical with theine and caffeine, and found in the *Guarana officinalis*.

GUN-COTTON, a substance discovered by Professor Schönbein. It is made by immersing one part of cotton wool in ten parts of an acid composed of equal parts of sulphuric and nitric acids. After immersion for about two minutes, the wool is withdrawn and the liquid is pressed out, and it is rapidly washed with water till all remains of the acid are gone. One hundred parts of cotton thus treated yield one hundred and sixty-nine parts, of which one hundred and two are nitric acid, water has disappeared, and the rest is cellulose. According to Porret and Teschemacher, gun-cotton consists of $C^{12} H^{8} O^{8} + 4N O^{5}$. Gun-cotton has not superseded the use of gunpowder, as in fire-arms its explosive force is found inferior, but in the blasting of rocks it possesses some advantages over gunpowder. Gun-cotton is soluble in ether, and a compound is formed, to which the name of *collodion* has been given. This substance has been found of the greatest use in many of the arts, especially photography. On being exposed to the air the ether evaporates, leaving a thin transparent film behind. This is applied to wounded surfaces instead of gold-beater's skin. It may be made into delicate bags into which hydrogen may be introduced for balloons. In photography the collodion is mixed with the iodides to be acted on by light, and, being spread on glass, pictures, from which any number of impressions may be taken, are produced.

Harmaline, $C^{27} H^{15} N^{2} O^{2}$, and *Harmine*, $C^{27} H^{12} N^{2} O^{2}$, are alkaloids occurring in the seeds of *Peganum Harmala*. They are united with phosphoric acid. Harmaline forms yellow salts with the acids, and is transformed into a red matter by oxidising agents. The *harmala red* of commerce is the powder of the seeds. It is used in dyeing red, rose-colour, and pink. It is used in large quantities in Russia. Harmaline yields a number of substitution products, such as *nitroharmaline*, *cyanoharmaline*, &c.

Hatchetine, a fossil resin found in the lignite of Wales. It is colourless, fusible, and volatile.

Helicine, $C^{26} H^{16} O^{14}$, a compound formed when *salicine* is acted on by diluted nitric acid. It contains the elements of sugar and hyduret of salicyle. It crystallises in the form of small white needles. When heated to 347° it forms a resinous insoluble substance.

Hellenine, $C^{15} H^{10} O^{2}$, is a concrete volatile principle allied to the essential oils. It is a solid crystalline body, and is obtained from the *Inula Helenium*. With nitric acid it yields *nitro-hellenine*, &c.

Hippuric Acid, $C^{18} N H^{8} O^{5}$, is found in large quantities in the urine of the cow and the horse, and other herbivorous animals. It has also been detected in human urine. It is procured by evaporating the urine of the horse or cow to a small bulk, and acidulating with hydrochloric acid. The mixture deposits brown crystals of hippuric acid, which may be made white by boiling with lime, and dissolving the hippurate of lime, and again adding hydrochloric acid, when the pure hippuric acid is thrown down. It forms large semi-transparent four-sided prisms, which are sparingly soluble in cold water, and very soluble in hot water and in alcohol. Under heat it melts and gives off benzoic acid, benzoate of ammonia, and a fragrant oily substance. It forms salts which are soluble and crystallisable.

Humic Acid. [Geine.]

Humine. [Geine.]

Hyperuric Acid, $C^{10} N^{4} H^{6} O^{9}$, discovered by Unger, and formed by acting on guanine with hydrochloric acid and chlorate of potash. It differs in composition from uric acid by 1 equivalent of water and 2 of oxygen, hence its name. It is colourless, and crystallises in short rhombic prisms, and when heated, is resolved into hydrated cyanic acid, water, and carbon.

Idrialine, $C^{3} H$, a carbohydrogen found in the mines of Idria. It colours sulphuric acid intensely blue. It is probably identical with *succisterene*, a substance obtained from amber, and which has the same property of colouring oil of vitriol intensely blue.

Inosite, $C^{12} H^{12} O^{12} + 4H O$, is a peculiar species of sugar, discovered by Scherer in the juices obtained from the flesh of animals. It crystallises in large crystals, which have a sweet taste, but which do not enter into a state of fermentation. It yields, however, both lactic and butyric acids when exposed to the action of caseine. It differs from glucose in its not giving the usual reaction with the salts of copper and potash, and in possessing two atoms more water in its composition. It has not yet been found ready formed in the animal system.

Iridiocyanogen, $C^{2} N + Ir$, is a hypothetical compound radical. It forms with hydrogen Iridiocyanic acid, and with potassium an Iridiocyanide of potassium. It occurs in the form of colourless crystals, and gives a deep indigo blue with the salts of peroxide of iron. This is one of the many compounds of a metal with cyanogen, like ferrocyanogen, and which have all the power of combining with other metals possessed by that body. Thus there are cobaltocyanogen, chromocyanogen, platinocyanogen, &c.

Isatinic acid, $C^{16} H^{6} N O^{6} + H O$, is formed by the action of a strong solution of potash on isatine, $C^{16} H^{5} N O^{4}$. The compound formed is isatinate of potash, from which the isatinic acid may be separated. It is, however, at once resolved into isatine and water, but if isatinate of lead be treated with sulphuretted hydrogen in vacuo, a white flocculent powder is obtained, which becomes red on being dissolved by boiling water, and the solution on cooling deposits isatine. Isatinic acid unites with the metals, the latter representing in the various compounds the hydrogen of the water.

Isatyde, $C^{16} H^{6} N O^{4}$, is a product of isatine, when this substance is acted on by sulphide of ammonium. It is a gray crystalline powder, and represents isatine with one equivalent of hydrogen. This equivalent of hydrogen may be supplanted by chlorine and sulphur, and thus *chlorisatyde* and *sulphasatyde* are produced.

Jamaicine is formed with *Surinamine* in the *Geoffræa inermis* and *G. Surinamensis*. They are crystallisable alkaloids, capable of forming with the acids salts, which are precipitated with taurine and corrosive sublimate.

Kakodyle. [Cacodyl—Chemistry, *S.* 1.]

Kinic or **Quinic Acid**, $C^{7} H^{4} O^{4} + 2 H O$, is obtained from cinchona bark, in the manufacture of sulphate of quinine. It occurs in the bark united with the quinine, and when lime is added to a solution of bark, a kinate of lime is formed. The kinic acid is procured from this compound by the action of oxalic acid. It forms salts with the metals highly interesting to the chemist.

When kinic acid, or kinate of lime is distilled with sulphuric acid, a new compound called *kinone* is obtained. It occurs in crystals of a fine golden yellow colour, which are soluble in water, having a pungent smell when in the state of vapour. When kinone is acted on by reducing agents, it takes up 2 and 4 equivalents of hydrogen, forming *green* and *white hydrokinone*. The first forms green crystals of exceeding beauty, the latter are white. Wöhler has obtained several compounds of kinone, of which the following tabular statement gives the names as far as they are yet known :—

Kinone	$C^{25} H^{8} O^{8}$
Green hydrokinone . . .	$C^{25} H^{10} O^{8}$
White hydrokinone . . .	$C^{25} H^{12} O^{8}$
Chlorohydrokinone . . .	$C^{25} H^{10} Cl^{2} O^{8}$
Chlorokinone	$C^{25} H^{6} Cl^{2} O^{8}$
Brown sulphohydrokinone . .	$C^{25} H^{11} S^{4} O^{7}$
Yellow sulphohydrokinone . .	$C^{25} H^{12} S^{3} O^{7}$
Brown Chlorosulphokinone . .	$C^{25} H^{8} S^{4} Cl O^{5}$
Orange do.	$C^{25} H^{6} S^{4} Cl O^{5}$

Kreatine. [Creatine.]

Kreatinine. [Creatine.]

Kynole. [Aniline.]

Lactamide, $C^{6} N H^{7} O^{4}$, is obtained by the action of lactic acid on ammonia. It is interesting as being identical in composition with three other bodies, alanine, sarcosine, and urethane (carbamate of the oxide of ethyle). They have all of them, however, very distinct properties. This substance differs from the others in yielding lactic acid and ammonia when acted on by acids and bases; hence its name.

Lactucine is the active principle of the *Lactuca virosa*, or wild lettuce. It is obtained from the juice of this plant, which is called Lactucaricum. It is a bitter, crystalline, resinoid substance, possessing anodyne properties.

Lampic Acid. Another name for *Aldehydic acid.* [Aldehydic Acid—Chemistry, *S.* 1.]

Lauric, or **Laurostearic Acid**, $C^{24} H^{23} O^{3} H O$, a crystalline fatty acid, obtained from the fat of the berries of *Laurus nobilis*. It forms soaps with the alkalies.

Lecanoric Acid, $C^{18} H^{8} O^{8}$, is found in several lichens, especially *Lecanora tartarea*, and *Gyrophora pustulata*. It occurs in the form of minute white crystals, which are insoluble in water, but soluble in ether and alcohol. When heated with alkalies, it yields a carbonate of the alkali, and a sweet substance called orcine. Thus :

$$\underbrace{C^{18} H^{8} O^{8}}_{\text{lecanoric acid.}} \quad 2 C O^{2} + \underbrace{C^{16} H^{8} O^{4}}_{\text{orcine.}}$$

The same change takes place when lecanoric acid is boiled in water. By the action of air and ammonia, this acid is gradually converted into a deep blue or purple colour (Erythric Acid). This acid combines with bases, and with the compound radicals. *Lecanorate of oxide of ethyle* is the *Pseudoerythrine* of Heeren, and the *Erythrine* of Kane. It is produced by boiling the lichens with alcohol. It was discovered by Schunck, to whom chemistry is greatly indebted for a knowledge of the compounds contained in the lichens.

Leiocome is the name given to a substance possessing the properties of gum, and which is produced by simply exposing starch to a temperature of 300°. It has a brownish yellow colour, and acts in the same manner as gum, and is externally used instead of this substance in calico printing.

Leucic Acid, $C^{12} H^{12} O^6$, an organic acid belonging to the leucine series.

Leucine, $C^{12} N H^{13} O^4$, is a substance identical in composition with glycocine and alanine. It has the same relation to valerianic acid that they have to formic and acetic acids. It forms crystalline scales, which are volatile, and when heated with potash they yield valerianic acid, carbonic acid, and hydrogen. This substance has been detected in the liver of the calf as a natural product. It is also found among the products of the putrefaction of fibrine and albumen.

Leucoline = *Quinoline*, $C^{18} H^9$, is one of the compounds found in the least volatile portions of the basic oil of coal-tar. It is also formed when quinine, cinchonine, strychnine, or thialdine are heated in contact with potash. It is a liquid with a disagreeable smell, and boiling at the temperature of 460°. It neutralises acids, and forms with them salts.

Leucoharmine. [Harmaline.]

Lichenine, $C^{12} O^{10} H^{10}$, is a variety of starch found in the *Lichen islandicus*, or Iceland moss. It is colourless and tasteless, swelling up into a jelly-like mass in cold water, and dissolving in hot. Its solution is not coloured blue by iodine, but the jelly is. It is converted into sugar by diluted and boiling sulphuric acid.

Limonine, $C^{42} H^{25} O^{13}$, is a bitter crystalline substance found in the seeds of lemons and oranges. It closely resembles *Cnicine*, the bitter principle of the *Cynarocephalæ*. It contains 2 atoms less water.

Lipyle. [Glyceryle.]

Lophine, $C^{46} H^{16} N^2$, is one of the bases derived from the oil of bitter almonds. It is formed when hydrobenzamide ($C^{42} H^{18} N^2$) is distilled. Ammonia is given off, and lophine is left undissolved. It is soluble in alcohol with acids, and precipitated again by ammonia. It occurs in the form of fine silky crystals, and acts towards acids in the manner of a base. By the action of nitric acid it yields a yellow crystalline compound called *trinitrolophyle*.

Luteoline is a non-azotised colouring principle found in the woad (*Isatis tinctoria*). It is volatile and crystallisable.

Malamide, and **Malamidic Acid**, are synonyms of *Asparagine* and *Aspartic acid*. [Asparagin—Chemistry, *S.* 1.]

Melampyrine is a crystallised non-azotised substance obtained from the cow-wheat, *Melampyrum nemorosum*. It is a tasteless neutral principle.

Melassic Acid, $C^{24} H^{12} O^{16}$, is formed from cane sugar by the action of heat and alkalies. It has a very dark colour, and when thrown down by hydrochloric acid appears as a black flocculent deposit.

Melissic Acid, $C^{60} H^{59} O^3 + HO$, is one of the substances yielded by wax. According to Brodie, when the *hydrated oxide* of *melissyle* or *melissine* is heated with lime and potash, it yields hydrogen gas and melissate of the base. When the acid is separated, it presents itself as a crystalline waxy substance, melting at 192°.

Mellone. [Mellone—Chemistry, *S.* 1.]

Melissyle, $C^{60} H^{61}$, a negative radical found in myricine, a substance which forms about four-fifths of bees'-wax. It consists of the hydrated oxide of melissyle combined with palmitic acid. The palmitic acid is easily separated from the hydrated oxide of melissyle by saponification. The latter is a true alcohol, and, like common alcohol, yields a carbohydrogen resembling olefiant gas. Its composition is $C^{60} H^{62} O^2$. It is identical with *melissene* or *melissic alcohol*. This compound is very interesting, as it has been shown by Brodie to possess the same relations, and to form a series of compounds homologous with those of ethyle and methyle, the lowest of the series of carbohydrogen radicals.

Menispermine, $C^{18} H^{12} NO^2$, is a white fusible crystallisable alkaloid, forming salts with the acids found in the seeds of the *Menispermum Cocculus*, known as *Cocculus Indicus*.

Menyanthine is a non-azotised uncrystallisable neutral principle found in the common buck bean, *Menyanthes trifoliata*.

Mesitylole, $C^{18} H^{12}$, is obtained from the distillation of acetone with fuming sulphuric acid. Thus, 3 equivalents of acetone = $3(C^6 H^6 O^2)$, yield 6H O and mesitylole. The atoms of hydrogen may be substituted by chlorine, bromine, and nitrous acid.

Mesaconic Acid, $C^5 H^2 O^3 + H O$, is an acid described by Gottlieb and obtained from the action of nitric acid on citraconic acid. It forms minute crystals, sparingly soluble in water.

Methionic Acid, $S^2 C^2 H^3 O^7$, this acid with *Ethionic*, isethionic, and althionic acid is formed by the action of sulphuric acid on ether and alcohol.

Methylo-urea. [Aniline.]

Methylodiethylamylium. [Amyle.]

Methylethylamylamine. [Amyle.]

Mimotannic Acid. The tannic acid produced from catechu possesses some properties different from that of the tannic acid from oak bark, and Berzelius proposed calling the one mimotannic acid, from *Mimosa*, and the other quercitannic acid, from *Quercus*, the name of the oak.

Myricine. [Melissic Acid.]

Myriospermine. Balsam of Peru, according to Richter, contains two oils, *myroxyline*, which is insoluble in alcohol and *myriospermine*, which is soluble in that liquid. The latter substance when treated with an alcoholic solution of potash, yields an acid resembling cinnamic acid, which is called *myriospermic acid*.

Myristic Acid, $C^{28} H^{27} O^3 + H O$, is a crystalline fatty acid found in the seeds of *Myristica moschata*, the common nutmeg. Combined with the oxide of lipyle, it forms the fat of the nutmeg, with the oxide of ethyle a myristate which is an oily liquid.

Naphthaline, $C^{10} H^4$, or $C^{20} H^8$, is found in all kinds of tar, but especially in coal tar. It is easily obtained by redistilling this latter substance, when it occurs in a semi-solid state. It may be then purified by sublimation and crystallised from hot alcohol. It is colourless and volatile, forming large tabular transparent crystals, with a peculiar smell and an acrid taste. It is volatilised like camphor by exposure to the air, and boils at a temperature of 414°. It forms with bromine and chlorine a large number of compounds by substitution, and is acted on in the same way by sulphuric and nitric acids. These compounds have been studied with great diligence and singular accuracy by Laurent, who has founded on them his great *law of substitutions*, which has been one of the most remarkable aids to the development of modern organic chemistry. [Chlonaphtase.]

The compounds of chlorine and bromine with naphthaline are very numerous, and have many of them been carefully described by Laurent. The whole of the possible compounds of these two elements with naphthaline amounts to the large number of 1040. In the same manner sulphuric and nitric acids are found to act on naphthaline, and to give a long series of compounds highly interesting to the chemist, but which have not yet been fully studied. The following are a few examples of these compounds:—

Hyposulphonaphthalic acid .	$C^{20} H^8 S^2 O^5 + H O$.
Hyposulphonaphthic acid . .	$C^{11} H^5 S^2 O^6$.
Sulphonaphthiline . .	$C^{20} H^5 S O^2$.
Sulphonaphthilide . . .	$C^{24} H^{10} S O^2$.
Nitronaphthaline . . .	$C^{20} H^7 N O^4$.
Thionaphthamic Acid . .	$C^{20} N S^2 H^8 O^5 + H O$.
Nitronaphthese . . .	$C^{20} H^6 N O^4$.
Nitronaphtale	$C^{19} H^6 N^3 O^{11}$.

Odorine. [Picoline.]

Œnanthic Acid, $C^{14} H^{13} O^2 + H O$, is found in wines in combination with oxide of ethyle, forming an ether, which is one of the elements of the odour of wines. It is also found in the spirit of fermented grain. In order to obtain the acid, the ether is decomposed by caustic potash, and the œnanthate of potash thus formed is distilled with dilute sulphuric acid. The acid thus obtained is a semi-liquid substance, insoluble in water, but soluble in alcohol and ether. The œnanthate of oxide of ethyle, *œnanthic ether*, is a colourless liquid, having the well-known smell of wine, and producing a stupifying effect. This ether has been shown by Mulder to be only one of many ethers which give the peculiar odours or *bouquet* to wines. (Mulder's 'Chemistry of Wine.')

Œnanthyle, $C^{14} H^{13}$, is known by some of its compounds. *Hydrated Oxide of Œnanthyle—Œnanthole—Œnanthal*, $C^{14} H^{13} O + H O$, is the aldehyde of œnanthylic acid, and is obtained from castor oil. *Œnanthylic Acid*, $C^{14} H^{13} O^3 + HO$, is an oily acid, and yields fatty salts. The œnanthylates of the oxides of ethyle and methyle are fragrant compounds.

Oleo-phosphoric Acid. [Cerebric Acid.]

Opiammon, $C^{40} H^{19} N O^{16}$, is obtained from the opianate of ammonia by the loss of one equivalent of ammonia and four of water. It is a pale yellow powder, which, when boiled with water, yields opianic acid and opianate of ammonia.

Opianic Acid, $C^{20} H^{10} O^{10}$, is formed from the decomposition of *Narcotine*, one of the compounds contained in opium. This acid forms soluble and crystallisable salts, with the oxides of the metals and oxide of ethyle. The latter is *opianic ether.*

Opianine, $C^{66} N H^{36} O^{23}$, is a crystalline compound found in company with narcotine and other compounds in opium.

Opianyle, $C^{20} H^{10} O^{8}$, is formed by the action of nitric acid on narcotine. It crystallises in fine needles, which are soluble in ether and alcohol, and become of a deep purple when brought in contact with sulphuric acid.

Orcine. [Erythric Acid.]

Oreoselone. [Athamantine.]

Oxamic Acid, $C^{4} O^{5} N H^{2}$, is one of the products of the action of heat on oxalate of ammonia. This acid forms soluble and crystallisable salts, with lime, baryta, ammonia, and oxide of silver.

Palmitic Acid. [Cetyle.]

Papaverine, $C^{40} N H^{2} O^{8}$, a crystalline base discovered by Merck in opium.

Paramide, $C^{8} H N O^{4}$, is formed when mellitate of ammonia is heated in a retort to about 320°. It is accompanied by another body called *Euchronic Acid.* Paramide is a solid yellow substance, which when long boiled with water is changed into a bimellitate of ammonia.

Paranaphthaline = *Anthracene*, $C^{30} H^{12}$, is a substance polymeric with naphthaline, and also found in coal tar. It melts at 356° and distils at 392°, crystallising in foliated plates. It forms with nitric acid a series of compounds, in which oxygen is substituted for hydrogen. These compounds are again capable of uniting with hyponitrous acid. As with the compounds of naphthaline we are indebted for all that is known of these to the researches of Laurent.

Parellic Acid, $C^{21} H^{8} O^{10}$, one of the substances produced in the various dyeing lichens of commerce. It is found in company with lecanoric acid.

Parietine = *Rhabarbine* = *Parietinic Acid* = *Chrysophanic Acid*, $C^{10} H^{8} O^{3}$. This substance, which was first found in rhubarb and has the above names, is also found in the *Parmelia parietina.* [Chrysophanic Acid.]

Pelargonic Acid, $C^{18} H^{17} O^{3} + H O$, is found in the oil of *Pelargonium roseum.* It is an acid oily liquid, with a rancid smell. It becomes solid at low temperatures, and its salts form soap. It forms a *Pelargonate of the oxide of Ethyle*, $C^{4} H^{5} O + C^{18} H^{17} O$, which is an oily liquid of a very peculiar smell. It is stated by Frankland that whiskey owes its peculiar flavour to the presence of this compound. It is manufactured for the purpose of giving new whiskey the flavour of old. It is probable this acid is formed from sugar, as all oily acids are found to be.

Phenyle, $C^{12} H^{5}$, the hypothetical base of carbolic acid, which according to Laurent is an *Hydrated oxide of Phenyle*, $C^{12} H^{5} O + H O$. Laurent has succeeded in obtaining with this radical phenyle a series of compounds resembling those of indigo, salicyle, and other bodies.

Phillyrine is a non-azotised compound, crystallising in silver scales and of a bitter taste, obtained from various species of *Phillyrea.*

Phloretine. [Phloridzin.]

Phloridzeine. [Phloridzin.]

Phloridzin, $C^{42} H^{29} O^{24}$, is a substance closely resembling salicine. It is obtained from the roots of the apple, pear, plum, &c., and is extracted in the same way as salicine. It crystallises in the form of small scales, which are soluble in hot water and in alcohol. It is very bitter and powerfully febrifuge. When boiled with dilute sulphuric acid, it yields a resinous substance called *phloretine*, $C^{30} H^{14} O^{10}$, and grape sugar. If phloridzin moist be exposed to atmospheric air and ammonia it forms a deep red substance, soluble in ammonia, and which is precipitated from the solution by acids. It has the same elements as phloridzin, with eight equivalents of oxygen and two of ammonia. This is *phloridzeine.*

Pthalamide, $C^{16} H^{6} N O^{4}$, is formed from pthalic acid by ammonia.

Pthalic acid, $C^{16} H^{4} O^{6} + 2H O$, is formed by the action of nitric acid on chloride of naphthaline.

Picoline, $C^{12} H^{7} N$, is a volatile oily base, isomeric with aniline, and found in coal tar. It has very powerful basic properties, and is probably the same substance as the *odorine* described by Unverdorben.

Picric Acid = *Carbazotic Acid* = *Nitropicric Acid* = *Nitrophenisic Acid*, $C^{12} \left\{ \begin{matrix} H^{2} \\ 3\ N\ O^{4} \end{matrix} \right\} O + H O$, is formed by the action of nitric acid on anilic acid, indigo, salicine, salicyle, salicylic acid, hydrate of phenyle, common silk, and other substances. However obtained it assumes a crystalline form, and is of a pale yellow or white. It has a very bitter taste, and is said to be used for adulterating bitter beer. It is fusible and volatile, readily uniting with bases; its salts crystallise and explode when heated.

Picrotoxine, a bitter principle obtained from the seeds of *Menispermum Cocculus* (*Cocculus Indicus*). It forms white prisms on crystallising, and appears to be a vegetable base containing nitrogen.

Picryle = *Picrine*, $C^{42} H^{18} N O^{4}$, is yielded by the distillation of the product obtained by acting on oil of bitter almonds with sulphuret of ammonium. By the action of nitric acid it is converted into *trinitropicryle* $C^{42} \left\{ \begin{matrix} H^{15} \\ 3\,NO^{4} \end{matrix} \right\} NO^{4}$ which is a yellow crystalline powder.

Pine Apple flavour. [Butyle.]

Porphyroxine, a crystalline compound found in Bengal opium.

Propione, $C^{5} H^{5} O$, is a compound homologous with acetone. It is formed when propylate of baryta is exposed to heat. When oxidised it yields propylic acid. It is a volatile oily fragrant liquid. It was formerly called metacetone.

Propyle, $C^{6} H^{7}$, a compound hypothetical radical. Some of its compounds are known, but not its ether or its alcohol. *Propylic acid*, $C^{6} H^{5} O^{3} + H O$, is however well known, and has this radical for its base. This acid is next above acetic acid in the series of volatile acids. It is procured by heating the cyanide of ethyle with a solution of potash in alcohol. Propylate of potash is thus obtained, which must be distilled with sulphuric acid, when propylic acid passes over. It is an oily acid, and its salts have something of a fatty character.

Rhabarbine. [Parietine.]

Rhodeoretine, $C^{42} H^{35} O^{20}$, an acid found in jalap. It has the property of striking a fine red colour with sulphuric acid. When combined with bases, it takes up an equivalent of water, and is then called *hydrorhodeoretine.* When acted on by hydrochloric acid, it is resolved into glucose and an oily substance called *rhodeoretinole.* In this respect rhodeoretine resembles salicine and phloridzine.

Rubiane, $C^{72} H^{40} O^{40}$, a yellow crystalline acid found in madder (*Rubia tinctorium*).

Rubinic Acid, a red acid obtained from catechine, or tanningenic acid. [Catechine.]

Rue, Oil of. [Capric Acid.]

Saliretine. [Chemistry—Salicin, *S.* 1.]

Sanguinarine, an alkaloid found in *Sanguinaria canadensis.* It is a gray powder, which produces powerful sneezing. Its salts are of a red colour.

Saponine, an active principle found in the *Saponaria officinalis.* Although this plant is apparently inactive, this principle is a powerful sternutatory, and has a sweet and acrid taste. It is soluble in water, and when agitated it froths like soap. *Saponaria* was formerly used as a detergent.

Sarcocollin, $C^{22} H^{19} O^{10}$, a gum found in the Sarcocolla of commerce, which is the dried juice of the *Penæa mucronata.* It has a sweet and bitter taste, and is soluble in both water and alcohol.

Sebacic Acid, $C^{10} H^{8} O^{3} + H O$, is obtained by distilling oleic acid or oleine, and boiling the product with water, when the solution on cooling deposits crystals of sebacic acid. This acid is soluble in alcohol and ether, and forms salts with the metals and compound radicals. The sebate of the oxide of ethyle has a fragrant smell like melons.

Selenaldine, a compound formed by the action of seleniuretted hydrogen on aldehydammonia.

Senegine, an acrid non-azotised principle, obtained from the *Polygala Senega.* It acts as a sternutatory.

Sinapoline, $C^{14} H^{12} N^{2} O^{2}$, a base obtained from oil of mustard by the action of the moist hydrated oxide of lead.

Sinnamine, $C^{8} H^{6} N^{2}$, a base obtained by acting on *Thiosinnamine*, $C^{8} H^{8} N^{2} S^{2}$, by any oxide of lead or mercury, when the latter loses all its sulphur, and a portion of its hydrogen, and sinnamine is left. It forms definite compounds with chlorides of mercury and platinum.

SPANIOLITMINE, $C^{18} H^{7} O^{16}$, one of the three solids which, according to Kane, exist in litmus, in addition to *Erythroleine*, which is a red fluid. The other solids are *Azolitmine* and *Erythrolitmine*.

STILBENE, $C^{28} H^{12}$, one of the products of the decomposition of the compounds of benzoyle. It is formed from the hyduret of *Sulphobenzoyle*, $C^{14} H^{5} S^{2} O$, which, when strongly heated, gives off sulphuretted hydrogen, and at last distils over, in pearly scales, stilbene. It forms a compound with chlorine when this gas is passed through melted stilbene. Bromine also combines with stilbene, forming bromide of stilbene, with the addition of nitric acid, *nitrostilbase*, *nitrostilbese*, and *nitrostilbic acid.*

STYRACINE, $C^{36} H^{10} O^{4}$, is a substance procured from liquid storax, by distillation with carbonate of soda. At the same time it yields cinnamate of soda and *styrole*, $C^{16} H^{8}$. It is probable from this fact that styrole and cinnamole are the same substance. Styracine may be regarded as a compound of cinnamic acid, $C^{18} H^{7} O^{3}$, with the oxide of a compound radical, $C^{18} H^{9}$, which is called *styryle*. If styracine be heated with a solution of potash, a cinnamate of potash is left, and a *hydrated oxide of styryle* distils over. This substance exists in two forms, as a solid and as a liquid, and has been described under the name of *styrone*.

SUBERYLE, $C^{8} H^{6} O$, the hypothetical radical of suberic acid, which would thus have this formula, $C^{8} H^{6} O^{3} + H O$.

SURINAMINE. [JAMAICINE.]

SYNAPTASE = *Emulsin*. The white part of both sweet and bitter almonds is principally composed of a peculiar matter very soluble in water, which has been called *synaptase* by M. Robiquet. It appears to be identical with a substance described by Liebig and Wöhler, and called by them emulsin. Robiquet prepared synaptase by submitting sweet almonds, from which all the oil had been expressed, to maceration for two hours, and then subjecting them to pressure gradually increased. The filtered liquid holds vegetable albumen in solution which may be thrown down by acetic acid, also gum which may be precipitated with acetate of lead. The liquid now contains acetate of lead, acetic acid, sugar and synaptase. The lead may be thrown down by sulphuretted hydrogen, and the synaptase by alcohol. The synaptase should be washed with alcohol, and dried in ovens over sulphuric acid. The dry synaptase is a yellowish white opaque horny mass, which is very soluble in cold water. Iodine produces in the solution a rose colour. The synaptase soon decomposes in solution, deposits a white precipitate, and acquires a mouldy odour. It coagulates at 140°, like albumen. It contains azote and produces ammonia. The following is the result of two analyses of this substance by Dr. R. D. Thomson, and Mr. Richardson.

Carbon . . .	49·025	48·555
Hydrogen	7·788	7·677
Oxygen	24·277	25·026
Nitrogen	18·910	18·742
	100·000	100·000

The action of synaptase on the amygdalin of the almond is very singular, and throws light on the way in which the oil of bitter almonds is formed in some of the seeds of the almond-tree. "On mixing a solution of 10 parts of amygdalin in 100 parts of water, a particular decomposition immediately takes place; the mixture becomes opalescent without losing its transparency; acquires the odour of bitter almonds, and gives on distillation hydrocyanic acid and hyduret of benzoyle with the vapour of water. The residue is rendered turbid by coagulated synaptase, and on continuing the evaporation, a very sweet liquid is obtained, which contains crystallisable sugar. After destroying the sugar by fermentation, a fixed acid remains in the residue. The quantity of sugar obtained is more considerable than what the elements of the amygdalin could produce; it would appear, therefore, that the elements of the synaptase contribute to its formation. The decomposition is not complete unless the amygdalin and synaptase are dissolved in a proper quantity of water; if it is insufficient to dissolve the hyduret of benzoyle liberated, a corresponding quantity of amygdalin remains undecomposed. (Traité, p. 276.) The constituents of the bitter almond are the fixed oil, which is separated by expression, and the synaptase and amygdalin, the two last in such a condition that they cannot re-act upon each other. When the almond cake is treated with boiling alcohol, the amygdalin is dissolved out, and the synaptase coagulated. When the cake is moistened with water, the odours of hydrocyanic acid, and of the essence, are immediately perceived, but the cake must be diffused through a certain quantity of water, in order that the mutual action of the synaptase and amygdalin may be complete, and that the whole of the last may disappear. In preparing the distilled water of bitter almonds of pharmacy, M. Liebig recommends that a mixture of 1 part of the cake and 20 parts of lukewarm water be made, and left to itself for twenty-four hours before submitting it to distillation. One atom of amygdalin contains the elements of (Liebig):—

1 equiv. of hydrocyanic acid . .	$C^{2} H N$
2 equiv. of hydruret of benzoyl .	$C^{28} H^{12} O^{4}$
½ equiv. of sugar	$C^{6} H^{5} O^{5}$
2 equiv. of formic acid . . .	$C^{4} H^{2} O^{6}$
7 equiv. of water	$H^{7} O^{7}$
1 equivalent of amygdalin . .	$C^{40} H^{27} N O^{22}$

One hundred parts of amygdalin are said to yield 47 parts of the crude essence of bitter almonds, and these 47 parts to contain 5·9 parts of free hydrocyanic acid. The last acid is not indicated by nitrate of silver added to a solution of the crude essence in water, owing to the presence of the oil; to obtain a precipitate of cyanide of silver, ammonia-nitrate of silver must be used, and the ammonia saturated with nitric acid, after the lapse of some time." (Graham's 'Chemistry.')

SYRINGINE, a non-azotised bitter principle, found in the common lilac (*Syringa vulgaris*).

TANACETINE, a non-azotised vegetable principle, obtained from the *Tanacetum vulgare*, the common tansy.

TANGHINE, a non-azotised bitter principle, obtained from the *Tanghinia venenifera*, a poisonoust ree in Madagascar.

TARTRALIC ACID, $C^{12} H^{6} O^{5} + 2 H O$, and *Tartrelic Acid*, $C^{16} H^{8} O^{20} + 2 H O$, two acids obtained from tartaric acid. By long contact with water their salts are converted into tartrates and tartaric acid.

TEROPIAMMON, $C^{60} N H^{29} O^{26}$, a compound described by Anderson. It is obtained from narcotine by the action of nitric acid of moderate strength. It forms small white crystals, which are sparingly soluble, and which present a crimson red colour when heated with sulphuric acid.

THIOSINNAMINE, $C^{8} H^{8} N^{2} S^{2}$. When ammonia is added to the pure oil of mustard, $C^{8} H^{5} N S^{2}$, this substance is formed. It is crystalline, acts as a powerful base, and yields a variety of interesting compounds. [SINNAMINE.]

TOLUOLE = *Tolene*, $C^{14} H^{8}$. This substance, which, according to Deville, is a radical base, is contained in the Balsam of Tolu. It is homologous with benzole. When it is acted on by nitric acid, the hydrogen is replaced by nitrous acid, and two new compounds, *Nitrotoluole* and *Dinitrotoluole*, crystalline, are formed. The first is a liquid, and the second is a solid. Other compounds have been produced by Deville. *Toluylic acid*, $C^{16} H^{8} O^{4}$, corresponds with benzoic acid.

URAMILE. [URYLE.]

URYLE, $C^{8} N^{2} O^{4}$, is the hypothetical base of the various compounds obtained from uric or lithic acid. This base is also known by the name of *Cyanoxalic acid*, as it contains the elements of 2 equivalents of oxalyle, and 2 of cyanogen.

The following table will show the relation of this substance to the various compounds derived from uric acid:—

Uric acid	$C^{10} N^{4} H^{4} O^{6}$
Alloxantine	$C^{8} N^{2} H^{5} O^{10}$
Alloxan	$C^{8} N^{2} H^{4} O^{10}$
Dialuric acid . . .	$C^{8} N^{2} H^{4} O^{8}$
Hydurilic acid . . .	$2 (C^{12} N^{3} H^{6} O^{11})$
Nitrohydnrilic acid . .	$C^{8} N^{3} H^{2} O^{14}$
Uramile	$C^{8} N^{3} H^{5} O^{6}$
Thionuric acid . . .	$C^{8} N^{3} H^{7} O^{14} S^{2}$

VALERYLE, $C^{10} H^{9}$, a compound radical not known in its separate state. Its hydrated protoxide *valeral* or *valeraldehyde*, is said to be one of the products of the oxidation of albuminous matter. It is a volatile liquid, yielding valerianic acid when exposed to oxidising agents. It unites with ammonia, forming a crystalline compound with ammonia.

Valerianic acid, $C^{10} H^{9} + O^{3} + H O$, is found in nature, in the oil of valerian, obtained from the *Valeriana officinalis*. It has also been found in train-oil and sperm-oil combined with the oxide of lipyle. It also occurs in various fats and oils from the animal kingdom, and in the seeds of the guelder rose (*Viburnum Opulus*).

Valerate of the oxide of Ethyle is a fragrant ether, and is found in plants, giving a peculiar scent to those which possess it. It combines with various other bases. The compounds of valeryle, as far as they are known, are homologous with those of methyle, ethyle, formyle, and acetyle.

Xyloidine, $C^{12}\left\{\begin{matrix}H^8\\2NO^4\end{matrix}\right\}O^{10}$. When potato starch is rubbed up with strong nitric acid, the starch is dissolved, and a viscid liquid is produced from which water precipitates the compound called xyloidine. It resembes in some of its properties gum tragacanth, but it contains so large a quantity of nitric acid that it is explosive.

The following works may be consulted on the subject of the present state of Organic Chemistry:—Gregory's *Handbook of Organic Chemistry*; Fowne's *Elements of Chemistry*, edited by Jones and Hfomann; Lechmann's *Physiological Chemistry*, translated by Day for the Cavendish Society; Gmelin's *Handbook of Chemistry*, translated by Watts for the Cavendish Society; Bowman's *Medical Chemistry*; Turner's *Elements of Chemistry*, edited by Liebig; and Graham's *Elements of Chemistry*.

CHERT, a variety of quartz being a kind of granular Chalcedony. It is a transition from the smoother forms of Quartz to Hornstone. [Agate.]

CHESHUNT. [Hertfordshire.]

CHIGWELL. [Essex.]

CHILDREN, JOHN GEORGE, was born on the 18th of May, 1777, at Ferox Hall, Tonbridge. From the Grammar school of that town he went to Eton, and afterwards, in 1794, entered Queen's College, Cambridge, as fellow-commoner. He studied with a view to the church, but the early death of his wife led him to travel in the south of Europe and in the United States, from whence he returned to devote himself to scientific pursuits.

While studying mineralogy, chemistry, and galvanism, he made the acquaintance of Davy, Wollaston, and other leading men of science. In 1807 he was elected a Fellow of the Royal Society. In the following year he contributed a paper to the 'Philosophical Transactions,' on 'Some experiments performed with a view to ascertain the most advantageous method of constructing a voltaic apparatus, for the purposes of chemical research,' in which he determined the effect of unusually large battery plates. With twenty pairs of plates each four feet long and two feet wide, he confirmed Davy's observation, "that intensity increases with the the number [of plates], and the quantity of electricity with the extent of the surface."

This was followed in 1815 by a paper, published also in the 'Philosophical Transactions,' 'An account of some experiments with a large voltaic battery,' in which a further series of singularly interesting results was described, among them the conversion of iron into steel by union with diamond, under the sole action of the battery.

Between the dates of these papers Mr. Children travelled in Spain, and visited the quicksilver mines of Almaden, then but little known in England. In 1816 he was appointed one of the librarians in the department of Antiquities (afterwards of Natural History) of the British Museum. In 1819 he published a translation of Thénard's 'Essay on Chemical Analysis,' and in 1822 of Berzelius's 'Treatise on the Use of the Blowpipe,' with additional experiments and notes. He discovered a method for extracting silver from its ore without amalgamation, and derived considerable profit by selling the right to use it to several South American mining companies in 1824. He helped in establishing the 'Zoological Journal,' which appeared in 1825, and was one of the first editors. In 1826 he was elected secretary of the Royal Society, and resigning the following year on account of ill health, was re-elected in 1830, and retained the office for seven years. In 1839, on the death of his third wife, Mr. Children resigned his post at the British Museum. He died on the first day of 1852.

CHINA. In the previous Supplement, under the head China, an account is given of the last war between Great Britain and China, from its commencement in 1840 to its termination in September, 1843, as well as of the events which preceded the war, and the treaties by which it was followed. In 1856 a dispute occurred between the British and Chinese authorities at Canton. A small vessel, not British, but with a British register, and bearing the British flag, was boarded by the Chinese, and twelve of the crew were seized. This led to a demand for apology, required by the British plenipotentiary, but refused by Yeh, the Chinese commissioner or governor of Canton. Hostile proceedings followed. The forts in the Canton river were attacked and taken, and a large number of war-junks burned. Lord Elgin was sent out as Her Majesty's commissioner, with a fleet and troops, for the purpose of entering into negotiations with the Emperor of China. Meantime the great mutiny had broken out in Hindustan, most of the troops sent from England were required to assist in quelling it, and the quarrel with the Chinese remained unsettled. As however the dispute was confined to Canton and the authorities there, especially the commissioner, Yeh, the British authorities, in conjunction with the French, resolved to attack the fortifications of Canton. This operation was successfully performed in the morning of the 28th of December, 1857, when the principal forts were carried by escalade, and the whole of the defences of the city were taken possession of. The assault was conducted by Major-General Van Straubenzee, commander-in-chief of the British troops in China, with about 4000 men, assisted by Rear-Admiral Sir Michael Seymour, commander of the British naval forces, and by Rear-Admiral Sir Rigault de Genouilly, commander of the French naval forces, with about 1500 men. The British and French forces continue to hold possession of Canton. Commissioner Yeh was captured on the 5th of January, 1858, and also the Tartar general.

CHINCHAS, a group of three islands in the Bay of Pisco, on the coast of Peru, lies between 13° and 14° S. lat., 76° and 77° W. long. They are naturally bare rocks, without a sign of vegetation of any sort, but they have obtained great celebrity for the vast quantities of guano with which they are covered. The islands lie nearly north and south, and are separated by channels from one mile to two miles broad. In their general formation they are all alike. On the eastern side they present a perpendicular wall of rock, from the edge of which the guano slopes towards the centre of each island, where a pinnacle of rock rises above the surface; from this point there is a gentle slope to the western shore, the guano continuing to within a few feet of the water. Each of the islands is about two miles round; and each presents the appearance of a flattened cone, the rocky inequalities of the original surface having been filled up and covered with the guano, the cuttings of which vary in depth from a hundred feet to a few inches. Round the base of the islands little rocky peninsulas jut out, in which the washing of the sea has formed many caverns, the resort of sea-lions. Whales also are frequently seen gamboling about the islands. The middle island has been moderately worked, but the greatest quantity of guano has been taken from the north island: the south island is still untouched. The quantity of guano on the three islands has been estimated at 250 millions of tons. Guano is also found on the Battista Islands, and upon San Gallen Island, which lie immediately south of the Chinchas, but only in small quantities. It is also found on the Lobos Islands, off the north-west coast of Peru, and at various points along the coast of South America; but what is obtained from the Chincha Islands is prized above all other deposits on account of its extreme dryness. [Guano, *S.* 2.]

CHIOCOCCA (from χιὼν κόκκος), a genus of plants belonging to the natural order *Cinchonaceæ*. Calyx with an oval tube, and an acutely 5-toothed permanent limb. Corolla funnel-shaped, with an obconical tube or throat, and five acute lobes. Stamens with the filaments hardly adnate to the bottom of the corolla, downy, and shorter than the anthers, which are inclosed and linear. Style rather clavate at the apex, entire or slightly 2-lobed. Berry somewhat didymous, compressed, crowned by the teeth of the calyx, containg two chartaceous 1-seeded pyrenæ. Seeds pendulous. Embryo with a long superior radicle. Albumen cartilaginous. Shrubs generally with a somewhat climbing habit. Leaves opposite, ovate or oblong acute, glabrous. Stipules broad at the base, permanent, more or less apiculated. Racemes axillary, opposite, simple or panicled. Flowers pedicellate, of a yellowish-white colour. Roots emetic and alexiteric.

C. racemosa, Racemose Snow-Berry, has oval leaves acuminated at both ends, smooth; stipules broad at the base, and apiculated by a long point at the apex; filaments of stamens downy. It is a native of the West Indian Islands and Carthagena, on hills. It is a very variable shrub. The corollas at first are white and scentless, but at length become yellowish and sweet-scented. The berries are snow-white, hence the English name. The root has an acid bitter taste, and has long been used as a strong resolutive or attenuant.

C. densiflora, Dense-Flowered Snow-Berry, has ovate rather coriaceous leaves, many-flowered racemes, the corolla much longer than the calyx, the filaments densely-bearded. It is a native of Brazil, in woods at Almeida and Serradas, on the mountains of Bahia, and at the port of St. Catherine.

C. anguifuga, Anguifuge Snow-Berry, has ovate acuminated leaves; stipules very broad, short, each ending in a short point; racemes panicled; corolla not quite three times longer than the calycine teeth. It is a native of Brazil in woods, French Guyana, Trinidad, Peru, Cuba, and on the Spanish Main.

C. odorata, Sweet-Scented Snow-Berry, has broad oval leaves, rather coriaceous, very blunt, acute at the base, and running down the short petioles; peduncles axillary, solitary; 3-4-flowered corolla, with a bearded throat. It is a native of Elizabeth Island, one of the Society Islands.

C. barbata, Bearded Flowered Snow-Berry, has oval leaves, acute at the base, and tapering into short tepioles, acuminated and obtuse at the apex; peduncles axillary, solitary; 1-3-flowered; corolla with a bearded throat; 5-cleft. It is a native of the Society and Friendly Islands.

C. Javana, Java Snow-Berry, is a parasitical shrub, with oblong lanceolate leaves, acuminated at both ends, glabrous, velvety, and shining above; corymbs terminal, trichotomous. This is a native of Java, on the mountains, upon trees.

All the species of *Chiococca* grow best in a mixture of loam, peat, and sand, and strike freely in sand under a hand-glass.

CHIPPING NORTON. [Oxfordshire.]

CHIRK. [Denbighshire.]

CHLORINE. [Chemistry, *S.* 1.]

CHLOROCINNOSE. [Chemistry, *S.* 1.]

CHLOROCYANIC ACID. [Chemistry, *S.* 1.]

CHLOROPHYLE. [Tissues, Organic, *S.* 1.]

CHLOROPHYLLITE. [Mineralogy, *S.* 1.]

CHLOROSALICYMIDE, CHLOROSAMYDE. [Chemistry, *S.* 1.]

CHOLERA. [Public Health, *S.* 2.]

CHRYSEN. [Chemistry, *S.* 1.]

CHUMLEIGH. [Devonshire.]

CHURCH BUILDING COMMISSIONERS were first appointed by the statute 58 Geo. III. c. 45 (which however was amended by upwards of thirty subsequent Acts), for building new churches in populous districts, and for dividing existing parishes, and assigning new ecclesiastical districts and determining their endowment and patronage, their recommendations being notified and carried into effect by orders in council. In this way, not only have new districts been carved out of existing parishes, and themselves considered as original parishes, but churches and chapels have in some cases been constituted the parish church, and the original parish church has become a district church or chapel of ease. The ministers of these districts are usually denominated *incumbents*, not being *parsons* and *vicars*, properly so-called. The Church Building Commission, although by the original Act limited to ten years, was from time to time extended; and the powers of the commissioners have been recently transferred to the Ecclesiastical Commissioners.

CINCHOVATINA. [Chemistry, *S.* 1.]

CINNAMODENDRON, a genus of plants referred to Von Martius's doubtful order *Canellaceæ*. This genus has been separated from *Canella*, which is well represented by *C. alba*, a common West Indian aromatic shrub, with evergreen coriaceous obovate alternate stalked leaves, no stipules, and corymbs of purple flowers. *C. alba* is often called Wild Cinnamon in the West Indies, on account of its warm aromatic fragrant properties. There is but one other species of *Canella*. *Cinnamodendron* has but one species, *C. axillare*. It is a Brazilian tree with aromatic properties. Its bark is used as a tonic and stimulant. It is administered in low fevers and relaxed sore throat.

CINNYRIDÆ. [Sun-Birds.]

CLAIM IN CHANCERY. [Equity, *S.* 2.]

CLAPHAM. [Surrey.]

CLARE. [Suffolk.]

CLARK, WILLIAM TIERNEY, a civil engineer, was born at Sion House, Somersetshire, August 23, 1783. He was apprenticed when very young to a millwright in Bristol, and followed the trade for several years in that city and at Colebrookdale. In 1808 he removed to London, and entered the service of the late Mr. Rennie as draughtsman; and held the employment till 1811, when he was appointed engineer of the West Middlesex Waterworks. The establishment was at that time on a very small scale—an engine of twenty-horse power supplying the neighbouring hamlets from an insufficient reservoir, yielding no profit to the company. But under Mr. Clark's advice the works were enlarged, and he spared no exertion to render them complete and effectual, until at last there were three pumping-engines of the aggregate power of 245 horses, and reservoirs capacious enough to contain from 35 to 40 million gallons, and producing an annual rental of nearly 70,000*l.* This post he retained for the rest of his life.

In 1819 Mr. Clark undertook to complete the Thames and Medway Canal, a work which had been stopped for want of capital, and under his direction it was finished some years afterwards; and the great tunnel through the Frindsbury hills remains as a solid proof of his ability. His next work was the suspension bridge over the Thames at Hammersmith, which was commenced in 1824 and finished in 1827. It is chiefly remarkable for the small deflecion of the chains between the chord-line or points of suspension. The suspension-bridge at Marlow was also designed by Mr. Clark, and he was employed by the late Duke of Norfolk to build one over the Arun.

Mr. Clark was however best known by the suspension-bridge which he constructed across the Danube at Pesth. It was begun in 1839 and finished in 1849, at a cost of 622,000*l.* At times the bursting of dams and the pressure from accumulated ice in the winter threatened a total stoppage of the works, but all obstacles were overcome by the energy and perseverance of Mr. Clark, and the bridge remains an admirable monument of his genius and skill.

Mr. Clark was elected a Fellow of the Royal Society in 1837; he was a Fellow also of the Astronomical Society, and a member of the Institution of Civil Engineers. He died September 22, 1852.

CLARKSON, THOMAS, was born March, 26, 1760, at Wisbeach, Cambridgeshire, where his father, who was a clergyman, was master of the free grammar school. He was at first educated under his father, and after that was sent to St. Paul's School, London, and thence to St. John's College, Cambridge, where he gained the first prize for a Latin dissertation proposed for the middle bachelors. In the following year, 1785, the Vice-Chancellor of the University announced as the subject of a Latin dissertation for the senior bachelors, 'Anne liceat invitos in servitutem dare?' ('Is it right to make slaves of others against their will?'). The prize was awarded to Clarkson for his essay, which was read with great applause in the Senate House, in June, 1786. He had used much industry in collecting materials for this dissertation, and had become greatly excited by what he had read of the miseries to which the slaves were subjected in the carrying on of the trade. He resolved to use all his efforts to get it suppressed, and in order to do so relinquished his chances of advancement in the church, for which he had been intended, and in which he had taken deacon's orders. He translated his essay into English, and its publication brought him into connection with a small body of Quakers who had for several years formed an association for the suppression of the slave-trade, and he was afterwards introduced to Mr. Wilberforce, and other persons of influence. William Penn in 1668 had denounced the trade as cruel, impolitic, and unchristian; in 1727, at a general yearly meeting of the Quakers in London, it was declared "that the importing of negroes is cruel and unjust, and is severely censured by the meeting;" and in 1760 a similar meeting passed a resolution to exclude from their society all who "participated in any way in that guilty traffic." While Mr. Wilberforce, seconded by a party which gradually increased, repeatedly brought the question before the House of Commons, Mr. Clarkson was labouring without the walls of parliament, was collecting evidence, writing letters and pamphlets, and attending meetings at Liverpool and Bristol, then the chief centres of the trade, and at Plymouth, Bridgewater, and other places. He even went to Paris, and remained there six months in the greatest heat of the French revolution, furnishing Mirabeau with materials for speeches against the trade, which were delivered before the French Convention, but without producing the desired effect. In England, however, after more than twenty years of incessant exertion, the cause was won: a law for the entire abolition of the trade in slaves was passed March 25, 1807, Mr. Wilberforce having first brought the subject before parliament in 1787.

But the exertions of Clarkson and his supporters, who had now become numerous, did not terminate with the suppression of the trade in slaves. The struggle was afterwards continued during another twenty years for the total abolition of slavery in the British West India Islands. In 1833 their efforts were again crowned with success, by the passing of the Emancipation Act, which liberated nearly a million of slaves, and awarded twenty millions of pounds sterling as compensation to their late owners. Declining health had prevented Clarkson from appearing in public during the latter years of the movement. Cataract had formed in both his eyes, and for a short time he was quite blind. He underwent an operation which completely restored his sight, and in 1840 he made his last public appearance at a meeting of the Anti-Slavery Convention at Exeter Hall, over which the Duke of Sussex presided. His talents and untiring energy were unanimously acknowledged, and he was enthusiastically greeted as the patriarch of the cause. He died at his residence, Playford Hall, Sussex, September 26, 1846, at the age of eighty-six.

Besides several pamphlets and other small works, all bearing more or less directly on the one great object to which he had devoted his life, Mr. Clarkson published, in 1806, 'A Portraiture of Quakerism,' 3 vols. 8vo; in 1808, 'The History of the Abolition of the Slave Trade,' 2 vols. 8vo; in 1813, 'Memoirs of the Public and Private Life of William Penn,' 2 vols. 8vo; and in 1836, 'Researches, Antediluvian, Patriarchal, and Historical,' 8vo.

(Thomas Taylor, ***Biographical Sketch of Thomas Clarkson ; Gentleman's Magazine.***)

CLARY. [SALVIA.]

CLAY, HENRY, was born in Hanover county, Virginia, April 12, 1777. He was the seventh son of a clergyman, who died when Henry was very young, leaving his widow and family but scantily provided for. Having received a common school education, Henry obtained a situation as copying clerk in the chancery court of Richmond. Here he probably received a certain amount of initiation in legal proceedings, so that, although he was nineteen years of age when he formally commenced the study of the law, he was when only twenty admitted to practise at the bar. The tide of migration was then setting strongly westward, and the young advocate thought that the fertile valleys of the west offered for him also a promising field of labour. He accordingly removed to Lexington in Kentucky, and there, in October 1799, he fairly commenced his legal career. As an advocate he quickly achieved a marked success. Young Clay, it was soon seen, not only possessed great natural ability and doubled its value by constant diligence, but had the more marketable talent of knowing how to manage a jury. Yet though he found himself on the road to fortune, his ambition was directed rather towards political than professional success. The convention for framing a constitution for the state of Kentucky soon afforded him the opportunity he desired of taking a prominent part in political movements. His advocacy of a provision for the gradual abolition of slavery entailed on him some temporary unpopularity, but this was removed by his opposition to measures which were regarded as an encroachment on the part of the central government, and he was at the next election (1803) returned to the state legislature.

His political career was now fairly begun, and for nearly fifty years his life may be said to have been devoted to the service of his country. His first election to Congress was in 1806, but it was only for the remaining portion of a term; and in 1807 he was again elected to the General Assembly of Kentucky, of which he was chosen speaker; an office he held till he was in 1809 elected for an unexpired term of two years to the senate of the United States. In 1811 he was sent as a representative to Congress, and on the meeting of the House of Representatives he received the very remarkable honour of being elected speaker, though he was now for the first time a member of the house. But his speeches in the senate, and his conduct as speaker of the Kentucky Assembly, had established his reputation; and so well satisfied were the members with their choice, that he was five times re-elected speaker. During this period he took a prominent part in the great questions of the day, but especially distinguished himself by his earnest denunciations of the English claims to right of search and other maritime prerogatives; and as he was one of the prime instigators to the war with England, so during its continuance he remained one of its strongest advocates. He was in 1814 appointed, avowedly in consequence of the leading part he had taken in the discussions on the war, one of the commissioners to negociate the treaty of peace. On his return to America he was at once re-elected to Congress.

He now directed his energies to home legislation; but when the question of South American independence was mooted, Clay eagerly urged its immediate recognition: he was already promulgating his favourite idea of the eradication of every species of European authority from the American continent. While engaged in a decided course of opposition to the general policy of President Monroe, there were two great measures which specially occupied his mind. One was the establishment of a national system of internal improvements, which the president opposed as unconstitutional, but which Clay successfully vindicated from that objection; the other was a return to a modified protective system. Both of these measures were carried, and the successful issue of his exertions placed Clay in the estimation of a large portion of his countrymen in the very first rank of American statesmen. He was now looked to by many as the probable successor to the presidential chair, and it was well understood that he himself coveted that elevated post. That he might be in a better position to bear the increased expenditure its acceptance would necessarily entail, he resigned in 1819 his seat in Congress, and returned to the active pursuit of his profession, in which he promptly regained a highly lucrative practice. But when the conventions began to consider the claims of the candidates for the presidency, it was apparent that Clay would not be chosen; his name was therefore withdrawn, and he returned in 1823 to the House of Representatives, by whom he was immediately restored to his place as speaker. Three candidates went to the vote for the presidency, but as neither could obtain the absolute majority required by law, the election lay ultimately in Congress, and there Clay exerted all his influence in favour of Adams, who was chosen; and he in return appointed Clay secretary of state. This office he held until 1827, and during his occupancy of it discharged its duties with marked diligence and vigour.

On the election of General Jackson in 1829, Clay retired for awhile into private life, but in 1831 he was elected to the United States senate. In 1833 Clay was again an unsuccessful candidate for the presidency. He had now to renew the struggle for his protective tariff. The entire subject was re-opened, and the country was agitated from end to end. South and north were almost in open conflict. At length Clay brought forward his 'Compromise Bill:' it was accepted by both parties, and modified protection to national interests became the established law of the United States. His subsequent tour through the middle and eastern states was a continued triumph. Passed over at the presidential election of 1836, at that of 1839 his claims were again put forward; but though his party was now in the ascendancy, at their convention he was set aside by them for General Harrison, who was accordingly elected. Clay remained a member of the senate till 1842, when, finding that his strength was insufficient to sustain him in his arduous course of self-imposed labour, and vexed at President Tyler successively vetoing measures which he had succeeded in persuading Congress to adopt, he took a formal leave of the scene of his prolonged labours and triumphs in a speech which produced a powerful impression on the senate and on the country. It was generally felt that the veteran statesman had scarcely been treated by his countrymen as his long and on the whole unquestionably popular course of public service deserved. It was acknowledged by his party that in their presidential conventions the honourable claims of this really great man had been set aside, and the coveted honour bestowed on obscure mediocrity. 'Justice to Clay' was adoped as a rallying cry, and in the election of 1844 he was put in nomination and supported by the full strength of his party. But this time the majority was on the other side, and Polk was elected. Clay remained in retirement till 1849, when he was again returned to the senate. To him was due the famous slavery 'Compromise Act' of 1850, which for a brief space quieted the bitter strife which the question of slavery had enkindled in the union. But it only for the moment allayed the storm; and Clay lived long enough to perceive that as a permanent measure his project was a failure. He had laboured beyond his strength in endeavouring to reconcile the irreconcilable, and now he longed only for rest. But his was not to be a rest on earth. He resigned his office as senator, but before the day named for his resignation to take effect, he had ceased to live. He died June 29, 1852, aged 75. Henry Clay was undoubtedly a man of powerful intellect, but he will hardly retain the rank which his contemporaries too readily assigned him. He was wanting in comprehensiveness. His views were at best too strictly national, and, as in the case of the protective tariff, and in his general foreign policy, he too readily took for granted that what seemed to give an advantage to his countrymen was really for their benefit in the large view of things.

CLINKSTONE, a grayish blue rock, consisting principally of Felspar. It passes gradually into gray basalt, but is distinguished from that rock by its lower specific gravity. When struck with a hammer it rings like iron. It is frequent in volcanic districts. It is also called *Phonolite.*

CLINTON, HENRY FYNES, was born January 14, 1781, at Gamston in Nottinghamshire. He was the eldest son of the Rev. Charles Fynes Clinton, D.D., prebendary of Westminster, and incumbent of St. Margaret's, Westminster, and was descended in direct line from Henry, second earl of Lincoln. The family name was Fynes till his father obtained a royal licence, April 26, 1821, to resume the ancient family name of Clinton.

Mr. Clinton was educated at Southwell School, Nottinghamshire, where he remained from 1789 till 1796, and was well grounded in the classic languages. In September 1796 he was removed to Westminster School, where he remained till Easter 1799, not on the foundation. In April 1799 he went to Oxford, where he was entered a commoner of Christ Church, and remained till 1806. He graduated B.A. in 1803, and M.A. in 1805.

At the general election of 1806 he was returned M.P. for Aldborough, through the interest of the Duke of Newcastle, and continued to be one of the representatives of that borough till the dissolution of 1826, after which he was succeeded in his seat by his next brother. He was diligent in his parliamentary attendance, but was not a speaker. In his politics he was a conservative. After the death of Mr. Planta, in December 1827, he was a candidate for the office of principal librarian of the British Museum; but the claims of Sir Henry Ellis from long service and experience determined the choice of the Marquis of Lansdowne, then Home Secretary, in his favour. Mr. Clinton inherited an ample fortune from a distant relative. He died at his residence, Welwyn, Hertfordshire, October 24, 1852.

Mr. Clinton married June 22, 1809, but his wife died February 2, 1810. He married January 6, 1812, a daughter of Dr. Majendie, bishop of Bangor, who survived him, together with eight daughters. His only son, Charles Francis Clinton, graduated B.A. of Christ Church, Oxford, in 1836, served in Spain in the Christino army, was decorated with the Cross of San Fernando by Espartero, was appointed in 1843 British arbitrator under the treaty with Portugal for the abolition of slavery, and died at Loando, on the west coast of Africa, in 1844.

Mr. Clinton was a classical scholar of the highest class. He read carefully all the best works of the Greek and Roman writers with a diligence perhaps unexampled, at least in modern times. He himself states, that while at Oxford, during less than seven years, he read 5223 pages of the Greek poets and prose-writers; but that afterwards, between 1810 and 1820, he read about 40,000 pages: the reading at Oxford amounting to 746 pages annually, while the reading during 1810-20 amounts to 4000 pages annually, which is at any rate more than five times greater.

Mr. Clinton's two great works, the 'Fasti Hellenici' and 'Fasti Romani,' have a European reputation, and are literary works of which every classical scholar of Great Britain may well be proud. The 'Fasti Hellenici' (the 'Civil and Literary Chronology of Greece'), 3 vols. 4to, Oxford, was commenced in 1810, and was published in four separate volumes in 1824, 1827, 1830, and 1834; but the work is now divided into 3 vols., which are sold separately—vol. i. extending from the earliest accounts to the 55th Olympiad, vol. ii. from the 55th to the 124th Olympiad, and vol. iii. from the 124th Olympiad to the death of Augustus. Besides the chronological tables, of which these volumes for the most part consist, they are interspersed with dissertations on the early inhabitants of Greece, the Messenian wars, scripture chronology, the writings of Homer, the population of ancient Greece, and other interesting subjects. The 'Fasti Romani' (the 'Civil and Literary Chronology of Rome and Constantinople, from the Death of Augustus to the Death of Heraclius'), 2 vols. 4to, Oxford, were published in 1845 and 1850. In 1851 Mr. Clinton published 'An Epitome of the Civil and Literary Chronology of Greece, from the Earliest Accounts to the Death of Augustus,' 8vo, Oxford; and in 1853 appeared 'An Epitome of the Civil and Literary Chronology of Rome and Constantinople, from the Death of Augustus to the Death of Heraclius,' 8vo, Oxford: two abridgments which are very useful to those students who cannot afford to purchase the larger and more expensive works.

(*Literary Remains of H. F. Clinton, edited by C. J. F. Clinton*, 1854; *Gentleman's Magazine.*)

CLONES. [MONAGHAN.]

CLOWES, WILLIAM, printer, was born at Chichester, January 1, 1779; died January 26, 1847. The father of Mr. Clowes was educated at Oxford, and kept a large school at Chichester; but he died when the subject of this notice was an infant, leaving his widow to support two children with straitened means. She was enabled, by keeping a small school, to give her son a business education; and he was apprenticed to Mr. Seagrave, a printer at Chichester. He came to London in 1802, and worked as a compositor with Mr. Teape, of Tower Hill. In 1803 he commenced business on his own account in Villiers-street, Strand, on a capital of 350*l*. He purchased one press, engaged one assistant; and, after working as a compositor through the day, would often, for two or three consecutive nights, toil at press, to have his stock of type free for the next day's demand. It was this energy of character that raised Mr. Clowes to his subsequent eminence. Fortune favoured his exertions. He married when he was at the age of twenty-four, a cousin of Mr. Winchester, a stationer, who had much government business; and by him he was recommended for important official work. His punctual industry and obliging and kindly disposition brought friends around him; and in a few years the humble beginner with one press had a considerable printing office in Northumberland Court, Strand. This office was burnt down; but a larger rose in its place. In 1823 he commenced steam-printing. He had two or three machines in a dark cellar; and, the process being novel, his office had many visitors of literary reputation. Mr. Clowes was always a signal example for the honest ardour of manufacturing enterprise to lead the way under new circumstances. He saw that newspapers were printed by steam; and he estimated the possibility that books might be demanded in sufficiently large numbers to make the new invention of more universal application than was at first considered probable. An action brought by the Duke of Northumberland, whose palace was close to Mr. Clowes's printing-office, to abate the steam-press as a nuisance, was successfully defended; but the printer removed his noise and his dirt, under the award of arbitrators; and the decision was a fortunate one for him. In 1826 he became the occupier of the spacious and well-known premises in Duke-street, Stamford-street. In the course of years the humble establishment of the young Sussex compositor grew into 24 steam-presses and 28 hand-presses, giving employ to 600 persons in the largest, most complete, and well-organised printing manufactory that had ever existed in the world. The creation of literature that should at once reconcile the apparently dissimilar qualities of goodness and cheapness, through a demand for books before unprecedented, gave a considerable impulse to the energies of Mr. Clowes. 'The Penny Magazine' and 'The Penny Cyclopædia' issued with undeviating regularity for fourteen years from his printing-office. Mr. Clowes was not a common man. His powers of arrangement were most acute; he was at once bold and prudent. He was one of those few men who would not recognise the word 'impossible' as one to be lightly employed. He who in 1803 had a few hundred weight of type to be worked from day to day like a banker's gold, would not hesitate, in the height of his prosperous career, to have tons of type locked up for months in some ponderous blue-book. To print an Official Report of a hundred folio pages in a day or night, or of a thousand pages in a week, was no uncommon occurrence. Mr. Clowes's name will not be associated with the honours of the great classical printers; his was another ambition. He lived in an age when knowledge was to become the inheritance of the many; and he furnished the means of carrying out this literary revolution in a more efficient manner than any of his professional competitors. His name will be permanently associated with the intellectual development of our time. (*National Cyclopædia.*)

CLUNCH, a name given to the lower and harder beds of the Cretaceous Rocks. They are occasionally used for building purposes, and have been especially employed for internal work in cathedrals and other large public buildings. This material stands well if not exposed to accidents from mechanical violence. (Ansted, *Elementary Geology.*)

CLUSIACEÆ. [GUTTIFERÆ.]

CLUTHALITE. [MINERALOGY, S. 1.]

COAL, an opaque combustible mineral substance of a black or brown colour, and in all cases giving indications of having been derived from a vegetable source. Such is a definition that would probably include all those substances which are used in domestic economy and the arts for the purposes of combustion, and popularly called Coal. At the same time it should be stated that the term has at present no special scientific application that is universally admitted, and each investigator thinks himself at liberty to apply the term in accordance with his own views. As the knowledge of chemical principles and methods of investigation have advanced, substances which at one time were regarded as identical have been shown to have a very different chemical composition as well as microscopic structure. This has led in some instances to the discussion of the question, What is Coal?

For instance, in our courts of law, one of the most recent cases—that of Gillespie *v.* Russel—was tried in Edinburgh in the year 1853. In this case, by an agreement for a lease entered into between the plaintiffs and defendants, the former agreed to grant to the latter a lease of "the whole coal, ironstone, iron-ore, limestone, and fire-clay, but not to comprehend copper or any other mineral whatsoever." It was alleged by the plaintiffs that, although the defendants had in the course of their operations come upon iron-ore and ironstone, coal, and fire-clay of workable value, they had neglected these, and had chiefly worked a certain mineral substance which the plaintiffs contended was not let to the defendants, not being one of the mineral substances specified in the agreement. This mineral was of much greater value, it was stated, than any which the defendants were permitted to work. Although used as a combustible material, it was alleged that this substance was not coal, and that its chemical, microscopical, and mineralogical characters were not those of coal. On the other hand, it was asserted by the defendants that the mineral in question was coal; that they had been led to seek a lease of the Torbane-Hill estate from the fact that on the adjoining lands of Boghead this mineral existed, and was worked and sold as coal, being known in the markets by the name of the 'Boghead Gas Coal.' This mineral, they contended, was true coal, belonging to the variety known as Cannel or Parrot Coal. This trial was interesting on account of the large number of chemists, mineralogists, geologists, and microscopists examined, who appeared in about equal numbers on either side; one set of them contending that the mineral was coal, whilst the others contended it was not. A large amount of interesting facts on the nature of coal and the substances with which it is found associated was laid before the jury, who came to the conclusion that, whatever might be the result of scientific investigation in more rigorously defining the nature of coal and limiting the use of that term, both plaintiffs and defendants called this mineral coal when the lease was drawn up, and therefore gave a verdict in favour of the defendants.

The same question which has thus been debated in Scotland has also come before the law courts of Germany and of the United States of America with the same differences of opinion; and we refer to these cases to show the difficulty of defining accurately this well-known substance. It may be regarded in the present state of our knowledge as one of those instances in which the typical form is lost by irregular combination with other and different substances.

That Coal is and must be of vegetable origin seems to be agreed upon by all inquirers, but the question of how to determine that origin in particular cases is the difficulty. Again, it is well known that coal after it is deposited undergoes certain chemical changes by which substances with a very different chemical character are produced, such as bitumen, paraffine, &c. These, mixed with the coal itself and the earthy matters around, may form compound substances about whose nature there may be considerable difference of opinion. This is not improbably the case with the Torbane-Hill mineral, and will account for the peculiarity of both its chemical and microscopical characters.

Coal presents itself ordinarily in a massive form, and is brittle or sectile. It has a hardness of 2·5, and a specific gravity of 1·2 to 1·75. It is opaque, and has a black or brown colour. Its chemical composition is distinguished by the presence of carbon; in addition, it also yields, on ultimate analysis, hydrogen, oxygen, and nitrogen. On burning it leaves an ash which consists of varying quantities of silica, alumina, and oxide of iron. The carbon and hydrogen are often found chemically united to form bituminous compounds which are mixed with the coal. It is the presence of these compounds which causes coal to burn with a bright flame; at the same time they give off a bituminous odour. Those destitute of bituminous compounds burn with a pale blue flame, due to carbonic oxide, which is formed in these cases through the decomposition of the water present.

The following table, founded on Mr. Mushet's Analysis of Coal, is taken from Professor Ansted's 'Elementary Course of Geology, Mineralogy, and Physical Geography:'—

Analysis of various kinds of Coal.

Locality.	Description of Coal.	Specific Gravity.	Carbon.	Bitumen. Volatile Matter. Water.	Ash.
Newcastle-upon-Tyne	Bituminous . .	1·257	57·00	37·60	5·40
Lancashire	Ditto . . .	1·260	54·90	40·48	4·62
Ditto	Cannel . . .	—	56·40	41·00	2·60
North Wales . .	Bituminous . .	—	62·72	36·00	1·28
Staffordshire Potteries	Ditto . . .	—	62·40	34·10	3·50
Yorkshire. . . .	Ditto . . .	—	67·14	30·73	2·13
Ditto	Ditto . . .	—	58·38	39·51	2·00
Derbyshire . . .	Ditto . . .	1·235	52·46	45·50	2·04
Ditto	Cannel . . .	1·278	48·36	47·00	4·64
Ditto	Cherry . . .	—	57·00	40·00	3·00
Shropshire . . .	Bituminous . .	—	64·10	34·77	1·13
South Staffordshire . .	Ditto . . .	—	54·05	42·70	3·25
Ditto	Ditto . . .	—	54·17	43·33	2·50
Dean Forest . . .	Ditto . . .	—	63·72	32·03	4·25
South Wales . . .	Ditto . . .	—	60·25	33·00	6·75
Ditto	Ditto . . .	—	66·02	29·15	2·83
Ditto	Ditto . . .	—	70·68	25·82	3·50
Ditto	Anthracite . .	—	91·89	6·61	1·50
Ditto	Dry	—	79·50	17·50	3·00
Ditto	Steam	—	85·00	11·87	3·30
Clyde Valley . . .	Bituminous . .	—	51·20	45·50	3·13
Lismahago . . .	Cannel . . .	—	39·43	56·57	4·00
Scotch coal (mean) .	Dry	—	48·81	41·85	9·34
Ireland, Leinster . .	Dry Anthracite	1·602	92·88	4·25	2·87
Ditto ditto . .	Cannel . . .	—	79·60	12·00	8·40
France (mean) . .	Dry	—	79·15	7·37	13·25
France, St.-Etienne .	Bituminous . .	—	65·68	27·83	6·49
Spain (mean) . . .	Ditto . . .	—	53·00	40·00	7·00
Belgium, Hainault .	Ditto . . .	1·276	84·67	13·23	2·10
Belgium, Liége . .	Ditto . . .	—	76·00	19·60	4·40
Ditto ditto . .	Dry	1·365	81·90	9·00	9.10
Silesia	Glance	—	58·17	37·89	3·93
Bengal	Slaty . . .	1·447	41·00	36·00	23·00
America, Ohio . . .	Bituminous . .	—	55·55	41·85	2·60
America, Alleghany .	Dry	—	78·65	9·47	11·73
America, Nova Scotia .	Bituminous . .	1·321	58·80	28·20	12·95
America, Pennsylvania	Anthracite . .	—	92·60	2·25	2·25

The following analyses of the Torbane-Hill Mineral and Cannel Coal were presented by Dr. Fyfe at the trial in Edinburgh:—

	Carb.	Hyd.	Oxy.	Nit.	Sulp.	Ash.
Torbane-Hill Mineral .	60·25	8·8	3·6	1·5	9·8	25·6
Capeldrae Cannel Coal .	56· 7	6·8	8·8	1·9	0.25	25·4

The Torbane mineral is only remarkable amongst other coals for the large quantity of sulphur it contains.

A large series of coals, more especially Welsh, has been submitted to chemical examination by order of the government; and the following table is taken from the 'Report on the Coals suited to the Steam Navy,' by Sir Henry De la Beche and Dr. Lyon Playfair, in the second volume of the 'Memoirs of the Geological Survey of Great Britain:'—

Locality, or name of Coal.	Specific Gravity of Coal.	Carbon.	Hydrogen	Nitrogen.	Sulphur.	Oxygen.	Ash.
Welsh Coals:—							
Graigola	1·30	84·87	3·84	0·41	0·45	7·19	3·24
Anthracite	1·375	91·44	4·46	0·21	0·79	2·58	1·52
Oldcastle Fiery Vein .	1·259	87·68	4·89	1·31	0·09	3·39	2·64
Ward's Fiery Vein .	1·344	87·87	3·93	2·02	0·83	included in Ash	7·04
Burea Coal . . .	1·304	89·66	4·63	1·43	0·33	1·03	3·96
Llangenneech . . .	1·312	85·46	4·20	1·07	0·29	2·44	6·54
Pentrepoth . . .	1·31	88·72	4·50	0·18	—	3·24	3·36
Pnetretelin . . .	1·358	85·52	3·72	trace	0·12	4·55	6·00
Duffryn	1·326	88·26	4·66	1·45	1·77	0·66	3·26
Mynydd Newydd . .	1·31	84·71	5·76	1·56	1·21	3·52	3·24
Three-quarter Rock Vein. . . .	1·34	75·15	4·93	1·07	2·85	5·04	10·96
Gwm Frood Rock Vein . . .	1·255	82·25	5·84	1·11	1·22	3·58	6·00
Gwm Nanty-gros . .	1·28	78·36	5·59	1·86	3·01	5·56	5·60
Resolven	1·32	79·33	4·75	1·38	5·07	included in Ash	9·41
Ponty Pool . . .	1·32	80·70	5·66	1·35	2·39	4·38	5·52
Bedwas	1·32	80·61	6·61	1·44	3·50	1·50	6·94
Ebbw Vale . . .	1·275	89·78	5·15	2·16	1·02	0·30	1·50

Locality, or name of Coal.	Specific Gravity of Coal.	Carbon.	Hydrogen	Nitrogen	Sulphur.	Oxygen.	Ash.
Porthmawr Rock Vein	1·39	74·70	4·79	1·28	0·91	3·60	14·72
Coleshill . . .	1·29	73·84	5·14	1·47	2·34	8·29	8·92
Scotch Coals:—							
Dalkeith Jewel Seam	1·277	74·55	5·14	0·10	0·33	15·51	4·37
Ditto Coronation Seam . .	1·316	76·94	5·20	trace	0·38	14·37	3·10
Wallsend Elgin . .	1·20	76·09	5·22	1·41	1·53	5·05	10·70
Fordel Splint . .	1·25	79·58	5·50	1·13	1·46	8·33	4·00
Grange Mouth . .	1·29	79·85	5·28	1·35	1·42	8·58	3·52
English Coals:—							
Broomhill . .	1·25	81·70	6·17	1·84	2·85	4·37	3·07
Park End, Sydney . .	1·253	73·52	5·69	2·04	2·27	6·48	10·00
Irish Coals:—							
Slevardagh . . .	1·59	80·03	2·30	0·23	6·76	Included in Ash	10·80
Foreign Coals:—							
Formosa Island .	1·24	78·26	5·70	0·64	0·49	10·95	3·96
Borneo (Labuan kind)	1·28	64·52	4·74	0·80	1·45	20·75	7·74
3 feet Seam .	1·37	54·31	5·03	0·98	1·14	24·22	14·32
11 feet Seam .	1·21	70·33	5·41	0·67	1·17	19·19	3·23
Patent Fuel:—							
Wylam's Patent Fuel	1·10	79·91	5·69	1·68	1·25	6·63	4·84
Bell's ditto .	1.14	87·88	5·22	0·81	0·71	0·42	4·96
Warlich's ditto .	1·15	90·02	5·56	trace	1·62	Included in Ash	2·91

Coal differs considerably in its physical properties, and it has obtained various names in the markets. The mineralogist generally divides it into two varieties:—

First, Coal without Bitumen.

Second, Coal with Bitumen.

The first variety is known by the general name of *Anthracite*. It has however various local names. [ANTHRACITE.] It is sometimes very hard, and has a high lustre, and is often iridescent. Besides being used for fuel, it is often made into inkstands, small boxes, and other articles of use. This is more especially the case with the Anthracite of America. It is the most common form of coal in the Welsh beds.

The Bituminous varieties of Coal present greater differences of structure and appearance, and have a larger number of names. By the above analyses it will be seen that the quantity of Bitumen, or substances resembling it [BITUMEN], differ very much in different specimens of coal. It is generally softer and less lustrous than Anthracite, although occasionally specimens exhibit a very brilliant fracture. Its specific gravity is less than that of Anthracite, seldom exceeding 1·5, whilst the specific gravity of Anthracite ranges from 1·3 to 1·75. The kinds of this coal are known by various names.

The following are analyses of the different kinds of Coal as they occur in the Newcastle beds:—

	Splint Coal.	Caking Coal. No. 1.	Caking Coal. No. 2.	Cherry Coal.
Density	1·302	1·274	1·280	1·266
Carbon	74·961	83·558	87·859	81·691
Hydrogen	6·251	5·150	5·159	6·054
Nitrogen and Oxygen . . .	4·873	8·743	5·139	8·478
Ash	13·912	2·591	1·393	1·576
Relative heat by the same weight of Coal . . .	110·310	114·980	122·530	116·630
Relative heat by the same volume of Coal . .	108·990	111·310	119·030	112·070

Pitching or Caking Coal is known by its velvet or grayish-black colour. When first thrown on a fire it breaks into small pieces, but on the continued application of heat the pieces again unite into a solid mass or cake. It burns readily with a yellow flame, but on account of its caking quality it is likely to clog the fire unless it is frequently stirred. The Newcastle beds mostly yield this form of coal.

Cherry Coal resembles in external appearance the pitch coal, and when exposed to heat it cracks and flies, but does not cake. It is very brittle, and on this account much loss is occasioned in mining it. It burns with a clear yellow flame. This kind of coal occurs in the Glasgow beds.

Splint Coal is a variety found in connection with the last, and is remarkable for its hardness; for which reason it is sometimes called Hard Coal. It is found at Glasgow.

Cannel Coal has little lustre, is very compact and smooth in its texture, and breaks with a large conchoidal fracture. It burns very readily, giving out a clear yellow flame without melting. In consequence it has been employed in the making of candles—hence its name. It is often employed for making inkstands, snuff-boxes, and other articles of use. At the Great Exhibition of 1851 several models of public buildings, monuments, &c., were exhibited, formed of Cannel Coal.

The above coals are those most commonly burned. Their goodness for heating is tested by the quantity of water they evaporate. The following are the results of some recent experiments:—

	lb.	oz.
Common Scotch Bituminous Coal . . .	5	14
Carr's West Hartley Main (Newcastle) .	7	5
Merthyr Bituminous Coal	8	0
Pure Welch Anthracite	10	8½

From which it will be seen that the heating power of anthracite nearly doubles that of some bituminous coals.

Brown Coal, Wood Coal, Lignite, are names given to less perfect varieties than the last. Specimens of these coals have a brownish-black colour, and burn with an empyreumatic odour.

On placing sections of Lignite under the microscope, the structure of the wood of the plant forming it can be readily detected. This is not the case with the other kinds of coal, where, although the woody fibre can be frequently made out, it has evidently undergone considerable change. Professor Quekett, on this ground, proposes to confine the term Coal to those mineral substances alone which are evidently made up of the woody tissue of plants. He maintained that the Torbane mineral was not coal, on the ground that it was not composed of the debris or remains of vegetable woody tissue. Although woody and vascular tissue can be seen in the Torbane mineral, Professor Quekett maintains that this has been accidentally introduced, and that no true vascular or spiral tissue is found in coal.

The term *Brown Coal* is frequently applied to coal more recently deposited than that of the great coal-beds of the world, and this quite independent of its structure or any peculiarity in combustion. *Lignite* is also a term applied to the semi-carbonised forms of wood which are frequently found in deposits later than those of the coal deposits. Most of these varieties of coal contain a large quantity of water, and the quantity of matter given off at a moderate heat by distillation is at least equal to that of the carbon contained.

"*Dysodil* is a yellow or grayish highly laminated substance, often found with lignite, and burning vividly, and spreading an odour of assafœtida." (Ansted.)

Jet is another variety of coal belonging to the bituminous series. It sometimes occurs in elongated reniform masses, and sometimes in the form of branches with woody structure. It is soft and brittle, with a conchoidal fracture. Its specific gravity is but little greater than that of water. It is opaque, of a velvet colour, and has a brilliant and resinous lustre. It is found in Saxony, and also in the Prussian amber-mines in detached fragments. It is sometimes washed up on the shores of Great Britain. The finer sorts are used in the manufacture of ornaments and trinkets of various kinds. The coarser sorts are burned as fuel. It gives out when burning a greenish flame and a strong bituminous smell, and leaves a yellowish ash. It contains about 37½ per cent. of volatile matter.

For an account of the origin of Coal, and the beds of Coal on the surface of the earth, see COAL FORMATION and COAL PLANTS.

(Dana, *Manual of Mineralogy*; Ansted, *Elementary Course of Geology, Mineralogy, and Physical Geography*; *Memoirs of the Geological Survey of Great Britain and of the Museum of Practical Geology*; Gregory, *Hand-Book of Organic Chemistry*; *Reports of Juries of Great Exhibition*; *Catalogue of the Great Exhibition*; *Proceedings of the Microscopical Society*; *Microscopical Journal*, 1854.)

COBOURG. [CANADA, *S.* 2.]

COCCIDÆ. [GALLINSECTA.]

COCKBURN, ADMIRAL, THE RIGHT HONOURABLE SIR GEORGE, G.C.B., who represented a branch of the same family as Lord Cockburn, was born in 1772, and entered the navy in 1781. Having served in the East India, Home, and Mediterranean stations, in 1795 he co-operated with the Austrian troops in Piedmont, and took part in the capture and blockade of Leghorn. He subsequently received the thanks of the House of Commons for his operations against Martinique, which resulted in that island being ceded as a British colony. In 1812 he was sent as commissioner for reconcilling Spain and her transatlantic colonies. He was conspicuous in the hostilities with America in 1813 and 1814. On the cessation of hostilities he was employed to convey Napoleon to St. Helena. Having sat in the unreformed parliament from 1818 to 1830 for Portsmouth, Weobly, and Plymouth, he was returned for Ripon in 1841. He was a Lord of the Admiralty from 1818 to 1828, and again, from 1841 to 1846, when he retired from public life. When far advanced in years he inherited his brother's baronetcy, and died in August 1853.

COCKBURN, HENRY THOMAS, LORD, a Lord of Session in Scotland, was the son of Archibald Cockburn, of Cockpen, one of the Barons of the Exchequer in Scotland, by a sister of the wife of the first Viscount Melville, and represented an ancient Scottish family which has produced many distinguished members. He was born in 1779, and called to the Scottish bar in 1800. His family connections belonged to the Tory school, but although the Scotch patronage of the crown for many years was dispensed by Lord Melville, Mr. Cockburn in early life adopted liberal opinions.

It was not until November 1830 that any high legal position fell to Mr. Cockburn, when he became solicitor-general for Scotland, upon the promotion of Jeffrey to the attorney-generalship. He had however long before this time risen to considerable eminence in his profession, and was particularly distinguished for the ability of his advocacy, and the influence which he exerted upon the minds of juries. Among other cases in which he was engaged may be particularly mentioned that of the Queensberry title, in which considerable property was at stake. He had also brought himself into notice by gratuitously defending the prisoners charged with treason at Stirling, Glasgow, and other Scotch towns, in the year 1818. As a strong proof of his success as an advocate, we may mention that he was engaged to defend Mrs. McDougall, who was put upon her trial at Edinburgh as the accomplice of Burke and Hare, and that he obtained her acquittal. During the earlier part of his legal career, the arguments of counsel were delivered partly in writing, and partly 'vivâ voce' (as is the case now in the House of Lords). The drawing up of these arguments frequently involved points of the greatest nicety, and several drawn up by Mr. Cockburn attracted the observation of the bench, and even as a young man his papers on feudal law had met with general approval.

Such a man as Cockburn could not long remain without reaping a more permanent reward than the solicitor generalship. Accordingly in 1834 he was promoted to the Scottish bench as one of the lords of session, to which three years later was added the further appointment of a lord commissioner of justiciary. Upon the bench Lord Cockburn was surpassed by few in his clear enunciation of law, and in his charges to juries. He was distinguished by a skilful detection of whatever was false in principle or in evidence, as well as by the breadth and grasp of his legal judgments, which were seldom reversed on appeal.

Besides the 'Life' of his friend Lord Jeffrey in 2 vols. (1852), Lord Cockburn published only one small pamphlet, which was entitled 'On the best way of spoiling the beauties of Edinburgh.' He was an early contributor however to the pages of the 'Edinburgh Review;' and it is said that an article from his pen in that review was mainly instrumental in causing a reform in the method by which Scotch juries had been previously chosen.

As a friend, neighbour, and citizen, no less than as a relative, Lord Cockburn was beloved. His death, which happened April 26, 1854, while he was on circuit at Ayr, was preceded by an illness of but a few days' duration. He left a large family by his widow, who is sister of the wives of the late Scotch judges, Lords Fullerton and Dundrennan.

COD-FISH. [MORRHUA.]

CODEIA. [CHEMISTRY, S. 1.]

CODRINGTON, SIR EDWARD, ADMIRAL, G.C.B., was born in 1770. He was a grandson of Sir Edward Codrington, first baronet, of Dodington, Gloucestershire. He entered the navy July 18, 1783, and served in several ships till he became lieutenant, May 28, 1793. He served as lieutenant on board the Queen Charlotte, 100 guns, Lord Howe's flag-ship, in the victory over the French fleet off Brest, June 1, 1794, and was appointed to bear to England the duplicate despatches. He was in consequence promoted to the rank of captain, and continued in active service till 1797. He was unemployed from this time till 1805, when he was appointed to the command of the Orion, 47, and was engaged in the battle of Trafalgar. For his services in this victory he was rewarded by a gold medal. He left the Orion in December, 1806, and in November, 1808, was appointed to the command of the Blake, 74, in which ship he sailed under Lord Gardner in the expedition to Walcheren, and was thanked for his services in forcing the Schelde, in August 1809. In 1810, 1811, and 1812, Captain Codrington was employed on the coasts of Spain, in the defence of Cadiz and Tarragona, and in co-operating with the Spanish patriots in Catalonia. In January 1813 he returned to England.

In 1814 Captain Codrington sailed to North America, and while there was promoted to the rank of rear-admiral, and was appointed captain of the fleet under Sir Alexander Cochrane. He took part in the attack on New Orleans. At the conclusion of the war with the United States he returned to England, and was created a knight commander of the Bath, January 2, 1815. He attained the rank of vice-admiral July 10, 1821.

Sir Edward Codrington was appointed, November 1, 1826, commander-in-chief of a squadron in the Mediterranean destined to observe the Turco-Egyptian fleet, and hoisted his flag on board the Asia, 84. He was joined by a French and a Russian squadron, and the battle of Navarino took place October 20, 1827; when the Turco-Egyptian fleet, consisting of 81 ships of war, was almost entirely destroyed. For this victory Sir Edward Codrington was advanced to the dignity of knight grand cross of the Bath; but as there was much doubt among politicians as to the propriety of destroying this fleet, and the Duke of Wellington admitted that it was an "untoward event," Sir Edward was recalled from the Mediterranean in April 1828. In 1832 he was elected M.P. for the borough of Devonport, and was re-elected in 1835, and again in 1837. He was of liberal politics, and very popular. In 1837 he attained the full rank of admiral, and on the 22d of November 1839, was appointed commander-in-chief at Portsmouth, when he resigned his seat as a member of parliament. He occupied his station at Portsmouth for the usual term of three years. He had a good-service pension of 300*l.* a year. He died in London, April 28, 1851.

CŒLEBOGYNE, a genus of plants belonging to the natural order *Euphorbiaceæ*. This genus was named by Mr. J. Smith from a specimen grown in the Royal Gardens at Kew. It is remarkable for the fact that being diœcious, the pistiliferous flowers have ripened their fruit and produced seeds containing a perfect embryo without the presence of the staminiferous plants. This appears to be quite an exceptional case to the law of production of the embryo by the agency of the pollen cells coming in contact with the ovule. Further observation may detect some hitherto undiscovered means by which the pollen-cells of perhaps an allied plant may come in contact with the pistils of the *Cælebogyne.* (*Linnæan Transactions.*)

COGGESHALL. [ESSEX.]

COLBY, THOMAS, Major-General in the army, and one of the Directors of the Ordnance Survey, was born at Rochester, 1st of September 1784. When his father, Captain Colby, of the Royal Marines, sailed with the fleet under Lord Howe, he was sent to Dr. Crockell's school at Northfleet, and from thence he entered the Royal Military Academy at Woolwich. He obtained his first commission as second lieutenant of engineers in 1801, being then but seventeen years of age. His diligence and success in scientific study were such that in January of the following year, at the special request of Captain Mudge, then superintendent of the ordnance survey, he was appointed one of the assistants in that great work. Entering at once on his duties, he justified the expectations formed of him, by the intelligence and conscientious activity which he brought to the work of surveying. He was on a tour of inspection in Cornwall, in 1803, when he lost his left hand by the bursting of an old pistol, and suffered at the same time such a fracture of the skull from a fragment of the barrel, that he felt the effects of the accident for the rest of his life whenever he attempted any long-continued mental exertion. Though the loss of his hand was a hindrance to the active discharge of his duties, Colonel Mudge was so well satisfied of his merits, that he kept the young lieutenant permanently attached to the survey.

In 1803 Lieutenant Colby was observing at Dunnose, one of the prominent points of the survey; in 1804 at Beaumaris; and in 1806 with the zenith sector at Burleigh Moor and Delamere Forest. The winter months he passed in the

'Drawing Room' at the Tower, computing and preparing the results for publication, and superintending the construction and engraving of the ordnance maps on a scale of one inch to the mile. So thoroughly was he identified with that great national work, that the history of one becomes in great measure the history of the other. In 1807 Colby was promoted to the rank of captain. The third volume of 'An Account of the Trigonometrical Survey of England' was published in 1811, and his name appearing jointly with that of Colonel Mudge on the title-page, showed how highly his services had been appreciated by his chief. In 1813 it was determined to extend the meridian line into Scotland, a task which called out in an especial manner the energies for which Captain Colby was remarkable. Within the next three years he visited and observed at the principal stations beyond the Tweed, besides attending to his official business at the Tower. The persevering labour and activity required for a season of observation on the hills would appear incredible to one unacquainted with the nature of the work. Besides the mental exercise of keeping all the subordinates to their duty, so as to produce harmony in the results, there was much personal fatigue to be endured in long walks over the country, together with storms and wearisome delays on the mountain tops. But with Captain Colby duty was paramount, and he cared not for privation, so that the work was perfect. Major Dawson in his account of 'A Season on the Hills' gives a striking picture of the toils and hardships experienced: "It was no uncommon occurrence," he remarks, "for the camp to be enveloped in clouds for several weeks together, without affording even a glimpse of the sun or of the clear sky during the whole period. And then in a moment the clouds would break away or subside into the valleys, leaving the tips of the mountains clear and bright above an ocean of mist, and the atmosphere calm and steady, so as to admit of the observations for which the party had waited days and weeks to be taken in a few hours." At times the tents would be blown down by storms—or the camps would be whitened by a fall of hail or snow in July: or the captain taking two or three of the junior officers and a few men with him would start on a 'station-hunt;' steering a course direct by compass for the peaks that seemed most suitable, regardless of the nature of the intervening country. In these explorations they walked from thirty to forty miles a day, wading streams, crossing bogs, scaling cliffs, and sliding down into rocky valleys, Captain Colby ever the foremost; and when they came to a summit which his experience told him was suitable for a station, he would help with his own hand in building up the great pile of stones by which it was to be distinguished and observed from distant points. Sometimes the resting-place at night would be a miserable hovel where no other food was to be obtained than the national porridge; at others the weary explorers rested under a ducal roof—and on the west coast during the hot months they were tormented and blistered by the bites of innumerable midges. In one trip in 1819 the party walked 586 miles in twenty-two days. From this brief summary, a notion may be formed of the severe labour of the survey, apart from the scientific duty of observing with the instruments, which on all favourable occasions was continued from sunrise to sunset.

Captain Colby's activity and kindliness of disposition were not less apparent in camp than on the station-hunts. He would assist in erecting houses to "shelter the soldiers; and occasionally join with the men in a game of quoits, or in putting the stone or crowbar, and was a warm promoter of their feast at the close of each trigonometrical season." He was quite indifferent as to personal fame, but not so as to making known the merits of his officers, and he at times permitted them to publish portions of the work in their own names rather as principals than assistants. His command over his temper was perfect; but he disliked to be disturbed by curious visitors when busy with observations for which he had long waited the opportunity. Once, while encamped on Slieve Donard in Ireland, the summit of Sca Fell in Cumberland became visible at the distance of 111 miles, and after many trials the instrument was brought to bear upon it. "Colby was on the point of successfully finishing his observation, which would have been a geodesical triumph, as including the longest side of a triangle ever attempted, when an officer on entering the observatory accidentally struck his elbow, and threw the telescope off the object. A momentary ejaculation of anger escaped his lips, but though he could not again succeed, and the object was therefore lost, he never afterwards alluded to the subject."

He was one of the party that accompanied Biot on his trip to Shetland in 1817, when, in compliance with the wishes of the French government, one of their savants was permitted to observe on the line of the English arc. A coolness however arose between Biot and Colby, and while the latter, undeterred by fog or storm, made his observations with the sector on the rock of Balta, the former carried on his pendulum observations on the island of Uist; and Colby afterwards assisted in connecting the French with the English triangulation by the observations across the straits of Dover.

In 1820 Captain Colby was elected a Fellow of the Royal Society; he took an active part in establishing the Astronomical Society; and General Mudge having died, he was appointed his successor as superintendent of the Survey, and in the Board of Longitude. In 1821 he was promoted to the rank of major, and in 1824 he undertook the survey of Ireland. In this work the usual mode of proceeding was modified: the survey was made dependent on actual measurements with the chain, with a trigonometrical point fixed for every 400 acres; and the whole series of operations was so ably combined that one portion became a check on the other, and the utmost accuracy was arrived at, although the number of persons employed exceeded two thousand, mostly from the native peasantry. A change was also made in the publication: the sheets were engraved on a scale of six inches to the mile, all the principal farms, fields, and inclosures being represented, so that the maps have ever since been regarded by the government, land-proprietors, and surveyors, as authentic plans of all the estates in the country. Poor-law boundaries, townlands, land-improvements, engineering works, and the Irish census, have all been based upon them. They are comprised in 1939 sheets.

In 1825 Major Colby became lieutenant-colonel, and in that year he obtained the Duke of Wellington's sanction for raising and training three companies of sappers and miners to aid in the Irish survey, as the want of really efficient assistants was felt at first as a serious hindrance to the progress of the work. In the course of the operations Colby measured a base-line of eight miles, on the south shore of Lough Foyle, with 'compensation-bars' which he had himself invented. He had carried on a series of experiments on the heating and cooling of metal rods, and he succeeded in constructing a bar of brass and iron in combination, the extremities of which remained always the same distance apart whatever might be the temperature. Such is the exactitude obtained with this apparatus that it has since been used in measuring a base of eight miles at the Cape of Good Hope, in the remeasurement of the English bases, and in those required for the great arc of the meridian in India.

In 1838 Colonel Colby resumed the triangulation of Scotland, which had been suspended; and from this date up to his promotion to the grade of major-general in 1846, when by the regulations of the service his connection with the survey ceased, he continued his usual active and energetic superintendence of the various operations. He brought the engraving of the English maps to an excellence never before achieved. The seconds of latitude and longitude were marked on the margins, and he co-operated with Sir Henry De la Beche in introducing the geological facts and features which have since become so important a part of the survey. He took the necessary measures for a series of tidal observations round the coast of Ireland, for the purpose of establishing a true datum level: "the most important series of tide-observations," says the astronomer-royal, "that has ever been made."

Through all his scientific career General Colby never sacrificed duty to selfish considerations; and his rare administrative abilities, and sound judgment combined with high principle, enabled him to accomplish well all that he undertook. He had resources ready for every emergency, and the hardy perseverance that triumphed over all obstacles. He died in Liverpool on the 9th of October 1852, leaving a widow and seven children. He was a fellow of the chief scientific societies of London, Edinburgh, and Dublin; LL.D. of Aberdeen, and a knight of Denmark.

(*Professional Papers of the Royal Engineers; Proceedings of the Royal Society; Monthly Notices of the Astronomical Society.*)

COLERAINE, county of Londonderry, Ireland; partly in the parish of Killowen and barony of Coleraine, and partly in the parish of Coleraine and barony of the north-east liberties of Coleraine; a sea-port and post-town, a municipal and parliamentary borough, and the seat of a Poor-Law Union, is distant 145 miles N. from Dublin. The population in 1851 was 5920, exclusive of 342 inmates of the Union workhouse. Coleraine returns one member to the Imperial Parliament. The paving, lighting, &c., of the town are under the care of 21 town commissioners. Coleraine Poor-Law Union comprises 20 electoral divisions, with an area of 112,366 acres, and a population in 1851 of 43,021.

Coleraine is situated on both banks of the river Bann, at a distance of 4 miles from the sea. The principal part of the town is on the right bank, and consists of a central square called the Diamond, with several leading streets diverging from it. The bridge connecting this portion of the town with the suburb of Killowen or Waterside on the left bank of the river is a stone structure of three arches, 288 feet long and 32 feet in breadth, erected at a cost of 14,500*l.* There is a great thoroughfare by this road between the northern parts of the counties of Antrim and Londonderry. The parish churches of Killowen and Coleraine stand in the respective divisions on either side of the river. There are also two Roman Catholic chapels and six meeting-houses of various denominations of Dissenters, an Endowed school, a National Model school, and a savings bank. The old court-house and town-hall stands in the centre of the Diamond. There is a new market-place with a commodious market-house. The town is lighted with gas. Vessels of 200 tons burden can ascend the river to the quay; but the principal maritime trade of Coleraine is conducted from the harbour of Port Rush, 5 miles distant on the coast near the embouchure of the river. At Port Rush is a harbour formed by two piers of 800 feet and 650 feet in length, inclosing an area of 8 acres, with from 15 feet to 20 feet of water at the wharfs. The customs duties of the Coleraine district in 1856 amounted to 8050*l.*: the excise duties amounted to 40,644*l.* The number and tonnage of vessels belonging to the port in 1856 were ten vessels of 233 tons aggregate burden. The entrances and clearances at the port in the coasting and cross-channel trade in 1856 were:—Sailing vessels, inwards 120, tonnage 6080; outwards 44, tonnage 1365: steam vessels, inwards 121, tonnage 29,966; outwards 51, tonnage 11,365. In the foreign and colonial trade there entered 9 vessels of 1922 tons, and cleared 4 vessels of 1790 tons. The principal trade is the manufacture and bleaching of linens and the salmon-fishery. A fine description of linen manufactured here is known as 'Coleraines.' The annual sales of linens are estimated at 600,000*l.* The fisheries (of salmon and eel) are the property of the Irish Society, who farm them out at an annual rent of 1200*l.* Upwards of 300 persons are employed as water-bailiffs in the protection of the Bann and its tributaries. Fairs are held on May 12th, July 5th, and November 3rd; markets are held on Monday, Wednesday, Friday, and Saturday. There are tanneries, bleach-grounds, paper-mills, and soap and candle works. Quarter sessions of the peace for the county of Londonderry are held here in rotation; and petty sessions fortnightly. Coleraine in the Presbyterian Church arrangement is the seat of a Presbytery of the General Assembly, consisting of 16 congregations.

Coleraine is remarkable in early Irish history as the place in which Patrick found a Christian bishop already located on his first progress through the northern parts of Ireland. A castle was built here in 1213 by Thomas Mac Uchtred, a Scottish adventurer. One of De Courcy's followers, called De Sendall, also erected a castle very soon after the conquest. The present town stands on the site selected by the Irish Society in 1613. It was at first fortified by an earthen wall with bastions. The place held out against the rebels in 1641. In 1683 the whole customs of the port amounted to only 18*l.* 9*s.* 8½*d.* The neighbourhood is rich and well cultivated. A fall of the Bann over a ledge of rock of 12 feet high, at the Cutts, about a mile above the town, adds considerably to the picturesque interest of the environs.

COLERIDGE, HARTLEY, the eldest son of Samuel Taylor Coleridge, was born at Clevedon, near Bristol, September 19th, 1796. Two sonnets of his father are commemorative of his birth; and an exquisite poem of Wordsworth, 'To H. C. six years old,' describes the peculiarities of the child, "whose fancies from afar are brought." His infancy is also associated with two poems of his father, 'Frost at Midnight,' and 'The Nightingale.' In 1800 S. T. Coleridge went to reside in the Cumberland Lake district; and there Hartley was reared; having a brother, Derwent, four years younger than himself, and a sister, Sara, six years younger. He was taken to London in 1807; and the various sights which he saw "made an indelible impression on his mind, the effect being immediately apparent in the complexion of those extraordinary day-dreams in which he passed his visionary boyhood." In 1808 he was placed, as well as his brother Derwent, as day-scholars of the Rev. John Dawes, at Ambleside. As a school-boy his powers as a story-teller were unique; his imagination weaving an enormous romance, whose recital lasted night after night for a space of years. During their school-days, the boys had constant intercourse with Mr. Wordsworth and his family; and Hartley made the acquaintance of Professor Wilson, who was his friend through life. His friendships and connections formed the best part of his education,—"by the living voice of Coleridge, Southey, and Wordsworth, Lloyd, Wilson, and De Quincey." In 1814 Hartley left school; and in 1815 went to Oxford, as a scholar of Merton College. His extraordinary powers as a converser, and his numerous invitations to wine-parties, were injurious to him in two ways—he used great freedom of remark upon "all establishments," and he acquired habits over which he had little subsequent power of control. He passed his examination for his degree in 1818, and soon afterwards obtained a fellowship at Oriel, with high distinction. An unhappy issue followed this honourable and independent position. "At the close of his probationary year, he was judged to have forfeited his Oriel fellowship, on the ground, mainly, of intemperance." The infirmity was heavily visited. We have no record that any friend stepped in to rescue one, so otherwise blameless, so sensitive, so unfit for any worldly struggle, from the permanent consequences of this early error. His brother, who records this painful epoch of his life, with a manly and touching sincerity says, "As too often happens, the ruin of his fortunes served but to increase the weakness which had caused their overthrow." It is unnecessary for us to follow the biographer's explanation of some of the causes which led to this unhappy result—his morbid consciousness of his own singularity—his despondency at being unsuccessful in obtaining University prizes—his incapacity for the government of the pupils whom he received while at college —his impatience of control, and a belief that he was watched by those who looked with suspicion upon the most harmless manifestations of his peculiar temperament. His qualification for future active exertion was irretrievably destroyed.

After leaving Oxford, Hartley Coleridge remained in London two years, occasionally writing in the 'London Magazine,' in which some of his sonnets first appeared. Against his will he was established at Ambleside to receive pupils. The scheme failed; and after a vain struggle of four or five years, the attempt to do what he was unfit for was abandoned. From that time to his death, in 1849, he chiefly lived in the Lake district—idle, according to ordinary notions, but a diligent reader, a deep thinker, and a writer of exquisite verses, and of prose of even a rarer order of merit. From 1820 to 1831, he contributed to 'Blackwood's Magazine.' In 1832 and 1833 he resided with Mr. Bingley, a young printer and publisher at Leeds; for whom he produced a volume of 'Poems,' and those admirable biographies of the 'Worthies of Yorkshire and Lancashire,' which make us more than ever regret that one who wrote with such ease and vivacity, should have accomplished so little. In 1834 his father died, having, in a codicil to his will, expressed great solicitude to ensure for his son that "tranquillity indispensable to any continued and successful exertion of his literary talents," by providing for him, through the proper application of a bequest after the death of his mother, "the continued means of a home." Mrs. Coleridge died in 1845, and an annuity was then purchased on Hartley's life. Meanwhile, he lived with a humble family, first at Grasmere, and then at Rydal, watched over by the kind people with whom he was an inmate, and beloved by all the inhabitants of the district. His illustrious friend Wordsworth was his close neighbour; and the house of the poet was always open to the child-like man of whose wayward career he had been almost prophetic. In 1839 Hartley wrote a life of Massinger, prefixed to an edition of his works published by Mr. Moxon; and during the latter years of his life he wrote many short poems, which appear in the two volumes published by his brother, 'With a Memoir of his Life,' in 1851. Hartley Coleridge died in the cottage which he had long occupied on the bank of Rydal Water, on the 6th of January 1849; and was buried in Grasmere churchyard. His grave is by the side of that of Wordsworth.

COLERIDGE, SARA, the only daughter of Samuel Taylor

Coleridge, was born at Keswick in 1803. Until her marriage she resided in the house of Robert Southey, who married her mother's sister. To his influence and paternal kindness the formation of her mental character must be largely ascribed, though she possessed in a remarkable measure the intellectual characteristics of her father. Her opening womanhood was spent at Keswick in the diligent culture and exercise of her remarkable powers. She readily lent her assistance to Southey in lightening as far as she could his literary labours: she often accompanied Wordsworth in his mountain rambles. In 1822 she had completed her first literary work, 'An Account of the Abipones, an Equestrian People of Paraguay, from the Latin of Martin Dobrizhoffer,' a translation suggested by Southey, and the admirable execution of which he has commemorated in a stanza of his 'Tale of Paraguay.' In 1829 she married her cousin, Henry Nelson Coleridge. [Coleridge, Henry Nelson, *S.* 1.]

She now gave herself to her domestic duties, and her next literary production was prepared as a Latin lesson-book for children, 'Pretty Lessons for Good Children,' and speedily passed through several editions. On the death of her father in 1834, her husband, who was the poet's literary executor, set himself to the task of preparing such of the poet's unpublished works as would serve best to exhibit him as a theologian, philosopher, poet, and critic, and Sara Coleridge most heartily devoted herself to assist in this pious duty. During her husband's life much of the collation and a considerable portion of the annotation fell to her share. After his death she did not hesitate to take upon herself the whole of the arduous labour. The 'Aids to Reflection,' 'Notes on Shakspeare and the Dramatists,' and 'Essays on his Own Times' were edited by her alone, and to some of them were affixed elaborate discourses on the most weighty matters in theology, morals, and philosophy, which were discussed in a clear and vigorous style, with a closeness of reasoning and an amount of erudition quite remarkable in one of her sex. But Sara Coleridge, like her father, had in no stinted measure the imaginative as well as the reasoning faculty. Her fairy tale, 'Phantasmion' wanted only the colouring of verse to have been generally allowed to rank among the more beautiful poems of the age; but in prose its often exquisite imagery and delicate shades of thought and feeling seemed to lack some clear and palpable intention; and it was regarded for the most part as vague, visionary, and obscure. Probably it will be on her commentaries upon her father's works—from which they are not likely to be by any future editor dissociated—that her fame will ultimately rest; but her rare acquirements and rarer gifts being thus expended on annotations, are now scarcely likely ever to meet with their due recognition. Sara Coleridge survived her husband ten years. She died May 3rd, 1852. At her death she was engaged in preparing a new edition of her father's poems, which was completed and published by her brother, 'Poems of S. T. Coleridge, edited by Derwent and Sara Coleridge,' 1852.

COLESHILL. [Warwickshire.]

COLLINS, WILLIAM, R.A., was born in Great Titchfield-street, London, September 18, 1787. His father, a native of Wicklow, was the author of various works which attracted some notice in their day; among others a poem on the slave trade, a novel entitled 'Memoirs of a Picture,' and a 'Life of George Morland.' The elder Collins was a picture-dealer as well as an author, though in neither calling had he had much pecuniary success. Morland was a friend of his, and when his son began to exhibit a fondness for art and some skill in drawing, he readily obtained Morland's consent that the youth might stand beside him and watch him paint. William made tolerable progress in his pictorial studies. He entered in 1807 as a student at the Royal Academy at the same time as Etty, and in after life the two R.A.'s were fond of comparing their early drawings and subsequent progress. His earliest appearance as an exhibitor on the walls of the Royal Academy was in 1807, when he contributed two small 'Views on Millbank,' and from that time, with the exception of two years when he was away in Italy, he did not miss an exhibition for the remaining nine-and-thirty years of his life. His father's death in 1812 threw upon the young painter serious responsibilities, but these only stimulated him to increased exertions. For some time he was forced to paint portraits as the readiest means of securing a moderate income, but his landscapes and rustic groups began to make their way, and he was soon enabled to follow the bent of his genius. Almost from the first he showed his fondness for painting groups of homely children engaged in some favourite diversion, or taking part in some juvenile trick; but it was not till the year following his election as associate of the academy, which took place in 1814, that he struck into that path—the representation of coast scenery—which perhaps most surely led him to fame and fortune. From that time—indeed, for some three or four years previous—Collins never wanted patrons; his course from first to last was one of moderate but unbroken success.

As a painter of rustic life, or rather, perhaps, we ought to say of country children and homely country scenery, Collins had hardly a rival. He watched the habits and noted every movement of the rough and unsophisticated urchins, and seldom failed to depict them in their most natural and unrestrained gaiety. Swinging on a gate, 'happy as a king;' gazing with unbounded admiration at the newly born puppy; enticing the 'stray kitten;' outwitted by the saucy robin just at the moment when making sure that the pinch of salt was about to fall on the bird's tail; exhibiting the fresh-found nest; buying the cherries—however the youngsters were represented the truth of the portraiture was at once apparent: and some quaint or novel incident was sure to be added, which marked more graphically than even the principal feature, the keenness of the painter's eye, and the skilfulness of his hand. In his coast scenes these characteristics were equally visible; and equally evident also was his happiness in his choice of a subject. In neither was there ever any attempt to surprise or excite. The painter knew exactly what was within the range of his powers. He saw his subject clearly; knew what he meant to accomplish, and seldom failed to accomplish it. Hence his pictures, apart altogether from their artistic skill, always appear to have a purpose. They show that there was something which really interested and pleased the painter, and as a consequence the spectator is himself also interested and pleased. But their technical qualities are of a very high order. Collins had an excellent eye for form, chiaroscuro, and colour. From the first he painted always with the greatest conscientiousness. He never slighted any part of his work, and always did his best; and hence his course exhibited continual progress. In his earlier pictures there may be traced something of feebleness arising from an excess of anxiety to render his work perfect. But, with increased command over his materials, he gradually acquired greater breadth and vigour; and though he always continued to finish his pictures with scrupulous care, he early recognised the truth of the axiom that mere correctness of detail is not finish. And then with his technical and manipulative skill there was shown a close study of nature. The receding or advancing wave, the moist or parched sand, the teeming clouds, every phase and every feature of earth, and sea, and sky, were faithfully observed and unobtrusively represented. No wonder that in a country like this, where every one who can turns to the scenery of nature with never-tiring zest, such faithful transcripts of her commoner aspects, animated too by life-like groups of those peasant children who, to city dwellers at least, always seem so genuine a part of the scenery, should have found abundant admirers and ready purchasers.

In 1836 Mr. Collins visited Italy, and remained there nearly two years; diligently availing himself of every opportunity of examining the works of the great masters, but at the same time filling his sketch-book with transcripts of the more striking features of the natural scenery and careful studies of the monks and peasants, and, above all, of the children, in that land of lazy enjoyment and perennial beauty. On his return in 1839, he sent to the academy as the fruits of his journey two views in Naples: one with groups of young lazzaroni playing the game of 'arravoglio;' the other with 'Poor Travellers at the door of a Capuchin Convent;' also a view at Subiaco. They manifested an increase of artistic knowledge and power, and were greatly admired. The next year he appeared in quite a new branch of art, that of historical painting. With increasing years Mr. Collins had been increasing in the depth and earnestness of his devotional feelings, and he not unnaturally felt a strong desire to represent in his own way the scenes on which his imagination loved to dwell. 'Our Saviour with the Doctors in the Temple" accordingly appeared on the Academy walls in 1840; 'The Two Disciples at Emmaus' in 1841. They of course attracted attention, and supplied a topic of conversaton in art circles, nor did they fail of purchasers; but it was felt to be a positive relief by the great body of the painter's admirers when, after a little coying with native scenery in one or two small pictures exhibited in 1842, he reappeared with all his old freshness and vigour in 1843 and succeeding years, with his 'Windy Days,' and 'Cromer Sands,' and 'Prawn Fishers,' and 'Cottage Doors,' and the like; and never did Collins enjoy more general popularity as a painter than in these last three or four years of his life.

Collins's journey to Italy not only led him to waste on uncongenial subjects several of the best years of his life, but during it he laid the foundation of the disease which shortened his days. It was not however till 1844 that disease of the heart declared itself in a decided form; but from that time he obtained only temporary relief from its distressing symptoms, though he laboured on at his calling with unabated industry, and almost to the last with little perceptible loss of power. He died on the 17th of February 1847, at his house, Devonport-street, Hyde Park Gardens.

Collins was elected R.A. in 1820; in 1840 he was appointed librarian to the Academy, but resigned it on finding that its duties required a greater devotion of time than he could afford to give to them. Collins was, as we have already noticed, fortunate in early finding friendly and liberal patrons. As early as 1818 one of his Norfolk coast scenes obtained a place in the Royal Collection, and George IV. subsequently commissioned a companion to it—'Prawn Fishers at Hastings.' Yet, though so much in request, the painter never obtained any of those extravagant sums for his works which we sometimes find popular painters demanding. The largest sum he ever received for a picture was 500 guineas, from Sir Robert Peel, for his large and admirable 'Frost Scene.' The paintings of Collins are to be met with in most of the great private collections in this country. In the National Gallery the foreigner would look in vain for a specimen of this, one of the most thoroughly national of English painters. Fortunately, the Vernon collection to a certain extent supplies the deficiency: there may be seen an excellent example of his delineations of rustic enjoyment in 'Happy as a King,' painted in 1836; one of his pleasant coast-scenes, in 'The Shrimpers—Evening,' painted in 1831; and his 'Fisherman's Widow,' painted in 1835. Mr. Collins married in 1822 the daughter of Mr. Geddes, A.R.A., and sister of Mrs. Carpenter, the well-known portrait-painter; and by her had two sons.

COLNE. [Lancashire.]

COLOMBO. [Columbo.]

COLUBRINA, a genus of Plants belonging to the natural order *Rhamnaceæ*. It has a spreading 5-cleft calyx; petals 5, obovate-convolute; stigmas 3. Fruit capsular, dehiscent, tricoccous, girded at the base by the calyx. The seeds are furnished with a short stalk. The species are shrubs with alternate, quite entire, or crenulated leaves, netted with distant feather-nerves, smooth but usually pubescent or rusty villous. The flowers are in axillary short crowded cymes, or in fascicles with simple peduncles.

C. fermentum, Fermented Snake-Wood, is a native of Guinea; the bitter bark of which tree is said to bring on violent fermentation in the liquors into which it is thrown. There are several other species described, natives of South America, Africa, and the East Indies. None of them are of any known use, and are not worth cultivation except in general collections.

COLUMBITE. [Columbium.]

COLYTON. [Devonshire.]

COLZA. [Brassica.]

COMBE, DR. ANDREW, was born in Edinburgh, October 27, 1797, the fifteenth child and seventh son of a family, which numbered seventeen in all. His father was a respectable brewer in Edinburgh, and a man of superior mind and integrity; his mother also was a superior person. Educated in his boyhood and youth very much under the care of his elder brother George, the well-known phrenologist, he chose the medical profession; and, having studied at Edinburgh and Paris, and taken the degree of M.D., he began practice in Edinburgh in 1823. A pulmonary complaint under which he had laboured since 1819, and which obliged him to make frequent journeys into warmer climates, precluded him from such an active career as a physician as he might otherwise have been fitted for. In 1836 he was appointed Consulting Physician to the King of the Belgians. As early as 1818 he had, like his brother George, given his attention to phrenology and become a convert to it; and both during his practice as a physician and afterwards, he continued to advocate its doctrines through the 'Phrenological Journal.' He was also a distinguished writer on general scientific and medical subjects. The following is a list of his most important separate works:—'Observations on Mental Derangements,' 12mo, Edinburgh 1831; 'The Principles of Physiology applied to the preservation of health, and to the improvement of physical and mental Education,' 8vo, Edinburgh, 1834—a work which has been highly appreciated, and has gone through sixteen or seventeen editions; 'The Physiology of Digestion considered with relation to the Principles of Dietetics,' Edinburgh, 1836, also a most popular and useful work; 'A Treatise on the Physiological and Moral Management of Infancy,' 8vo, Edinburgh, 1840, eight editions of which have been sold. These works were written by Dr. Combe in the intervals during which he enjoyed comparative freedom from the malady which he knew was to carry him away. The last years of his life were spent by him as a confirmed invalid, either shut up in his room in Edinburgh, or seeking health by continued travelling and sea-voyages. In 1842 he was in Madeira. The mildness of his demeanour during his long illness, and the zeal with which he continued to forward every scheme of benevolence which accorded with his sense of what was right and expedient, obtained him the peculiar regard of all who knew him. His death, long expected, took place on the 9th of August 1847. An interesting and affectionate account of his 'Life and Correspondence' was published in 1850 by his brother George.

COMBE MARTIN. [Devonshire.]

COMPOUND RADICLE. [Chemistry, *S.* 2.]

COMTE, AUGUSTE, a French philosopher, whose peculiar system of views has been put forth by himself, and is now generally referred to under the name of 'The Positive Philosophy,' was born within a year or two of the close of the last century. His family was strongly Catholic and royalist. Educated at one of the French lyceums, he gave very early proofs not only of a speculative turn of mind, but also of a dissatisfaction with the existing methods of knowledge and the existing forms of society, and a belief that he was destined to play the part of a Bacon in the 19th century, and initiate a new philosophical revolution. Mathematics and the physical sciences occupied much of his attention, but he had already extended his views to social questions, and become possessed with the doctrine that the time had come when all science and all philosophy must be treated from the social, as the supreme point of view. It was with views and aims of this kind fermenting in his mind, that, while yet a mere youth, he was involved within the powerful vortex of the Saint-Simonian school, which, immediately after the restoration of 1815, began to figure in Paris. The genius of Saint-Simon, then between his fiftieth and sixtieth year, drew around him, as by a kind of magnetic fascination, a number of ardent young men, whom he indoctrinated with his views, and almost all of whom—notwithstanding that few of them in mature years have adhered to the philosophy of their master—have been distinguished in one way or another in the subsequent history of France. Of these Comte was the youngest—the Benjamin, as he was called, of the Saint-Simonian school. Saint-Simon had high hopes of him; and when, about 1820, the school put forth, as one of their propagandist works, an exposition of the scientific basis of their system, it was on Comte that the preparation of the work devolved. The work entitled 'Système de Politique Positive' however only partially satisfied Saint-Simon, who said that while "it expounded the generalities of his system from the Aristotelian point of view," it overlooked "their religious and sentimental aspect." The truth is, Saint-Simon and Comte were beginning to part company. The discrepancy did not become decided till after the death of Saint-Simon in 1825, when Comte broke off from the little band of Saint-Simonians—including Enfantin, Bazard, Rodrigues, and Augustin Thierry—who remained faithful to the views of their master, and set about forming an organisation for their farther propagation. Comte subsequently spoke disparagingly of Saint-Simon, and represented his temporary connection with that enthusiast as rather an interruption to his own true intellectual development than a furtherance of it; but certainly there are such coincidences between M. Comte's subsequent works and the cardinal speculations promulgated by Saint-Simon when alive, that, unless we can suppose that the pupil prompted the master to a greater extent than usually happens in such cases, it is impossible to acquit M. Comte of a certain appearance of ingratitude in his allusions to this part of his education. In 1826 M. Comte was seized with what he calls 'a cerebral crisis,' which for the time was believed to be irrecoverable insanity. He did recover however, and lived to propound the philosophy with which his name is associated. Supporting himself by teaching mathematics—in which capacity he was professor at the École Polytechnique, till differences with his colleagues and the accession of Louis Napoleon to the empire deprived him of his office, and reduced him to a state of indigence in which his chief support consisted of voluntary contributions from his admirers in France and England—he published during the last seven and twenty years a series of works, all devoted to the elucidation of his 'Positive Philosophy,' and in which even those who have no sympathy with that system in its fundamental doctrines and its spirit, or even abhor it, recognise great power of intellect, and an extraordinary fertility of generalisation on all subjects.

First, published at intervals in six large volumes, between 1830 and 1842, came out his greatest work, entitled 'Cours de Philosophie Positive.' In this work, after propounding his main doctrine, which is, that the human mind has, by a natural law, passed through three successive stages in its thoughts upon all subjects; namely, the *theological* stage, in which phenomena are accounted for by the supposition of the agency of supernatural beings to produce them; the *metaphysical* stage, in which, while living supernatural beings are got rid of, certain abstract ideas, such as those involved in the words 'Nature,' 'Harmony,' and the like, take their place in men's thoughts as the productive causes of everything; and the *positive* stage, in which, shaking off both unseen spiritual agencies and abstractions, the mind grasps the notion of the universe in all its departments as proceeding according to certain laws or uniform sequences, to be ascertained by observation and induction;—he proceeds to apply this view to the entire system of human knowledge. All that man knows, or can know, he says, consists of certain sciences which may be arranged in a hierarchical order as follows, according to the increasing speciality and complexity of the facts with which they respectively deal:—1st, *Mathematics*, the most general and simple of all, which deals with the mere facts of number and magnitude; 2nd, *Astronomy*, which presupposes mathematics, but takes in as additional the facts of the celestial sphere, i. e. suns, planets, moons, comets, &c., as they are seen as mutually acting masses; 3rd, *General Physics*, which takes for granted mathematical and astronomical laws, but concerns itself also with the motions and other mechanical phenomena of bodies on our earth; 4th, *Chemistry*, which, in like manner, presupposes all the foregoing, but investigates farther the phenomena of the molecular changes and constitution of bodies; 5th, *Biology* (subdivided into Vegetable and Animal, and involving Psychology as a department of Animal Biology concerned more immediately with the phenomena of nerve and brain-function), undertaking the farther study of individual organised beings; and 6thly, *Sociology* or the *Social Science*, investigating, as the most complex phenomena of all, those of social or corporate life. Hitherto, according to M. Comte, only the first four of these sciences have been even partially emancipated from the theological and metaphysical spirit, and pursued positively; but the time had come, as he thought, for the extension of the true positive or scientific spirit to all, and consequently for the expulsion of theology and metaphysics from the universe. As the apostle of this great speculative change he first reviewed the various sciences up to the last and chief one, which, by a gross but convenient grammatical hybridism, he calls Sociology, giving in fact a series of treatises in which the generalities of mathematics, astronomy, general physics, chemistry, and biology, are lucidly expounded, and then reserves his strength, in the last three volumes, for Sociology. Here he reviews the history of the world, and protesting against the anarchy of all existing politics, attempts to lay down the basis of a true or positive politics, such as states will ultimately be governed by, when the positive millennium shall have come. Apart from the main purpose, this portion of the work abounds with striking thoughts and propositions of wide application.

In 1843 M. Comte published a small mathematical work entitled 'Traité Elémentaire de Géométrie Analytique à deux et à trois dimensions,' followed not long afterwards by a popular treatise on astronomy, which has been highly admired; and in 1844 he published a 'Discours sur l'Esprit Positif,' enforcing popularly the ideas of his larger work. Within the next few years, however, a second vital 'crisis' of his life—not this time of the 'cerebral' kind, but of the sentimental—worked a certain change in his views. A virtuous affection, to which he makes frequent allusion in subsequent autobiographic passages in his prefaces, for a lady named Clotilde, whose death left him miserable, revealed to him, what Saint-Simon had long before hinted, the deficiency and meagreness of his philosophy on the sentimental and religious side. To make up this deficiency was the object of all his later activity. This he attempted to do, not by obliterating any part of his already-proclaimed philosophy, not by calling back either cashiered theology or cashiered metaphysics into the universe, but by supplementing *positivisme* with the necessary effusion from the heart. In fact, during the last eight years, M. Comte endeavoured to found a new religion, consistent with the fundamental doctrine of positivisme; to accomplish which, seeing that positivisme denies deity or invisible spirits of any kind apart from humanity, he makes humanity itself the object of the new worship. In 1848 he published a 'Discours sur l'Ensemble du Positivisme,' in which the notion of the new religion, as the necessary appendix to his philosophy, was promulgated, and in 1849 he published a singular book of a more precise nature, entitled 'Culte Systematique de l'Humanité: Calendrier Positiviste, ou Système général de Commemoration publique,' in which work he proposed a systematic worship by humanity of itself, as represented in its greatest men of all ages—twelve of whom he specified as worthy to preside over the twelve months of the year, while for each week he nominated subordinate men, and for each day minor celebrities still (it was singular to the reader to note how many Frenchmen there were among these gods and godkins); and also arranged some of the formalities of the worship. In 1852 appeared the 'Catéchisme Positiviste, ou Sommaire Exposition de la Religion Universelle en onze Entretiens Systematiques entre une Femme et un Prêtre de l'Humanité;' M. Comte himself giving in the meantime practical effect to his views by assuming the office and title of the chief priest of his own religion, preaching as such, and performing the marriage ceremony and funeral rites when called upon by his disciples to do so. His disciples in this sense however were never numerous, and while publishing his last work, entitled 'Système de Politique Positive, ou Traité de Sociologie, instituant la Religion de l'Humanité,' the first volume of which appeared in 1851 and the others have been issued since, he was not only in poor circumstances, but complained of the desertion of his pupils one after another, and expressed his sorrow that he saw no one all over the earth whom, before he died, he could ordain as his successor in the chair of the new philosophy and the pontificate of the new religion. M. Comte died Sept. 5, 1857.

Those who desire farther information respecting the life and views of this very extraordinary personage, will find it either in his own works above enumerated, or in two works published in this country presenting an abstract of his views—'Comte's Philosophy of the Sciences, being an Exposition of the Cours de Philosophie Positive,' by G. H. Lewes; and Miss Harriet Martineau's 'Positive Philosophy of Auguste Comte freely translated and condensed' (5 vols. 1853.) Comte's 'Philosophy of Mathematics,' extracted from his main work, has been translated in America by W. M. Gillespie; and his 'Popular Astronomy' also, if we mistake not, has found an English translator.

CONDAMINEA, a genus of Plants belonging to the natural order *Cinchonaceæ*. It has a campanulate calyx, 5-crenate or 5-toothed limb, deciduous; corolla funnel-shaped, with a somewhat curved tube, which is a little longer than the calyx, a dilated throat, and a 5-parted limb; stamens inserted above the middle of the tube or near the throat; anthers oblong, linear, bifid at the base, length of corolla; stigma 2-lobed. Capsule turbinate, truncate, opening in the middle of the cells. Seeds numerous, very small, wedge-shaped. The species are American shrubs, with 2-parted acuminate stipules and terminal many-flowered corymbs.

C. corymbosa is a native of the hills and ravines of the Peruvian Andes. It has ovate-oblong leaves, acuminate, cordate, sessile, plicated, coriaceous; corymbs large, brachiate, trichotomous; corolla purple externally, with the throat and filaments naked; teeth of the calyx broad, short, and blunt. The bark is febrifugal. The bark gatherers of Peru are said to use this plant for adulterating samples of *Cinchona*. Its bark is only slightly bitter, and may be easily recognised by its being white inside, rather bitter, and viscid.

C. tinctoria is a native of South America, and is used occasionally as a dye.

CONDER, JOSIAH, was born in London on the 17th of

September, 1789. He was the son of a bookseller, and very early displayed a taste for literature. His first attempts were given to the world in the 'Athenæum,' a monthly magazine then edited by Dr. Aikin; and in 1810, in connection with a few friends, a volume of poems was published under the title of 'The Associate Minstrel.' In 1814, being at the time a publisher and bookseller in St. Paul's Churchyard, he purchased the 'Eclectic Review,' of which he continued to be editor until 1837, though he retired from the bookselling business in 1819. Under his management the 'Eclectic Review' received the assistance of many eminent men among the non-conformists, such as Robert Hall, John Foster, Dr. Chalmers, Dr. Vaughan, and others. During this period, his industry was displayed by the production of other works also. In 1818 appeared two volumes 'On Protestant Nonconformity.' In 1824 'The Modern Traveller' was commenced: it extended to thirty-three volumes, nearly the whole of which were compiled by Mr. Conder, and all under his superintendence. In 1824 also appeared 'The Star in the East,' a poem; and in 1834 a 'Dictionary of Geography,' and a new translation of the 'Epistle to the Hebrews, with Notes.' In 1836 he edited 'The Congregational Hymn-Book,' issued under the sanction of the Congregational Union; and in 1837 he published 'The Choir and Oratory: Sacred Poems,' to which Mrs. Conder was a contributor. He was the author of many other works, but we have mentioned the principal.

Mr. Conder's reputation having become established among the Dissenters, he was requested in 1832 to undertake the editorship of 'The Patriot,' a newspaper recently established in the dissenting interest. From this time he took a more active part in the public proceedings of the Dissenters, attending their meetings, and affording them the assistance of his counsels. 'The Patriot,' under Mr. Conder's management, became the organ of what may be termed in politics the Whig section of the Dissenters, as opposed to the Radical section; while in ecclesiastical affairs it represented the Congregationalists and Baptists. For twenty-three years Mr. Conder fulfilled the duties of his office with exemplary care, industry, and liberality; producing also occasionally works of importance, such as 'Analytical and Comparative View of all Religions,' 'The Harmony of History with Prophecy,' &c., and several pamphlets on stirring topics of the day.

Mr. Conder married in 1815 Joan Elizabeth, the daughter of Mr. Thomas of Southgate, by whom he left four sons and a daughter. After a short illness, he died on Dec. 27, 1855.

CONFEDERATION, ARGENTINE. [Plata, La, States of.]

CONIA. [Chemistry, *S.* 1.]

CONICINA. [Chemistry, *S.* 1.]

CONSCIENCE, COURTS OF. All the Courts of Conscience, Courts of Requests, and other similar tribunals were abolished in 1846, by the statute 9 & 10 Vict. c. 95, on the creation of the new County Courts. [Courts, *S.* 2.]

CONOPS, a genus of Insects belonging to the order *Diptera* and the family *Conopidæ*. The family *Conopidæ* is thus characterised:—Proboscis distinct, last joints of antennæ forming a short style. Wings perfect. Cubital vein simple; brachial veins without spurious vein; axillary lobe rounded. Halteres uncovered.

The genus *Conops* has the following characters:—Body of middle size, rather slender, generally adorned with yellow or red bands. Head thick, vesiculose, the crown especially, with a transverse vesicular tubercle; front broad in both sexes. Eyes prominent, oblong; ocelli none. Proboscis long, porrect, stiff, clavate, horizontal, or somewhat raised into a curve, geniculate at the base, arched above, hollow beneath, obliquely notched at the tip, much shorter than the labium. Lingua slender, filiform, transparent. Palpi uniarticulate, short, very small, fringed at the tips with fine bristles. Labium obliquely porrect, cylindrical, twice the length of the lingua, narrower towards the tip, most slender in the male, bilobed, slightly hairy, and with three shallow transverse furrows at the tip. Antennæ about as long as the head, porrect, seated on a tubercle, approximate at the base, diverging thence; first joint short, cylindrical, pubescent, forming an angle with the second; second long, sub-clavate; third conical, shorter than the second; fourth very short; fifth and sixth larger, widened on one side; sixth and seventh like a little spine. Thorax almost quadrate, slightly convex above, with a scapula on each side; scutellum small, semicircular. Wings lanceolate, finely pubescent, incumbent, and parallel in repose, præbrachial vein united with the cubital towards the tip; præbrachial and discal areolets long, the latter closed near the posterior margin by a transverse vein; anal areolet long, distinct, complete. Abdomen arched, rather long, with six segments more or less slender towards the base, obclavate towards the tip, which is incurved. Legs rather stout; tibiæ very slightly curved, compressed and dilated at the tips, in some cases with a transverse suture; tarsi rather broad; ungues and onychia distinct.

Male.—Abdomen with a projecting conical process on the fourth segment beneath.

These flies frequent flowers; their larvæ are parasitic on those of the humble-bee. There are twenty species of this insect in the collection at the British Museum, of these not more than three are found in England, the rest having been caught in the south of France, North America, and Australia.

A single specimen of *C. strigata* was found near Killarney, in Ireland, in the year 1850. (Walker, *Insecta Britannica.*)

CONSTANTINA. [Costantina.]

CONYBEARE, VERY REV. WILLIAM DANIEL, Dean of Llandaff, was born at his father's rectory, St. Botolph's, Bishopsgate, London, June 7, 1787. He entered Christchurch College, Oxford, in January 1805, and took his degrees B.A. in 1808, and M.A. in 1811. Mr. Conybeare was one of the earliest promoters of the Geological Society, and the important services he rendered to geological science may be seen in his numerous papers printed in the Society's 'Transactions.' He was the discoverer of the Plesiosaurus, that strangest of all the antediluvian monsters, and for his descriptions of the animal Cuvier paid him the highest compliment that can be offered by one scientific philosopher to another. His papers on the coal-fields, giving a description of the physical geography of important districts, and establishing the relations of some of the most remarkable British rocks, and their order of superposition, have furnished data for practical purposes, and show how the absurd mistakes of mining speculators are to be avoided. As will be seen from the subjoined titles, his researches were extended to various branches of inquiry. His first paper presented to the Geological Society was 'On the Origin of a remarkable Class of Organic Impressions occurring in Nodules of Flint,' vol. ii., 1814; 'Descriptive Notes referring to the Outline of Sections presented by a Part of the Coasts of Antrim and Derry,' vol. iii., 1816, made in a tour conjointly with the Rev. Dr. Buckland, Dean of Westminster; 'Notice of the Discovery of a New Fossil Animal, forming a link between the Ichthyosaurus and Crocodile,' &c., vol. v., 1821. In vol. i., new series, 1824, further notices are given, and 'On the Discovery of an almost perfect Skeleton of the Plesiosaurus;' and the same volume contains 'Observations on the South-Western Coal District of England,' written conjointly with the Dean of Westminster; 'Extraordinary Landslip and great Convulsion of the Coast near Axmouth,' Jameson's 'Edin. Journal,' 1840; 'On the Phenomena of Geology which seem to bear most directly on Theoretical Speculations,' 'Phil. Mag.' vols. viii. and ix., second series; 'On the Structure and extent of the South-Welsh Coal Basin,' *ib.* vol. xi.; 'Outlines of the Geology of England and Wales; with an introductory Compendium of the General Principles of that Science,' &c., 8vo, London, 1822 (conjointly with W. Phillips). He also drew up the 'Report on the Progress, Actual State, and Ulterior Prospects of Geological Science,' published in the first volume of the 'Reports of the British Association.'

Mr. Conybeare was elected a fellow of the Royal Society in 1819. He was a fellow of the Geological Society, and corresponding member of the Institute of France. He became Dean of Llandaff in 1845, having previously been public preacher in his own university, and Bampton lecturer in 1839. He died after three hours' illness, on August 12th, 1857, at Itchen Stoke vicarage, while staying with his third son.

COOKIA, a genus of plants belonging to the natural order *Aurantiaceæ*. The species are small trees with imparipinnate leaves; leaflets alternate, unequal at the base, or oblique.

C. punctata is a native of China and the Moluccas; it has ovate lanceolate leaflets, acuminated, hardly unequal at the base. It is a middle-sized tree bearing eatable fruit about the size of a pigeon's egg, yellow on the outside, the pulp white, rather acrid, but sweet. This fruit is esteemed as an article of diet in China and the Indian Archipelago, and is known by the name of Wampee. There are two or three other species, natives of the East, all known as Wampee Trees.

COOKSTOWN. [Tyrone.]

COOPER, JAMES FENIMORE, was born at Burlington, New Jersey, United States, on the 15th of September, 1789. His father was of a Buckinghamshire family, which emigrated to America some twenty years before the birth of the future novelist. When James was about two years old his father removed to the banks of the picturesque Otsego Lake, Western New York, and there founded the village of Cooperstown; and somewhat later he was elected a judge of the state of New York. Having himself initiated his son in the rudimentary branches of learning, he transferred him to the care of the Rev. J. Ellison, an episcopal clergyman at Albany, by whom he was prepared for college. He remained at Yale college from 1802 to 1805, when, having taken his degree, he entered the navy as a midshipman. He served at sea for six years, and his conduct won the approbation of his superiors, and the esteem of his fellow-officers. It was here he acquired that familiarity with a maritime life, and knowledge of the scenes and phenomena of the ocean, which lend such a charm to his naval stories. On retiring from the service he in 1811 married Miss Delancy, a sister of Bishop Delancy of New York, and took up his abode in the family village of Cooperstown.

His next few years were spent in private life. It was not till 1821 that Mr. Cooper appeared as an author. His first work was a novel, 'Precaution,' which professed to be a story of English life. It met with no success, but the author, little daunted, speedily ventured before the public again, with 'The Spy—a tale of the Neutral Ground.' A thoroughly original and genuine American novel caught the American ear, much as 'Waverley' had caught the Scottish. Its success was immediate and unbounded. In England its vivid portraiture of American character and scenery gave it the additional charm of novelty, and Cooper at once took rank with the leading novelists of the day. The 'Pioneers' followed in 1823, and confirmed the reputation of its author. A year later appeared 'The Pilot—a Tale of the Sea.' These were the types of a long series of novels which during many years flowed from Cooper's prolific pen. He had in them brought before his readers the mighty forests and wide prairies,—the backwoods of America, with their original occupants the Red Indians and the Anglo-American hunters and settlers, who were rapidly supplanting them; and the sea with its daring American privateers; and again and again he was to reproduce these in more or less varied forms. The strength of his narrative, his power in delineating character, his command of the passions, keenness of observation, and descriptive skill were acknowledged without stint, and America was admitted to have produced a great original novelist.

Cooper, like Scott, thought the tide of success was to be taken at the full; and he published novel after novel with a rapidity rivalling that of the author of 'Waverley.' For a time his imagination and stores of knowledge appeared to sustain without diminution the heavy drain. He was never happier in depicting peculiarities of character, nor carried the reader along with more rapidity and interest, than in the 'Prairie' and the 'Last of the Mohicans,' which appeared after 'Lionel Lincoln' and one or two others, in 1826; in the 'Red Rover' and the 'Water Witch,' and the 'Wept of the Wish-ton Wish,' which followed in succeeding years. But in these and a few others he exhausted his genius, and novels like 'Ned Myers,' the 'Sea Lions,' 'Mercedes of Castille,' and 'The Headsman of Berne,' served only to call into clearer notice the weak points of their author; yet the 'Deerslayer' and one or two other of his later stories had so much of beauty and strength, that had there been no intervening failures, there would have been little reason to fancy that the hand of the great American novelist had lost its skill.

In 1826 Mr. Cooper visited Europe, where he remained for about ten years, his longest sojourns being made in London and Paris. The fruits of his European travel were the novels of 'The Headsman,' 'The Bravo,' 'Heidenmaur,' and 'Mercedes,' none of which were very successful; and 'Homeward Bound,' and 'Home as Found,' which, with the 'Introductory Letter to his Countrymen,' stirred up some strong feeling. Nor was he, as we have already intimated, happier in the novels he wrote on his return to America, although in several of them he recurred to his old American forests and sea haunts. But he wandered also often into the regions of home and foreign politics, not even keeping clear of controversy in his novels; and his very inaptitude for reasoning rendered him the more dogmatic in maintaining his own views and irascible under contradiction or dissent. Some of his home critics he prosecuted for libel; his foreign opponents he denounced with unbounded wrath. However, as time wore on his better spirit resumed its sway, and it was rewarded at home and abroad with a return of the old admiration and esteem; so that his death, which occurred at Cooperstown on the 14th of September, 1851, caused a general expression of sorrow throughout America, which was sincerely responded to in this country, where he had hardly fewer readers and admirers than in his own land.

Besides the novels mentioned above, Mr. Cooper wrote 'The Pathfinder,' 'The Monikins,' 'The Two Admirals,' 'Wyandotte,' 'Wing and Wing,' 'Afloat and Ashore,' 'Autobiography of a Pocket Handkerchief,' 'Satanstoe,' 'The Chainbearer,' 'The Crater,' 'Oak Openings,' 'Jack Tier,' 'The Sea Lions,' and we believe one or two others. He also wrote a 'History of the United States Navy,' which does not bear a very high reputation; 'Lives of Distinguished American Naval Officers,' 'Gleanings in Europe,' 'Sketches of Switzerland,' 'Notions of the Americans by a Travelling Bachelor,' and 'The Way of the Hour.' Most European languages have translations of some of Cooper's novels, and it is stated that one or two of the Oriental tongues possess a version of at least one of his stories. Most of the earlier novels and several of the later have been rendered into German; and in French there is a translation by Defauconpret in 23 vols. 8vo, Paris, 1838-45, and another in 6 vols. by Messrs. Laroche and de Montémont.

COOT (*Fulica atra*). [RALLIDÆ.]

COOTEHILL, county of Cavan, Ireland, a post-town and the seat of a Poor-Law Union, in the parish of Drumgoon and barony of Tullaghgarvey, is situated in 54° 5′ N. lat., 7° 3′ W. long., 73 miles N.N.W. from Dublin. The population in 1851 was 2105, besides 1101 in the Union workhouse and other public institutions. Cootehill Poor-Law Union comprises 19 electoral divisions, with an area of 105,848 acres, and a population in 1851 of 44,333.

Cootehill lies on the road from Kingscourt to Clones, and has four principal streets, which are wide and substantially built. It contains a neat church, besides chapels for Roman Catholics, Presbyterians, Methodists, Moravians, and Quakers. There is here a brisk trade in linens, and a large market for agricultural produce. The town stands at the western extremity of a series of lakes which are navigable for the greater part of the distance (7 miles) hence to Ballybay. The neighbourhood is well cultivated, and adorned with numerous demesnes and mansions. Quarter sessions for the county are held at Cootehill. There are here a bridewell, a dispensary, and a station of the constabulary force. A fair is held on the second Friday in each month.

COPLESTON, REV. EDWARD, D.D., was born February 2, 1776, at the rectory-house, Offwell, Devonshire. His father, the Rev. John Bradford Copleston, was the rector of that parish, and he educated at his own residence a limited number of pupils, among whom was his son Edward. In 1791 Edward Copleston was elected to a scholarship at Corpus Christi, Oxford; in 1793 he obtained the Chancellor's prize for a Latin poem; and in 1795 he was elected a Fellow of Oriel College. He obtained the Chancellor's prize for an English essay on 'Agriculture,' in 1796, and in 1797 was appointed college-tutor, though he had not then taken his degree of M.A. In 1802 he was elected Professor of Poetry to the university, in which office he succeeded Dr. Hurdis. He published in 1813 the substance of the lectures which he had delivered, under the title of 'Prælectiones Academicæ', a work which gained him a high reputation for pure and elegant Latin composition combined with extensive poetical information. Some severe attacks on the University of Oxford having been made in the 'Edinburgh Review,' Mr. Copleston published in 1810 'A Reply to the Calumnies of the Edinburgh Review against Oxford,' which was followed by another 'Reply' in the same year, and by a third in 1811. These replies were greatly esteemed by the university, and regarded as a triumphant defence. In 1814 Copleston was elected Provost of Oriel College, and soon afterwards the degree of D.D. was conferred upon him by diploma, the instrument setting forth that this distinction resulted from a grateful sense of the many public benefits which he had conferred upon the university. Dr. Copleston is chiefly remembered as a divine by his work on 'Predestination,' which consists, for the most part, of three sermons preached at St. Mary's church, Oxford, 'An Enquiry into the Doctrines of Necessity and Predestination, with Notes and an Appendix on the 17th Article of the Church of England,' 8vo, London, 1821. Between the years 1811 and 1822 he contributed many articles to the 'Quarterly Review.' In 1826 Dr. Copleston was appointed to the deanery of Chester, and in 1827 he succeeded Dr. Sumner in the bishopric of Llandaff and deanery of St. Paul's, London. He also held the honorary appointment of professor of ancient history to the Royal Academy of Arts, and was a fellow of the Society of Antiquaries. After he became a bishop his time was chiefly occupied in the performance of the duties of his diocese. Some of his sermons, charges, and speeches in the House of Lords, were published at the time when made. He resided mostly during the latter part of his life at Hardwick House, near Chepstow, where he died October 14, 1849.

(*Memoirs of E. Copleston, Bishop of Landaff, with Selections from his Diary and Correspondence, &c.*, by William James Copleston, London, 1851, 8vo.)

COPROLITES (*κόπρος* and *λίθος*), the fossilised excrements of reptiles, fish, and other animals, found in various strata of the earth. Dr. Buckland in his 'Bridgewater Treatise' first drew attention to the probable nature of these substances, some of which had been previously known under the name of Bezoar Stones. These fossils were first detected in the Lias at Lyme Regis and in other localities, and their true nature inferred from the fact of their identity with similar masses found actually within the body of many species of *Ichthyosaurus*. The *Coprolites* are often found to contain scales of fishes, and occasionally teeth, and fragments of bone, belonging to species of fishes and reptiles which have been swallowed by the animal as food, and have passed undigested through its stomach. They often occur in a spirally twisted form, which is a characteristic of the excrements of some of the larger forms of recent fish, and have been accepted by comparative anatomists as indications of the nature of the intestinal tube in the extinct forms of Reptiles and Fishes.

Professor Liebig says in his 'Letters on Chemistry,' "In the autumn of 1842 Dr. Buckland pointed out to me a bed of Coprolites in the neighbourhood of Clifton, from half to one foot thick, inclosed in a limestone formation, extending as a brown stripe in the rocks for miles along the banks of the Severn. The limestone marl of Lyme Regis consists for the most part of one fourth part of fossil excrements and bones. The same are abundant in the Lias of Batheaston, and Broadway Hill, near Evesham. Dr. Buckland mentions beds several miles in extent, the substance of which consists in many places of a fourth part of Coprolites."

Coprolites, when chemically examined, are found to contain a large proportion of phosphate of lime. Liebig states that some he examined from Clifton contained above 18 per cent. of phosphate of lime, whilst other specimens have afforded a much larger per centage. The occurrence of phosphate of lime in these substances has led to their use as manures, and large quantities are annually collected in this country for that purpose. Before being used they are submitted to the action of sulphuric acid, by which the phosphate is converted into a super-phosphate of lime.

Not only have the beds of the Lias afforded deposits of phosphate of lime which have received the name of *Coprolites*, but they have also been found in the Greensand, in the Wealden Formation, and in the Red Crag. In the latter formation it may be altogether doubted as to whether the phosphate of lime there found in the form of dark-brown or blackish smooth nodules, can be appropriately called Coprolites. These nodules occur in beds or seams running through the Red Crag of Suffolk, where, in the neighbourhood of Ipswich and Woodbridge, and on the sea-coast of Felixstow and Bawdsey, it is worked to a considerable extent. In addition to these nodules, are found the fragments of the bones of various forms of *Cetaceæ*, all of which contain large quantities of phosphate of lime, and are collected under the name of Coprolites. It is still a question of interest as to how the nodules not having an organic basis have been formed. It has been supposed that all deposits of phosphate of lime are derived from the destruction of organised beings, but it is very evident that phosphate of lime must have existed in some form or another before the creation of either vegetable or animal beings. The increase also of the number of individuals of species of plants and animals demand that there should be some constant supply of this substance from the mineral kingdom. Whatever may be the result of further inquiry on this point, there can be little doubt of the impropriety of calling all deposits of phosphate of lime Coprolites. A better general name and which is not exposed to the objection of a false theory would be *Phosphatite.* [PHOSPHATITE, *S.* 2.]

COPYHOLD. The statute 4 & 5 Vict. c. 35, has been amended by the 6 & 7 Vict. c. 23; 7 & 8 Vict. c. 55; and 15 & 16 Vict. c. 51. The result of these statutes may be shortly stated thus. The lord may now be compelled by the tenant, or the tenant by the lord, to enfranchise the copyhold at the first surrender and admittance that takes place, and on terms, if the parties cannot agree, to be fixed by the Copyhold Commissioners.

COPYRIGHT. In order to take advantage of any disposition which may be manifested by foreign nations to recognise British copyrights, powers have been conferred on the Sovereign, by the stat. 7 & 8 Vict. c. 12, to grant, by Order in Council, privilege of copyright in this country to the authors of books, prints, and works of art, first published abroad. The exclusive right of representation may in like manner be granted to the authors of dramatic or musical compositions. Such Order in Council cannot, however, be made until due protection for British copyrights has been secured by the government of the country to the subjects of which the privilege of copyright in this country is conceded.

Under this Act, conventions for the mutual protection of copyrights have been entered into with the following eleven states:—Prussia, 1846 and 1855; Saxony, 1846; Brunswick, 1847; the Thuringian Union, 1847; Hanover, 1847; Oldenburg, 1847; France (and colonies), 1851; Anhalt-Dessau-Coethen, and Anhalt-Bernburg, 1853; Hamburg, 1853; Belgium, 1853; Spain, 1857; and their stipulations have been confirmed by the statute of 15 & 16 Vict. c. 12. Authorised translations of foreign books and dramatic pieces are by this statute protected for a term not exceeding five years from publication.

The Designs Act, 1850, enables designs to be provisionally registered for *one* year, and confers powers on the Board of Trade to extend the copyright for a term of three years. The same statute provides for the registration and protection against piracy of sculpture, models, copies, and casts. The copyright in engravings, prints, &c., is extended by the statute 15 & 16 Vict. c. 12, to prints taken by lithography, or other process of indefinite multiplication. ['Blackstone's Commentaries,' Mr. Kerr's ed., vol. ii. pp. 416-417).

CORACIAS. [ROLLER.]

CORALLINACEÆ, a family of Marine Plants belonging to the order *Algæ*. According to Harvey's definition it includes the *Corallinæ* and *Spongiteæ* of Kützing, and the *Corallinidæ* and *Nulliporidæ* of Dr. Johnston.

The forms referred to this family have been alternately regarded as animals and plants. When their structure was imperfectly understood they were regarded with many of the zoophytes (*Polypifera* and *Polyzoa*) and sponges as seaweeds. When the animal nature of these beings was established, it was again an inference that the Corallines belonged to the animal kingdom. Recent researches have however demonstrated the truly vegetable nature of this family both in their general structure and mode of reproduction. The following is Dr. Harvey's diagnosis in his 'Manual of the British Marine Algæ:'—Rigid, articulated, or crustaceous, mostly calcareous sea-weeds, purple when recent, fading on exposure to milk-white. Composed of closely-packed elongated cells or filaments, in which carbonate of lime is deposited in an organised form. Tetraspores tufted, contained in ovate or spherical conceptacles. Ceramidia furnished with a terminal pore.

The following general remarks on this family are taken from Dr. Harvey's work:—The root, where this organ is manifested, is an expanded crustaceous disc, often widely spreading. The frond almost always calcareous, effervescing strongly when thrown into acids, rarely destitute of lime, very variable in aspect and habit. The lowest forms of the order are simple incrustations, spreading like the crustaceous lichens over the surface of rocks, or the fronds of the larger *Algæ*. In the smaller of these the crust is a mere film, as thin as paper, generally circular, and extending by means of small additions to the circumference, so that the frond becomes marked as it advances with concentric circles. In the larger the crust is thick and stony, rising here and there into prominences and sinking into depressions. Still farther advance manifests itself by the crust assuming a branched habit: at first papillæ rise from the surface; these thicken, and widen, and lengthen, and at length throw out branches, till a shrubby frond, of stony hardness, but extremely brittle, is formed. All those changes in character take place within the limits of a single genus, *Melobesia*. Nearly related to this (and by many botanists considered identical) is *Mastophora*, a genus in which the frond is expanded into leafy lobes, usually fan-shaped, sessile, or stalked, but not adnate to rocks; of a flexible substance, containing a smaller portion of carbonate of lime than the former group. Some of these have the habit of *Padina*, but differ from that genus in being of a red colour. They are the most perfectly organised of the leafy or frondose Corallines (*Milleporeæ*). The articulated or true Corallines are filiform, either pinnated or dichotomous, the branches formed of strings of calcareous articulations, truncated at the upper extremity and rounded at the lower, each articulation connected with that above and below it by a flexible joint composed of cellular tissue, destitute of carbonate of lime. This joint in our British species is scarcely evident till after maceration; but in many exotic species (of *Amphiroa*) it is so long as to interrupt the continuity of the articulations, and is either marked or coated with wart-like calcareous tubercles.

The form of the articulations varies extremely, and often in the same species, or even in the same specimen, so that the determination of these plants is sometimes difficult. In many the articulations are cylindrical, in others oval and compressed, in some flat and irregularly shaped; but in the greater number they are heart-shaped or wedge-shaped, with the upper angles frequently prolonged with horns.

The fructification consists of hollow external or immersed conceptacles containing a tuft of oblong spores, divided at maturity by three horizontal fissures into four parts. They are therefore tetraspores, precisely similar to those of *Plocamium*, *Hypnea*, &c. The nature of the conceptacle varies even in the same species. Thus in *Corallina* it is normally formed by the metamorphosis of the terminal articulation of the branches, which swells at the sides and becomes pierced at the apex; but in *C. squamata* and even in *C. officinalis* other articulations frequently bear numerous small hemispherical conceptacles on their sides; and sometimes the whole surface is warted with such, and these irregular organs are equally furnished with tetraspores as the normal ones. These latter conceptacles, which are irregular in *Corallina*, are the normal fruit of *Amphiroa*, a genus chiefly from the Southern Ocean. In *Jania* the conceptacle is similar to that of *Corallina*, except that it generally bears a pair of ramuli (resembling the antennæ of an insect) from its upper angles.

The Corallines are found in all parts of the ocean, but are much more numerous in warm than in cold countries, and some of the species of the tropical and sub-tropical ocean are among the most beautiful of marine vegetables. Until recently the plants of this order were with other calcareous *Algæ* confounded with *Zoophytes*, or polypiferous corals. They are however undoubtedly of vegetable nature, and when the lime which they contain is removed by acid, the vegetable framework concealed beneath it is found to be of a similar structure to that of other Rhodosperms, to which group of *Algæ* they are further allied by their colour and the nature of their spores. The order consists of two, or if *Lythocystes* be rightly placed in it, of three sub-orders, as follows:—

Synopsis of the British Genera.

Sub-order 1. *Corallineæ.*—Frond filiform, articulated.

1. *Corallina.* — Frond pinnated. Ceramidia terminal, simple.

2. *Jania.*—Frond dichotomous. Ceramidia tipped with two horn-like ramuli.

Sub-order 2. *Nulliporeæ.*—Frond crustaceous or foliaceous, opaque, not articulated.

3. *Melobesia.*—Frond stony, forming either a crustaceous expansion, or a foliaceous or shrub-like body.

4. *Hildenbrandtia.*—Frond cartilaginous, not stony, forming a crustaceous expansion.

Sub-order 3. *Lythocysteæ.*—Frond plane, hyaline, composed of cells radiating from a centre. Fructification unknown.

5. *Lythocystis.*—A minute parasite.

Sub-order 1. *Corallineæ.*

1. *Corallina.* — Frond filiform, articulated, branched (mostly pinnate), coated with a calcareous deposit. Fructification turbinate or obovate, mostly terminal ceramidia, pierced at the apex by a minute spore, and containing a tuft of erect pyriform or club-shaped transversely parted tetraspores. Name from *Corallium*, Coral, which these plants resemble in having a stony substance.

C. officinalis is the most common example of this genus on British shores. It is decompound, pinnate, the lower articulations cylindrical, twice as long as broad, upper slightly obconical, round-edged, their angles blunt, ultimate ramuli cylindrical obtuse. It is found on rocks between the tide marks, extending from the limits of high to the extremity of low water mark. Perennial. Winter and spring. The root is a widely expanded red crust. The fronds from two to six inches high, tufted, much branched, bipinnated, but varying greatly in luxuriance according to the depth at which it grows.

C. elongata and *C. squamata* are both British species, and are mentioned in Dr. Johnston's work on the Corallines, and also by Dr. Harvey.

2. *Jania.* — Frond filiform, articulated, dichotomous, branched, coated with a calcareous deposit. Fructification urn-shaped. Ceramidia formed of the axillary articulation of the uppermost branches (mostly two-horned), pierced at the apex by a minute pore, and containing a tuft of erect pyriform transversely parted tetraspores. Named from *Janira*, one of the *Nereides*.

J. rubens is found on all parts of the British coast on the smaller *Algæ* between tide marks. The articulations of the principal branches and ramuli are cylindrical, about four times as long as broad. The fronds are from half an inch to two inches high, densely tufted, dichotomous, many times forked, fastigiate; branches either erect or spreading gradually, tapering upwards. Articulations cylindrical in all parts of the frond, without prominent angles; those near the base very short, the upper ones gradually longer. Ceramidia subterminal, urn-shaped, with long horns, formed of two to four articulations. Colour a pale red, with a purplish shade when quite fresh.

J. corniculata is also found on the southern shores of England and Ireland, and in Jersey.

Sub-order 2. *Nulliporeæ.*

3. *Melobesia.* — Frond attached or free, either flattened, orbicular, sinuated or irregularly lobed, or cylindrical and branched (never articulated), coated with a calcareous deposit; fructification conical, sessile. Ceramidia scattered over the surface of the frond, and containing a tuft of transversely-parted oblong tetraspores. The genus is named from one of the sea-nymphs of Hesiod.

M. polymorpha is found attached to rocks, thick, stony, incrusting, or rising into short clumsy branches, which are seldom much divided, and often merely rudimentary. Much is yet to be done in working out the species of this genus.

M. pustulata is the largest and most developed of the parasitic section of the genus. It is found on *Phyllophora rubens*, *Chondrus crispus*, &c. It is thick, of a dull purple or green colour, oblong or lobed, incrusting, smooth. Ceramidia numerous, large, rather prominent, and conical. Dr. Johnston refers his species to *Corallina officinalis*. This plant, he says, appears first in the guise of a circular calcareous patch of a purplish colour, and in this state is common on almost every object that grows between tide-marks. When developing on the leaves of *Zostera*, or in other unfavourable sites, these patches are usually pulverulent and ill-coloured, green or white, and never become large; but in suitable situations they continue enlarging in concentric circles, each marked with a pale zone, until they ultimately cover a space of several inches in diameter. The resemblance which in this condition the crust has to some crustaceous fungi, more especially to *Polyporus versicolor*, is remarkably exact; and neither is it less variable than the fungus in its growth, the variations depending on the nature of the site from which it grows. If this is smooth and even, the folliaceous coralline is entirely adnate and also even; but if the surface of the site is uneven or knobbed, the coralline assumes the same character. If it grows from the edge of a rock, or the frond of a narrow sea-weed, or from a branch of the perfect coralline, the basal laminæ spread beyond in overlapping imbrications of considerable neatness and beauty; they are semicircular, wavy, either smooth or studded with scattered granules, and these granules (ceramidia) may be either solid or perforated on the top. Such states of the coralline have been described as *Millepora lichenoides*, while its earlier states constitute Lamoroux's various species of *Melobesia*.

4. *Hildenbrandtia.* — The frond cartilagineo-membranaceous (not stony), crustaceous, suborbicular, adhering by its lower surface; composed of very slender closely-packed vertical filaments; conceptacles immersed in the frond, orbicular, depressed, pierced by a hole, and containing tetraspores and paraphyses at the base of the cavity.

H. rubra is found on smooth stones and pebbles between tide-marks and in deep water. It is very common, and forms a thin membranous crust, at first orbicular, and spreading concentrically, at last irregular in form, following the sinuosities of the body to which it may be attached. Viewed under the microscope, a small portion shows minute cells lying in a clear jelly. When in fruit, the surface is pitted with disc-like depressions, pierced by a hole which communicates with a chamber in which the spores lie. The colour is variable; now a bright, now a dull red.

Sub-order 3. (?) *Lithocysteæ.*

Lithocystis.—Plant calcareous; consisting of a single plane of cellules, which are disposed in radiating dichotomous series, forming an uppressed flabelliform frond. Named from a stone in the bladder, because the cells have stony coats.

5. *L. Allmanni* is parasitical on *Chrysymenia clavellosa* from an oyster-bed at Malahide, Dublin, by Professor Allmann. It forms minute dot-like patches of a whitish colour on the fronds of the *Chrysymenia.* Each dot consists of one or several fan-shaped fronds composed of quadrate cells disposed in dichotomous series. The plant is brittle, colourless, and effervesces in acid.

(Harvey, *British Algæ.*)

CORBRIDGE. [Northumberland.]

CORBULA, a genus of Marine *Mollusca,* belonging to the *Lamellibranchiata.* The shell is suborbicular or oval, tumid or depressed, very inequivalve, slightly inequilateral, rounded anteriorly, more or less truncated posteriorly; beak prominent; surface of the valves more or less furrowed or transversely striated, covered with an epidermis. Hinge composed of a recurved primary tooth in one or both valves, with corresponding socket and ligamental pit beside it. Ligament small, interior. Muscular impressions slightly marked, united by a pallial one with a very slight sinus. The animal is short, with very short united siphonal tubes. Orifices fimbriated. Mouth closed, except in front, where there is an opening for a bony narrow thick foot of considerable dimensions. Anal siphon with a conspicuous tubular membrane. Labial tentacles slender.

This genus was once abundant in the European seas, especially during the early part of the Tertiary epoch. Only a few species now exist. It has more species in the tropical seas of the present day.

C. nucleus is one of the most common species in the seas around the British Islands. Whilst very frequently found in the dredges, it is seldom washed on shore or found in shallow waters. It is about half an inch in length and about one-fourth less in breadth.

This genus belongs to De Blainville's family *Pyloidea,* which embraces *Solen, Panopea, Mya,* and other allied species. [Pylorideans.]

CORBY. [Lincolnshire.]

CORCHORUS, a genus of Plants belonging to the natural order *Tiliaceæ.* The leaves of *C. olitorius* are used in Egypt as a pot-herb. Fishing-lines and nets, rice bags, and a coarse kind of linen called tat, are made in India of the fibres of *C. capsularis.*

CORDIA, a genus of Plants belonging to the natural order *Cordiaceæ.* It has a tabular calyx, 4-5 toothed. Corolla funnel-shaped or campanulate, with a flat 5-7-cleft limb, and a hairy or naked throat. Stamens 5, short, inserted in the throat of the corolla. Style protruding, bifid, with 4 stigmas. Ovary 3-4 celled. Drupe containing 1 stone with 1 or 3 cells, two of which are usually abortive.

C. latifolia is a native of Hindustan. It has numerous spreading and drooping branches; the young shoots angular and smooth. The general height of trees ten or twelve years old about 20 feet. Leaves alternate, petioled, round, cordate, and ovate, often slightly repand; 3-nerved; of a hard texture, smooth above, scabrous and pale underneath; from 3 to 7 or even 8 inches long, and rather less in breadth. Petioles nearly rounded and smooth. Panicles short, terminal, and lateral, roundish; the branches alternate, diverging, and one or more frequently dichotomous. Flowers numerous, small, white. Bracts minute, villous. Calyx villous, campanulate, leathery; mouth unequally toothed. Corolla short, campanulate. Segments 5, linear oblong; filaments as long as the segments of the corolla, and inserted immediately under their fissures. Anther incumbent. Ovary ovate, 4-celled, with one ovule in each attached to the upper end of the axis. Style short. Stigma 4-cleft; segments long, rugose, and recurved. Drupe oblate-spheroidal, about an inch or an inch and a quarter in diameter; smooth when ripe, straw-coloured, covered with a whitish bloom. Under the name Sebesten Plums, Sebestans, or Sepistans, two sorts of Indian fruit, have been employed as pectoral medicines, for which their mucilaginous qualities, combined with some astringency, have recommended them. They are believed to have been the *Persea* of Dioscorides. Linnæus has erroneously applied the name of Sebesten to an American species of this genus which is not known in medicine.

C. Myxa is a native of many parts of India, Persia, Arabia, and Egypt. The trunk is generally crooked, from 8 to 12 feet high, and as thick or thicker than a man's body. The bark gray, cracked in various directions. Branches numerous, spreading, and bent in every possible direction, forming a dense shady head. The flowers are numerous, white, small; a very large proportion of them are sterile, and they always want the style. The drupe is globular, smooth, the size of a cherry, sitting in the enlarged calyx; when ripe, yellow; the pulp is almost transparent, very tough, and viscid. The smell of the nut when cut is heavy and disagreeable; the taste of the kernels like that of filberts. It is the true Sebesten of the European Materia Medica. The fruits, according to Roxburgh, are not used in the Circars medicinally, but when ripe are eaten by the natives, and also most greedily by several sorts of birds, being of a sweetish taste. The wood is soft, and of little use except for fuel. It is reckoned one of the best kinds for kindling fire by friction, and is thought to have furnished the wood from which the Egyptians constructed their mummy cases. The wood is said by Dr. Royle to be accounted a mild tonic.

C. Gerasacanthus is a native of the West Indies in woods, and of Mexico, near Acapulco. It has ovate oblong leaves, acute, quite entire, glabrous; racemes terminal, aggregate; flowers verticillate, sessile; calyx 10-furrowed, 10-striped, downy; limb of corolla 5-cleft; throat villous; stamens the length of the corolla. This is esteemed one of the best timber-trees in Jamaica, of which it is a native. The wood is of a dark brown colour, and gently striped: it is tough and elastic, of a fine grain, and easily worked. It is called Spanish Elm or Prince Wood by the English, and Bois de Chypre by the French.

C. Rumphii has brown wood beautifully veined with black, and smelling of musk.

There are above 100 species of this genus.

CORDOVA, the most important next to Buenos Ayres of the provinces of the Argentine Confederation, South America, comprehends the Sierra de Cordova and the surrounding hilly country, with some adjacent plains. It is divided on the N.E., N., and N.W. by the Grand Salina from Santiago, Catamarca, and Rioja, and on the W. by a travesia, or desert country overgrown with stunted prickly trees from San Juan. A sterile and thinly inhabited country lies on the south-east between it and San Luis. On the south it extends to the Pampas of Buenos Ayres. The low sterile tract in which the rivers Segundo and Primero are lost, and the Laguna Salados de los Porongos is situated, separates it on the east from Santa Fé. It has a population variously estimated at from 65,000 to 90,000. Cordova is much more fertile than the countries which surround it. Numerous rivers descend from the Sierra de Cordova, but all are lost in the desert, except the Rio Tercero, which, during part of the year, finds its way to the Carcarañal, which falls into the Paraná near Santo Espiritu below Santa Fé. This river would be navigable for six or eight months in the year, but for two small rapids, which however might easily be removed. The valleys within the Cordova Mountains, and those which extend along their sides, have a fertile soil, and maize and fruits are raised there in abundance, but the plains, as well as the declivities of the mountains, are only fit for pasture. Cattle and sheep constitute the principal wealth of the republic. Hides in large numbers and wool are exported to Buenos Ayres. At present the produce of this province is all sent to Buenos Ayres, but when steam navigation is established on the Paraná, the commercial intercourse will probably be largely carried on through Santa Fé. The province is ruled by a governor, assisted by a junta occasionally convoked; but the authority of the governor is in effect almost unlimited.

Cordova, the capital, is situated in 31° 26′ S. lat.; it is built on the banks of the Rio Primero, in a narrow valley considerably depressed below the general surface of the country. This situation is in many respects disadvantageous, but it is thus sheltered from the north and south winds, which blowing alternately on the higher grounds produce sudden changes in the atmosphere which are injurious to health. The town contains about 15,000 inhabitants. The streets are regularly laid out, and the houses are built of brick, and better than in other towns in the interior; most of them have balconies. In the centre of the town is a spacious square, on one side of which is a neat town-hall, and on the other a fine cathedral. There are also ten other well-built churches of old date and chiefly Moorish in style; and one modern church erected in a very costly manner. The University erected by the Jesuits is on a scale of great magnitude, covering an area of four acres. In former times it was famous, being the principal college (the Colegio Maximo) of the order in this part of the world. It contained also a very important library, which on the expulsion of the Jesuits was sent to Buenos Ayres. The university is still maintained, but is now hardly better than a provincial college. There are two nunneries and two convents of Dominicans and Franciscans. A fine public promenade occupies a considerable space; it includes a square sheet of water of about four acres supplied by a running stream, which is surrounded by walks, well shaded by trees, and has in the centre a lantern-shaped temple. The Segundo which waters the town is in summer a shallow stream, but in winter becomes a deep and wide river; to preserve the town from the effects of its overflow a strong wall has been built, yet destructive floods still sometimes occur. Cordova was formerly the depôt of the European merchandise intended to be sent to Peru, but this branch of commerce no longer exists. There is a mint in the town. The only manufacture is that of leather. There are no foreigners in the town, and scarcely any in the province of Cordova. Religious toleration is unknown.

Alta Gracia, a neat town near the base of the Sierra de Cordova, contains nearly 3000 inhabitants.

CORNCRAKE (*Crex pratensis*). [Rallidæ.]

CORNEL-TREE. [Cornus.]

CORNWALL. [Canada, *S.* 2.]

COROPHIUM, a genus of Animals belonging to the class *Crustaceæ* and the family *Gammarinæ*. With the whole of the family it is remarkable for the length of its antennæ. It has no claws. One of the species, *Cancer grossipes* of Linnæus, *Gammarus longicornis* of Fabricius, *Oniscus volutator* of Pallas, is well known on the coast of La Rochelle for its habit of burrowing in the sand. They live principally upon the annelides which inhabit the sand, and are remarkable for assembling in great numbers around their prey, and destroying it although it may be twenty times as large as themselves. They also attack fishes, *mollusca*, and the dead bodies of other animals.

CORPORATIONS. There has been a great increase of late years of bodies having many of the characteristics and privileges of Corporations, to which the remarks under Corporation in 'Penny Cyclopædia,' v. viii. p. 46, do not apply.

In effect there are now three distinct species of Corporations—1. Those which may be described as existing at common law, having been generally created by Royal Charter. 2. Municipal Corporations. 3. Trading Corporations.

Under the first head may however be classed those Municipal Corporations to which the Municipal Corporations Reform Act does not apply, the universities and the colleges therein, and most of the old chartered bodies, such as the College of Physicians, the Companies of London and other cities, and many more of our ancient charitable institutions. These are governed by the provisions of their Charters and Bye-Laws, adherence thereto being enforced when necessary by the Queen's Bench or in Chancery.

The second class of the Municipal Corporations have been treated of under the head of Boroughs.

The third class, or Trading Corporations, comprises Railway and Canal Companies, and similar bodies, created by Act of Parliament, having commercial profit for their object. Thus Joint-Stock Companies for the purpose of banking or insurance are each regulated by different statutes, and must each be constituted according to the provisions of these Acts. Other trading companies may constitute themselves into Corporations by registration in a prescribed form, and on complying with certain requisites.

The distinctive ranks of these different kinds of Corporations are noted under the appropriate heads. [Joint-Stock Companies, *S.* 2.]

CORREA, a genus of Plants belonging to the natural order *Rutaceæ*, of which one of the species, *C. alba*, is used by the settlers in Australia as a substitute for tea.

CORRIENTES, one of the Riverine provinces of the Argentine Confederation, South America, comprehends the northern portion of the peninsula formed by the rivers Paraná and Uruguay; the southern portion of the peninsula being occupied by the province of Entre Rios. The population is about 35,000.

The southern and eastern parts of the province are somewhat hilly, but the remaining and by far the greater part is low. About half the surface is covered with timber-trees, much of the wood being available for house and ship-building. Some thousand square miles are covered with palm-trees, which are used for a great number of purposes. In the northern part of the province is the Laguna Ybera, which is in fact a vast marsh overflowed during the periodical risings of the Paraná. It feeds all or nearly all the rivers which rise in the interior of the province and fall into the Paraná on the one side or the Uruguay on the other. The soil of Corrientes is generally sandy, but produces excellent crops. Cotton, tobacco, rice, sugar, indigo, and other tropical productions flourish, yet little attention is given to them, partly owing to the scantiness of the population and partly to the general dislike of the peasantry for agricultural occupations. Besides the articles mentioned above, maize and barley, arrow-root, melons, sweet potatoes, and various tropical fruits are raised. The sugar-cane is at present only grown in order to extract molasses for distilling; the sugar consumed in the province is imported from Brazil. All kinds of crops suffer at times from visitations of enormous swarms of ants and locusts, which entirely devastate the districts in which they appear. The chief employments of the inhabitants are the rearing of cattle and horses, there being a considerable extent of good pasture land; sheep however do not thrive very well. Large numbers of hides are exported. Mechanical pursuits are entirely neglected. The province is well adapted for commerce, there being on the Paraná four places which serve as good ports, and three on the Uruguay. The opening of these rivers will doubtless prove of great benefit to Corrientes, but the traffic can only be fairly developed when the rivers are navigated by steam-vessels. The inhabitants are for the most part a mixed race of Indians and Spanish, and of indolent habits. The language spoken, according to Mr. Woodbine Parish, is "more Guarini than Spanish." There are exceedingly few foreigners in either the capital or the country parts of the province. Most of the peasantry possess 40 or 50 mares, 30 or 40 cows, and from 100 to 200 sheep. The women are of more industrious habits than the men. They do a good deal of the agricultural labour, as ploughing, hoeing and attending to the crops, and reaping; make cheese for sale as well as home consumption; act as shepherds; and spin and weave both cotton and woollen cloths for summer and winter garments.

The government is almost entirely in the hands of a governor, who is elected by the Congress for a term of three years. The Congress consists of 15 deputies,—one from each of the 14 departments, except that of the capital, which returns two deputies. The revenue is derived chiefly from customs duties, and the church property which was seized by government during the civil wars. The army consists in time of peace of 1000 men, but during war all males between the ages of 14 and 60 are liable to serve. Indeed during the late war with Buenos Ayres a reserve corps was formed of 900 or 1000 women mounted on horseback, who are said to have proved of great service in some engagements with the army of Rosas. Corrientes took a leading part in the revolt of the other provinces against the supremacy of Buenos Ayres, and entered into the engagements with foreign powers which led to the downfall of Rosas. The main incitement to these measures on the part of Corrientes was the determination of Rosas to enforce the closing of the Paraná and Uruguay against all foreign vessels; and Corrientes made the opening of the navigation of these rivers a leading object in all negociations. The army of Rosas was defeated Feb. 2, 1851, by the army under General Urquiza, the governor of Corrientes. Rosas himself escaped to Buenos Ayres, and proceeded on board a British steam-vessel to England.

Corrientes, the capital, population about 5000, is situated in 27° 27′ S. lat., 58° 50′ W. long., below the confluence of the Rio Paraná with the Paraguay; and stands on a considerable elevation. It is rather a well-built town, but contains few buildings of any consequence. The situation of the town is admirably adapted for commercial purposes, affording on the one hand every facility for inland intercourse; and on the other for carrying on the export and import trade with Buenos Ayres and with foreign states by the navigation of the Paraná. *Santa Lucia*, also on the Paraná, 29° S. lat., 58° 55′ W. long., is the next important town in the province. It has some trade, but contains less than 3000 inhabitants.

The *Missiones*, which, according to the treaty between Brazil and Buenos Ayres, in 1828, was to constitute an independent republic, extend eastward from Corrientes, between the Paraná and Paraguay, to the confines of Brazil. This fertile tract, which was very populous under the sway of the Jesuits, is now filled with depopulated ruins. It contained only about a thousand inhabitants in 1825. Many of them perished in the following war and others emigrated, and it is now almost entirely depopulated.

CORROFIN. [Clare.]

CORSHAM. [Wiltshire.]

CORWEN. [Merionethshire.]

CORYPHODON, a genus of Fossil Animals belonging to the family of Tapirs. The remains of this genus have been found in this country; and although closely allied to the genus *Lophiodon* of Cuvier, Professor Owen regards its differences as of sufficient importance to constitute a new type. The specimen on which this genus was established is unique, and was dredged up from the bottom of the sea between St. Osyth and Harwich on the Essex coast, and now forms part of the collection of John Brown, Esq., of Hanway Green, near Colchester. This specimen is petrified, containing metallic salts, and having the appearance of fossils from the London Clay. There can be little doubt that it was originally imbedded in the Eocene Tertiary Formation of the Harwich coast. It consists of the right branch of the lower jaw, containing the last and part of the penultimate molar teeth of the lower jaw. Although this fragment resembles the same bone in the genus *Lophiodon*, yet a close examination of the crown of the last molar tooth exhibits a smaller antero-posterior diameter in proportion to its transverse diameter, as compared with the corresponding tooth in that genus. It also differs from the teeth of *Anthracotherium*, to which it has some resemblance. Professor Owen infers from this and other characters of these teeth that "the whole dental series of the extinct Eocene Pachyderms offered modifications of the Lophiodont type of dentition, which led towards that of the *Anthracotherium*, more especially of the smaller species from Garonne and Valery. From the closer resemblance which the fossil presents to the true Lophiodons, it must be regarded as a member of the same family of Tapiroid Pachyderms; indicating therein a distinct sub-genus, characterised by the want of parallelism of the two principal transverse ridges, and by the rudimental state of the posterior talon in the last molar tooth of the lower jaw. The name *Coryphodon*, which I have proposed for this sub-genus, is derived from κορυφὴ, a point, and ὀδοὺς, a tooth; and is significative of the development of the ridges into points. The broad ridged and pointed grinding surface of the tooth indicates its adaptation to comminute the coarser kinds of vegetable substances; and it is very probable that the habits and food of the Tapir, which is the nearest existing analogue of the *Coryphodon*, are not very dissimilar from those which characterised of old the present extinct species and the true Lophiodons."

Professor Owen gives the species the name of *Coryphodon Eocænus*. He also describes a tooth found in digging for a well at Camberwell, at a depth of 160 feet in the Plastic Clay. After describing this tooth, Mr. Owen says, "From its close resemblance in the essential characters of its form to the canines of the great extinct Tapiroid Pachyderms, and the apparent specific distinctions from any of the known species of *Lophiodon*, I strongly suspect it to have belonged to a *Coryphodon*."

(Owen, *British Fossil Mammals and Birds*.)

COSTA RICA, *Republic of*, the most southern state of Central America; occupies the western part of the table-land which divides the plains of Panama from those of Nicaragua. It lies between 8° and 11° N. lat., 82° 30′ and 86° W. long. On the S.E. it is bounded by the republic of New Granada, from which it is divided by a line extending from Point Burica (about 83°) north by east, to a point a little west of the lagoon of Chiriqui; on the N. it is bounded by the republic of Nicaragua, from which it is divided by the Rio San Juan from its mouth in the Caribbean Sea to the point where it issues from Lake Nicaragua, and west of that by the southern extremity of the lake itself, and thence westward by an imaginary line about 11° N. lat., to Salinas Bay on the Pacific Ocean. On the E., Costa Rica is bounded by the Caribbean Sea; on the W. by the Pacific Ocean. Its extreme length is about 260 miles, its average breadth about 80 miles. The area is 17,000 miles; the entire population 100,174.

Coast Line, Surface, &c.—Both the eastern and western coasts have a general north-western and south-eastern direction, but they differ considerably in character. Along the Caribbean Sea the coast is bordered by a narrow plain, is little indented by creeks or bays, and affords no large or secure harbour. Port Matina (10° 20′ N. lat.) at the mouth of the river of the same name, though small and far from safe, is the best harbour on this coast: it serves as the port of Cartago, and is occasionally visited by vessels from the West Indies. The western coast is much more broken. At its southern extremity is the wide open Golfo Dulce, the low shores of which are much indented by the numerous streams which fall into it. Farther north is Port Mantas, and beyond that is the bay formed by the Rio Estrella: neither of these appears to be used by shipping. More important is the Gulf of Nicoya, which is some distance northward. It has a wide open entrance turned to the south-south-west, but becomes narrower inland. It affords good shelter for shipping, is about 70 miles in length, and contains several islands. Punta de Arenas, on the eastern side of the gulf, is one of the best harbours on this part of the Pacific for vessels not drawing more than 10 feet of water. The Punta de Arenas is the port of San José, the present capital of Costa Rica. One other good harbour occurs on this coast, Punta Calebra, which is formed by the rocky headland called Punta Catalina.

The surface of Costa Rica comprises for the most part a table-land with an elevation of upwards of 2000 feet above the level of the sea. From the range of the Cabeçares Mountains in Veragua, east of the plain of Chiriqui, which connects the table-lands of Veragua and Costa Rica, there stretches a considerable number of mountain peaks, many of them of considerable height, and a large part of them volcanic. Some of them attain an elevation of 10,000 feet; the Volcano of Cartago is said to be 11,480 feet high. Towards the Caribbean Sea the descent is for the most part abrupt, but terminating from 20 to 30 miles from the sea, between which and the bases of the hills is a low, level, and marshy tract, covered with forests and subject to floods. Towards the Pacific the descent is more gradual; while the high land advances much nearer to the sea and descends to it in a series of terraces. A continuous range of volcanic hills extends from the north-western corner of the table-land of Costa Rica around the western side of the Lake of Nicaragua. The north-eastern extremity of the country subsides gradually into the plain of Nicaragua.

The only important river of Costa Rica is the San Juan, which is common to it and Nicaragua. It issues from the south-eastern extremity of the Lake of Nicaragua, and from that point to its outlet in the Caribbean Sea forms the boundary between the republics of Costa Rica and Nicaragua. It is a considerable stream and is navigable for some distance, but a large portion of its course is shallow or obstructed by sand-banks and rapids. From its commencement in Lake Nicaragua to its mouth, the distance, following the windings of the river, is 70 geographical miles. The width varies from 100 to 400 feet. The difference of level between the Lake of Nicaragua and the Caribbean Sea is 121 feet. It is by means of this river and the Lake of Nicaragua, with a canal from the lake to the Pacific Ocean, that it has been proposed to form the Nicaragua line of communication between the Atlantic and Pacific Oceans. At present the San Juan is only navigated by flat-bottomed barges.

The other rivers which enter the Caribbean Sea are very numerous, but all have very short courses, and none of them is navigable. The principal are the Matina, the Purissima, and the Tortuga. The great want of the state is a ready communication with the Atlantic, and this it is said might be met by forming a road about 66 miles long, from San José to the Sarapéqui, a feeder of the San Juan, and by improving the navigation of those rivers, thus enabling the produce of the republic to be shipped at the port of San Juan de Nicaragua. The rivers which fall into the Pacific have all a short course. The Estrella, the Arena, and the Baranca are among the more important. Several small lakes occur on the table-land.

Climate, Soil, and Productions.—The climate of Costa Rica is on the whole more regular and healthy than in other parts of Central America. There are two seasons, a dry season, which commences in November and lasts until April, and a wet season which occupies the remainder of the year. The thermometer rarely rises above 85° or falls below 65°. In the rainy seasen thunderstorms of a very severe description are frequent.

The soil is of varied quality, but in many parts very fertile. On the more elevated districts there are few forests, but on the lower declivities, and especially along the eastern coast, they are very abundant. A good deal of timber, especially Brazil wood, mahogany, and cedar is exported.

Around the town of Cartago and on the western and north-western parts of the country, wheat is cultivated to some extent. Maize is grown much more extensively, and is exported somewhat largely to Chili and Peru. Coffee is however the staple: it is of fine quality, and meets with a ready sale. Tobacco is raised to some extent on the table-land both for home consumption and exportation. Sugar is an important article in the agriculture of Costa Rica; it is chiefly grown on the western side of the country, and exported from Punta de Arenas. Cacao, indigo, &c., are also grown. All the articles peculiar to intertropical regions are produced abundantly except cotton, the vine, and cochineal, which are destroyed by the heavy rains. Agriculture however, though it is upon its agricultural produce that Costa Rica is chiefly dependent, is in a very backward state, and the capabilities of the soil are very far from having been made fully available. The most common fruits are apples, pears, peaches, &c. Of vegetables the leguminous kinds, as peas, beans, lentils, &c., are the most common. There are some good pasture lands, and along the San Juan cattle forms an important part of the wealth of the country. Horses and mules are bred, but not in large numbers. Swine are raised in the low districts. Sheep are tolerably abundant on the table-land. Poultry are bred in great numbers.

Fish are very plentiful along the coasts and in the rivers. In the Gulf of Nicoya pearls and the pearl-shells are obtained; also a shell-fish which yields a purple dye.

Several metals are said to exist, but gold is the only one which is worked. The most important gold mines are those of Aquacte not far from the gulf of Nicoya and Real del Monte. Coal is reported to have been found, but it is not worked.

The manufactures are confined to the coarser articles of home consumption. They consist chiefly of coarse cotton goods, common hats, coarse earthenware, furniture, wooden utensils, &c. The commerce appears to be steadily increasing. The exports consist of coffee, of which about 15,000 cwts. are exported annually; hides, about 10,000 annually; with mahogany, cedar, Nicaragua wood, sarsaparilla, mother-of-pearl, and a small quantity of pearls. Grain, fruit, drugs, cattle, and poultry, and various miscellaneous articles likewise form a part of the exports. The total annual value is estimated at upwards of a million dollars. The imports amount in value to about three-fourths of the exports. The exports aro chiefly made in British vessels. All the shipments are made from the Pacific ports, and mostly from Punta de Arenas. The exports are chiefly to the northern states of Central America, Chili, Peru, and the West Indies. The imports from Great Britain consist principally of cotton goods, woollens, hardware, and other dry goods. Crapes and other China goods are brought largely in American vessels, as well as coarse stuffs. Silks, brandies, and trinkets are brought from France; wines from Spain. A commercial treaty was made with England in 1850.

Divisions, Towns, &c.—Costa Rica is divided into six departments—San José, Cartago, Heredia, Alajuela, Guanacaste, and Punta de Arenas. The only towns of any importance are the capital, San José; Cartago, the former capital; and Alajuela and Villa Vieja on the western coast.

San José, the capital of the republic, population about 16,000, stands on the elevated table-land, 9° 46′ N. lat., 84° W. long. Its site is said to be 4500 feet above the level of the sea. It is a modern city, having grown up since the declaration of independence; and though the seat of the government, legislature, and courts of justice, as well as of the bishop, it has no buildings of any beauty or importance. It is however a busy commercial town. It communicates by a cart-road 72 miles long with its port, ***Punta de Arenas***, which is also a thriving place, being the principal port of Costa Rica.

Cartago stands at the base of the Volcano of Cartago, about 16 miles E. by S. from San José: population about 5000. It was once the capital of Costa Rica, and a place of some commercial as well as political consequence, but in both respects it has given way to San José. In 1841 it was almost entirely ruined by an earthquake, which destroyed seven out of its eight churches and nearly 3000 houses. It has never recovered from the calamity.

Alajuela, population, including the surrounding district, about 10,000, stands nearly midway between San José and Punta de Arenas, and is a place of some trade. A good deal of sugar is raised in the vicinity. ***Villa Vieja***, about 7 miles W. from San José, is likewise a place of some trade. Curridabat, Assari, Paraiso, Heredia, Barba, and Esparza, are other towns of more or less consequence.

Government, &c.—The government is in the hands of a president elected for six years, and a legislative assembly consisting of 12 deputies elected for three years. The revenue, derived principally from a duty on tobacco and spirits, land sales, stamps, &c., amounts to about 120,000 dollars. The state has no debt either foreign or domestic, and it has happily enjoyed internal and external peace for several years. The chief court of justice is the Tribunal of San José, which is presided over by seven judges. The militia consists of 5000 men, of whom 200 are called upon at a time to form the army on duty.

The white inhabitants of the republic are relatively more numerous in Costa Rica, than in the other republics of Central America: the ladinos, or mulattoes, are also numerous. They are chiefly settled on the western side of the table-land. The eastern side of the country is occupied by the Indians, who number about 10,000. The Roman Catholic is the established religion, but other forms of worship are permitted. The church is presided over by the Bishop of San José.

During the Spanish occupation of this part of America, Costa Rica formed a part of the kingdom of Guatemala. After the declaration of independence by the Spanish American colonies, September 1821, it remained for a short time united to the Mexican kingdom of Iturbe; but when the new federal union of the United States of Central America was established in 1823 after the model of the United States of North America, it formed one of the united states. On the dissolution of this short-lived union, Costa Rica became an independent republic, and has so continued ever since.

COTARNINA. [CHEMISTRY, *S.* 1.]

COTTON, MANUFACTURE OF. London, Liverpool, and Glasgow, are the three great places of import for cotton into this country, especially Liverpool; and the amount of this import is truly marvellous. Liverpool and Manchester often take opposite views of the cotton trade; they stand to each other in the relation of seller and buyer in respect to this commodity; and their interests frequently lead in opposite directions; but no such difference can affect the real magnitude of the trade. When we consider that Lancashire now contains nearly two millions of souls, that the Glasgow district contains seven hundred thousand, that the manufacture is the chief source of industry in both these districts, and that Cheshire and Yorkshire, together with other counties, also contain their hundreds of thousands of cotton-workers—we can hardly fail to see how extremely important the regular supply of cotton must be to Great Britain.

In our previous article (vol. vii. p. 93) we have brought down the statistics of the supply of this important article to 1835. The vast increase of our manufactures has of course occasioned a demand for larger supplies of the raw material, for which the United States of America are still our chief source, and on the whole it is the best, the cheapest, and the most reliable. But the British manufacturer does not like depending for so material an object on one country only particularly for a crop which is so likely to be affected by seasons, and of which the cultivation, which is by slave labour, he apprehends may be some day suddenly interrupted

For many years he has been looking out for places where a future supply may be looked for. But our East India possessions, Brazil, and Egypt (which is made to include Syria and a few other districts of the Mediterranean coasts of Asia) have long furnished a portion of his material, but by no means enough to satisfy his wants. The cultivation of cotton has been urged in Australia, the Cape of Good Hope, the West India Islands, and Guyana, among our own settlements; and recently Dr. Livingstone has stated the probability of obtaining a large supply from the interior of Africa with a likelihood at the same time of suppressing the slave-trade by occupying the natives in useful and profitable industry, instead of their barbarous and predatory wars. This, if ever realised, must evidently be a work of time. In our own settlements the price of labour seems on the whole to be too high to admit of any considerable increase of the quantities we derive from thence; for though there has been a general increase, the supply is very irregular, and is not large. In the year 1856 the United States supplied 77 per cent., the British possessions 17, Brazil 2·1, Egypt 3·3, and other places 6 per cent. of the total quantities imported. A portion, varying from one-sixth to one-sixteenth, is re-exported in the raw state, for most of the European nations are competitors with ourselves in the cotton markets of the world. Hamburg, Amsterdam, Rotterdam, Trieste, Antwerp, and France (chiefly at Havre) collectively take about two-sevenths of the quantity imported into the United Kingdom. A part of this, as we have said, is sent from England, but on the other hand there is every year imported a quantity of cotton manufactures, such as East India piece goods, stockings, fringe, yarns, &c., to the value of about 1,500,000*l.*, which has not been included in the following statement of the import of raw material, and the declared value of exports from the year 1836 inclusive. We have given occasionally a statement of the sources whence the raw material is derived, as they show the enormous differences of the crops in different places, and sometimes that an insufficient supply from America has been in some measure made up by an increase from other places, and especially from our own possessions; but we have not thought it necessary to repeat it for every year.

	Imported.	lbs.	1836.	Exported.	£
1836.	Total	406,959,057		Manufactures	18,511,652
				Yarn	6,120,366
1837.	United States	330,651,718	1837.	Manufactures	13,640,161
	Brit. Possessions	52,830,091		Yarn	6,955,942
	Brazil	20,940,145			
	Egypt	7,273,411			
	Other places	5,573,587			
		407,268,952			
1838.	United States	431,437,888	1838.	Manufactures	16,715,857
	Brit. Possessions	40,676,475		Yarn	7,431,869
	Brazil	24,464,505			
	Egypt	4,751,923			
	Other places	5,955,953			
		507,286,744			
1839.	United States	311,585,800	1839.	Manufactures	17,692,182
	Brit. Possessions	46,763,116		Yarn	6.858,193
	Brazil	16,948,011			
	Egypt	2,864,698			
	Other places	9,992,611			
		388,155,226			

Here was a large falling-off everywhere except in the British possessions, and in "other places," showing the efforts made to procure the raw material. Probably a portion was obtained from the continent. The exported manufactures, however, do not appear to have suffered. The following year shows a large increase from the British possessions:—

		lbs.			£
1840.	United States	481,572,510	1840.	Manufactures	17,567,310
	Brit. Possessions	77,133,730			7,101,308
	Brazil	14,885,464			
	Egypt	6,423,414			
	Other places	5,950,386			
		592,965,504			
1841.	Total	407,992,356	1841.	Manufactures	16,232,510
				Yarn	7,266,968
1842.	Total	531,750,086	1842.	Manufactures	13,907,884
				Yarn	7,771,464
1843.	Total	673,193,116	1143.	Manufactures	16,254,010
				Yarn	7,193,971

In this year the importations from Egypt, which had been gradually declining, sank to 857,160 lbs., but rose the next year to 5½ millions, and in 1845 to 11½ millions.

		lbs.			£
1844.	Total	646,111,304	1844.	Manufactures	18,816,764
				Yarn	6,968,684
1845.	Total	721,979,953	1845.	Manufactures	19,156.066
				Yarn	6,963,235
1846.	Total	467,748,624	1845.	Manufactures	17,726,966
				Yarn	7,573,727

In this year the duty on raw cotton was taken off, but from a deficient supply the manufacture declined, as also in the following year; nor did it recover itself till 1849.

		lbs.			£
1847.	Total	469,028,038	1847.	Manufactures	17,375,245
				Yarn	5,957 980
1848.	Total	713,026,151	1848.	Manufactures	16,753,369
				Yarn	5,927,831
1849.	Total	755,469,013	1849.	Manufactures	20,071,046
				Yarn	6,704,089
1850.	Total	663,576,861	1850.	Manufactures	21,864,797
				Yarn	6,383,704
1851.	Total	757,399,660	1851.	Manufactures	23,527,103
				Yarn	6,631,806
1852.	Total	953,342,242	1852.	Manufactures	23,454,810
				Yarn	6,634,026

In this year Egypt sent 44,922,568 lbs., the largest quantity it has ever furnished in one year.

		lbs.			£
1853.	Total	896,910,648	1853.	Manufactures	23,223,810
				Yarn	6,695,897
1854.	Total	887,335,904	1854.	Manufactures	24,948,367
				Yarn	6,695,897
1855.	Total	890,159,872	1855.	Manufactures	27,581,278
				Yarn	7,230,428
1856.	United States	780,039,668	1856.	Manufactures	30,219,099
	Brit. Possessions	180,448,584		Yarn	8,065,671
	Brazil	21,430,704			
	Egypt	33,699,008			
	Other places	7,119,624			
		1,022,737,588			
1857,*	United States	584,242,624	1857.	Manufactures	28,384,067
to Nov. 30.	Brit. Pos.	221,174,576	to Nov. 30.	Yarn	8,155,906
	Brazil	24,376,016			
	Egypt	21,160,720			
	Other places	7,755,776			
		858,709,712			

The prices given for cotton vary greatly. Different countries, different years, different qualities in the same year, all lead to difference of price. Sea Island cotton always realises the best price, while Surat cotton is near the bottom of the list; 1848 was a cheap year, while 1850 was a dear year; the lowest Sea Island (in the beginning of Oct. 1850) was quoted at 8*d.* per lb., while the highest reached 24*d.*, and Surats were 5*d.* to 7*d.* As the very dear cottons are sold only in small quantity, the average price for 1849 was probably about 6*d.* per lb., and for 1850 about 8*d.* We give the prices varied at periods, ten years apart, with the latest prices of the so-called Orleans for America, and Pernambuco for Brazil:—

	New Orleans.	Brazil.	East Indies.
1815	24*d.* to 27*d.*	34*d.* to —*d.*	17*d.* to 20*d.*
1825	8*d.* „ 12*d.*	12*d.* „ 13*d.*	6*d.* „ 8*d.*
1835	9*d.* „ 14*d.*	13*d.* „ 15*d.*	7*d.* „ 9*d.*
1845	4*d.* „ 8*d.*	6*d.* „ 8*d.*	2*d.* „ 4*d.*
1855	5¾*d.* „ 6½*d.*	6½*d.* „ 6¾*d.*	3¾*d.* „ 4¼*d.*
1856	7⅛*d.* „ 7⅝*d.*	7¼*d.* „ 7¾*d.*	5¼*d.* „ 5¾*d.*
1857 Dec. 31	6½*d.* „ 6⅞*d.*	6⅞*d.* „ 7½*d.*	4*d.* „ 4½*d.*

In the year 1856, the quantities exported were 2,035,491,291 yards of cotton cloth of the declared value of 28,527,789*l.*; 82,583,605 yards of lace and patent net, value 425,783*l.*; 5,442,359 lbs. of thread for sewing, value 586,383*l.*; 1,009,519 dozen pairs of stockings, value 308,656*l.*; and other descriptions of manufactures to the value of 370,485*l.*, independent of the yarn. The following list gives the products with the places to which they were sent in the first eleven months in 1857:—

Cottons, Calicoes, Cambrics and Muslins, Fustians and Mixed Stuffs.

	1857. Yards.
Hanse Towns	48,751,442
Holland	29,620,290
Portugal, Azores, and Madeira	45,932,221
Turkey	116,244,309
Syria and Palestine	36,852,515
Egypt	52,252,930
United States	169,985,234
Foreign West Indies	70,299,233
Brazil	180,129,154
Buenos Ayres	29,614,621
Chili	36,738,223
Peru	29,057,206
China and Hongkong	110,760,781

	1857.
	Yards.
Java	27,961,958
Gibraltar	18,433,819
British North America	32,088,413
„ West Indies	42,480,308
„ East Indies	422,295,029
Australia	20,029,516
Other countries	319,848,774
Total	1,849,376,975
	Doz. Pairs.
Stockings	979,340
	lb.
Thread for sewing	4,346,383

Cotton Yarn.

	lbs.
Russia	13,062,003
Sweden	1,569,686
Hanse Towns	44,186,476
Holland	34,862,817
Belgium	875,306
Naples and Sicily	6,108,024
Austrian Territories	4,464,967
Turkey	8,880,566
British East India	17,080,349
Other countries	33,697,262
Total	164,757,459

The total declared values of the cotton exports for the first eleven months of 1857 are as follows:—Cottons, calicoes, &c., 26,876,622*l.* Cotton yarns, including stockings and cotton thread for sewing, 8,155,905*l.*

A more detailed notice of the sources of production is given in the following statement of the amount of cotton in stock at Liverpool on December 31, 1857: the quantity is stated in bales:—

Sea Island	10,960
Stained	630
Bowed	56,940
Orleans	120,820
Alabama and Mobile	109,390
Pernambuco, Aracati, &c.	19,700
Bahia and Maccio	7,380
Maranham	8,920
Surinam Demerara	—
Barbadoes	70
Laguayra	110
Carthagena	3,170
Peruvian	1,070
Common West India, &c.	—
Smyrna	—
Egypt	15,200
Surat	141,030
Madras	3,860
Bengal	150
Total	400,300

At the same period there were 41,290 bales, chiefly East Indian, in stock in London; and 10,920 in Glasgow, making a total of 452,510 bales.

The quantity of cotton used in the mills of this country does not always show the quantity of work done. The quantity thus consumed was enormously greater in 1848 than in 1847, and a little greater still in 1849; but the quantities of work done, and wages paid, did not increase in a similar ratio. The latter two elements depend in great measure on the weight of cotton used in making a particular size of cloth or yarn. In some states of the market, heavy goods pay the manufacturer better than those of lighter texture; and at such a time the consumption of cotton is increased, though neither the manufacturers' profits nor the workmen's wages may have reached a higher aggregate. In some cotton fabrics, the material is worth two-thirds of the whole value; in others it amounts only to one-fiftieth: these are extreme cases; and between them every kind of ratio is observable in some or other of the numerous varieties of manufacture. In the case of yarns, the material is worth three-fourths of the whole price in some specimens, and only one-twentieth in others. A given number of spindles, employed in making cotton twist of the thickness called No. 20, would use up 1340 lbs. of cotton, in the time which would elapse in producing No. 30 out of 840 lbs., No. 40 out of 525 lbs., and No. 60 out of 224 lbs.; in the high Nos. the relative value of the labour is higher, and consequently the relative value of the material lower, than in the low Nos. In some of the gigantic cotton mills 30,000 or 40,000 lbs. of cotton less will be used in some weeks than in others, although all the machinery and all the hands may be employed at both periods; the difference arising from fine light goods being made at one time, and coarse heavier goods at another. When the demand for printed muslins, and other light goods, is relatively brisker than that of "domestics," or coarser cotton goods, the consumption of cotton in England is found to lessen. An advance in the price of cotton is much more strongly felt in respect to coarse goods and yarns, than in fine; so much so, indeed, that the demand from many foreign markets almost ceases if the price fluctuates beyond its usual limits; whereas in light goods, wherein labour forms a large ratio of the selling price, a rise in the price of the raw material is not so sensibly felt. Whenever the supply is deficient and the price high, the manufacturer has an inducement to produce light goods instead of heavy; and for a like reason, when the demand is slack, there is less dead weight of such capital in a stock of light goods than of heavy goods of equal market value.

The arguments put forth to show that we ought not to continue to be so much dependent, as we now are, on the United States for our supply of cotton, are somewhat as follows:—That our yearly supply from other quarters has been gradually decreasing; that while our consumption is increasing, the supply available for consumption increases in a less ratio, so that it can only be kept up by encroaching on the reserve store; that the United States is the only country where the growth of cotton is materially on the increase, and this increase is not equal in rapidity to the increase of manufacturing or consuming power in Europe and the United States; that no stimulus of price can materially augment the increase of supply in the United States, since the planters always grow as much cotton as the negro population can pick; and that, consequently, if the cotton manufacture of this country is to increase, it can only do so by applying a great stimulus to the growth of cotton in other countries adapted to the culture.

Which these "other countries" are to be, is a question whereon much difference of opinion prevails. In the early stages of the cotton manufacture, the countries surrounding the Mediterranean furnished us with nearly our whole supply. In the 18th century the West Indies provided the chief cotton supply; but at present the Mediterranean and the West Indies combined furnish a very insignificant ratio. Brazil, Egypt, and India, have successively entered the market; Australia and South Africa have recently done the same; and the question arises, which of all these, or whether all combined, can furnish a supply which will materially lessen our dependence on the United States? The Lancashire authorities themselves are at issue on this matter; for while some point to the East Indies as the source of an exhaustless supply; others feel reliance only on our own colonies in the West Indies, Africa, and Australia.

Since 1835 there have been no inventions to alter materially the processes of manufacture in cotton, but the improvements in the machinery have greatly facilitated the production in most of the various branches both of weaving and printing.

COUNTY COURTS. The whole jurisdiction in civil causes of the old *schyremote*, or County Court ('Penny Cyclopædia,' v. viii. p. 113), has been transferred to the new County Courts, first established for the recovery of claims not exceeding 20*l.* in amount, in 1846, but whose jurisdiction has since been considerably extended by 9 & 10 Vict. c. 95; 12 & 13 Vict. c. 101; 13 & 14 Vict. c. 61; 15 & 16 Vict. c. 54; and 19 & 20 Vict. c. 30.

The new County Courts were intended, not only to bring justice to every man's door (like the ancient Saxon tribunals whose place they have taken), but also to supply the place of a great variety of inferior courts, established in different localities by as many different Acts of Parliament, obtained for that purpose. These tribunals which were called Courts of Requests, or Courts of Conscience, and were intended solely for the recovery of small debts, were consequently abolished when the new County Courts were established.

The County Court may entertain suits for the recovery of all debts, damages, and demands, legacies, and balances of partnership accounts, where the sum sued for does not exceed 50*l.* If the parties consent in writing, claims to any amount may be determined; but the Court has no jurisdiction (unless the parties consent in writing) in any action in which the *title* to real property or in which the *validity* of any bequest under a will or settlement, may come in question; nor in any action for a malicious prosecution, for libel or slander, or seduction.

The Crown may sue in this Court for duties and penalties not exceeding one hundred pounds, the judgment in such cases being final. An action again may be brought in it against a custom-house officer, in respect of any illegal seizure of vessels or goods, where the damages do not exceed fifty pounds; but in this case there is an appeal, as in an ordinary action (16 & 17 Vict. c. 107). Questions between the Crown and any party liable for Succession Duties (not exceeding fifty pounds) may also be determined in this Court; the decision of the judge in such cases also being final (16 & 17 Vict. c. 51).

The County Courts are essentially *local* courts, for to give jurisdiction the defendant must reside within the district of the court, at the time of the action being brought. By leave of the Court, however, an action may be brought where the cause thereof arose within the district of the Court, in cases in which the defendant or one of several defendants has dwelt or carried on business in such district within six months. The Court has also jurisdiction to give a landlord possession of premises of which the rent does not exceed 50*l.* annually, and no fine has been paid, where the tenant's term has determined, or he has received notice to quit, or where the rent is half a year in arrear.

Its jurisdiction in testamentary matters is explained elsewhere. [Probate, *S.* 2.] The County Court has an exclusive jurisdiction in determining the claims and disputes of the members and officers of Friendly Societies, Industrial and Provident Societies, and of Literary and Scientific Institutions (18 & 19 Vict. c. 63, s. 41; 15 & 16 Vict. c. 31, s. 8, the Literary and Scientific Institutions Act, 1854), and in the appointment of trustees to, and the regulation of, all charities within the district of the Court, of which the gross annual revenue does not exceed 30*l.* [Charities, *S.* 2.]

A suit is begun by the entry of a plaint at the office of the Court, which sets out the names of the plaintiff and defendant, and the nature of the action. Thereupon a summons is issued, a copy of which is served on the defendant by one of the bailiffs of the Court, requiring the defendant to appear; which he must do at the Court to which he is summoned, or have judgment given against him. If defence is made, the matter in dispute is, on the trial, inquired into, and disposed of summarily by the judge; who is to decide all questions, as well of fact as of law, unless one or other of the parties has demanded a jury for the trial of matters of fact; for in actions for sums above 5*l.*, a jury of five may be obtained as of right; in this case the facts are to be tried by the jury.

In actions for more than 20*l.*, an appeal lies to either of the superior courts of law at Westminster, against the decision of the judge in matter of law, or in the reception or rejection of evidence. No appeal lies against his decision in matters of fact.

The Court, which is held once a month, is a court of record. On its judgment execution may be issued against the goods of the unsuccessful party. If he has no goods, but has the means of paying, and refuses to do so, he may be punished, after inquiry into his circumstances, by imprisonment for a period not exceeding forty days; or the judgment (if for more than 20*l.*) may be removed into one of the superior courts, and enforced there by the ordinary process of execution.

To encourage suitors to resort to this Court, the plaintiff in the superior courts (in suits in which they have concurrent jurisdiction) does not in general obtain costs in actions of *contract* where he recovers less than 20*l.*, and in actions of *tort* where he recovers no more than 5*l.*, unless the judge who tries the cause certifies for costs, or it appears that there was sufficient reason for bringing the action in the superior court.

Previously to the establishment of the County Courts, the Courts of Bankruptcy had, by the statutes 5 & 6 Vict. c. 116, and 7 & 8 Vict. c. 96, called usually the 'Protection Acts,' jurisdiction to grant to any person who was *a trader* owing less than 300*l.* in all, or who was *not a trader* within the bankrupt laws, protection from all process. This jurisdiction was, by the statute 10 & 11 Vict. c. 102, vested in the County Court, and the Court for the Relief of Insolvent Debtors, in London. [Protection Acts, *S.* 2.] In the County Court, also, may now be tried all actions of replevin. [Replevin, *S.* 2.] The judge has also power to grant a warrant for the arrest of an absconding debtor, and by statute 17 and 18 Vict. c. 104, to direct a vessel which has caused injury by collision or otherwise to another vessel to be detained until satisfaction is made for the injury, or security given to abide the event of legal proceedings.

The nature and jurisdiction of this Court have been described thus fully, in consequence not only of the recent erection of these tribunals, but of the extent and variety of the powers vested in them, and the important position they have taken in the estimation of the people. (Blackstone's 'Commentaries,' Mr. Kerr's edition, vol. viii., p. 38.)

COURTS.—The re-construction of local courts, anticipated in the article on this subject ('Penny Cyclopædia,' v. viii. p. 115), took place in 1846, in the re-organisation of the County Courts, with a simple and inexpensive procedure, and a professional judge in lieu of the Sheriff and suitors of the old *schyremote.* [County Courts, *S.* 2.] The Court of the Marshalsea, or Palace Court, has also been abolished, and provision made for the surrender of the inferior local courts by corporations and the lords of manors and hundreds. Most of these indeed have long been as much in desuetude as the court of piepoudre. Many of the more important borough courts have however obtained a renewed vitality, by having the provisions of the Common Law Procedure Acts of 1852 and 1854 extended to them, by order in Council. This has, of course, produced some anomalies. An inhabitant of Liverpool, for instance, may find himself commanded to enter an appearance at Westminster by the Queen; obliged to obey a like order to appear at Lancaster by the Duchess of Lancaster; threatened with judgment and execution by the Mayor of Liverpool, if he fail to appear at the Court of Passage in that town; and finally summoned to answer a plaint in the County Court of Lancashire holden at Liverpool. As to the alterations which have been made in the jurisdiction of other courts, see Bankruptcy, *S.* 2; Equity, *S.* 2; Probate, *S.* 2; Divorce, *S.* 2.

COWPER, EDWARD, was born in 1790. Little or nothing has been published concerning the circumstances and events of the early life of this distinguished inventor and improver of machinery. It is known however that it was chiefly owing to some of his inventions in cylinder-printing that Mr. Applegath was induced to build the extensive printing-office in Duke-street, adjoining to Stamford-street, London, now occupied by Messrs. Clowes, and he was a partner with Mr. Applegath in that establishment. They were also connected in making machines for calico-printing, and in the construction of new machinery for printing the 'Times,' of which, in conjunction with Mr. Applegath, he published a description. In fact, some of the most important improvements in machine-printing were of his invention, such especially as the giving a diagonal action to the rollers on the self-acting inking-tables. In the Great Exhibition of 1851 he exhibited a model, made by T. B. Winter, a student in King's College, London, of the printing-machine now in general use; and by such machines the catalogues of the Great Exhibition were printed. He had for many years an engagement at the large blacking-factory of Messrs. Day and Martin, in printing their labels in such a manner as to defy imitation. He furnished some contributions to the 'Penny Cyclopædia,' one of which was an elaborate article on a 'Button.'

Mr. Cowper, during some of the later years of his life, was professor of mechanics and manufacturing arts at King's College, and it is as a lecturer that he was best known to the public. His process of imparting knowledge consisted not only in giving descriptions, and illustrating them by models, but in exhibiting the machines themselves, and showing them at work. His manner of lecturing was simple and popular, and he had always a full attendance. His knowledge of machinery, of mechanical construction, and the mechanic arts, embraced the most minute as well as the largest objects. He delivered lectures on the mechanical structure of the Crystal Palace of 1851. He was much respected for his urbanity, and for his readiness in making communications from his large stores of information to the humblest individuals as well as to persons of higher station. He died at his residence, Kensington, London, October 17, 1852.

COWSLIP. [Primula, *S.* 1.]

CRAG, the uppermost of the distinctly Tertiary Strata of England—using this term in a sense which is perhaps gradually passing away, to be replaced by the larger meaning of Cainozoic. The Crag of Norfolk and Suffolk is partly a calcareous mass, rich in delicate corals; partly a subcalcareous sand, rich in shells; and partly a rudely aggregated deposit of sand, shells, pebbles, and bones. To these divisions, whose origin is due to different local conditions, and successive times, Mr. Charlesworth has assigned the titles of Coralline Crag, Red Crag, and Mammaliferous Crag. The position of these beds will be best seen from the following table of the classification of the Tertiary Rocks from Professor Ansted's 'Elementary Geology.'

Newer Tertiary, or Pliocene Series :—
1. Upper Gravel and Sand.
2. Till.
3. *Mammaliferous Crag.*
4. Fresh-Water Sand and Gravel.
5. *Red Crag.*

Middle Tertiary, or Miocene Series :—
6. *Coralline Crag.*

Lower Tertiary, or Eocene Series :—
7. Fluvio-Marine Beds, &c.

CRAIL. [Fifeshire.]

CRANBROOK. [Kent.]

CRASSULA, a genus of plants, the type of the natural order *Crassulaceæ*. It has a 5-parted calyx, much shorter than the corolla; sepals flattish; the petals 5, stellate, spreading, distinct; the stamens 5, filaments awl-shaped; scales 5, ovate, short; carpels 5, many-seeded. The species are very numerous. They are succulent herbs or shrubs, and are mostly natives of the Cape of Good Hope. Their leaves are opposite and entire, or nearly so. The flowers are mostly white, rarely rose-coloured. Upwards of fifty species have been described; and many of them, on account of their grotesque appearance, are cultivated in our gardens. They are greenhouse plants. One species, *C. tetragona*, is used at the Cape of Good Hope as a remedy in dysentery. Any medicinal properties they possess is probably owing to the presence of tannin.

CRAWFORD, THOMAS, an eminent American sculptor, was born at New York on the 22nd of March, 1813. At school he obtained some acquaintance with Greek and Latin literature, but, as is frequently the case with youths in his country, he seems to have been allowed in early life to follow very much his own course. Like Chantrey, his earliest instructor in the use of the chisel was a carver in wood. Whilst with him however his strong desire for higher training began to develop itself. He formed a collection of casts of ancient and modern works of a high class, and he learnt to model in clay. At length he was placed as a pupil under Messrs. Frazee and Launitz, and entered as a student the academy of design in New York. Mr. Lannitz urged him to proceed to Rome, and gave him a letter of introduction to Thorwaldsen. Accordingly he proceeded to Italy in 1834, and was received into the studio of Thorwaldsen, to whose friendship he was greatly indebted. Thrown by the death of his father on his own resources, he for some time supported himself by making busts. The first poetic work of his which attracted particular attention, was the statue of Orpheus, designed in 1839, but which he was compelled to leave unfinished by an attack of brain-fever, the precursor of his premature fate. On his recovery he completed the Orpheus in marble, a commission having during his illness arrived for it from the Boston Athenæum. It excited general admiration and anticipation. He worked on diligently, gaining in executive skill and confidence, and rising steadily in reputation. Among the chief of his earlier works are his 'Herodias with the head of John the Baptist;' 'The Babes in the Wood;' 'Flora;' and 'The Dancers'—two life-size statues of children, which have had considerable popularity. Among the best of his later works are his bronze statue of Beethoven, now in the Athenæum at Boston, America; the equestrian statue of Washington, which stands in the square at Richmond, Virginia; and the more ambitious alto-rilievo of the 'Progress of Civilisation in America,' which he was commissioned by the federal government to execute for the pediment of the Capitol at Washington. Others of his works are his statues of 'The Genius of Mirth;' 'A Shepherdess;' 'David;' and 'Prayer;' his groups of 'Adam and Eve,' of heroic size; 'A Family suffering under the plague of Fiery Serpents;' 'A Mother attempting to save herself and Child from the Deluge;' and his ideal busts of Sappho, Vesta, &c. He also made numerous designs for bassi-relievi illustrative of the Old and New Testaments; the poets of Greece, Italy, and England; events of American history, &c., as well as several models of leading American statesmen.

From first entering Rome, Crawford made that city his home. He had just completed a new and spacious studio, in order to work with more convenience at the numerous commissions which awaited completion, when he was stricken with a disease—tumour on the brain—which rendered him unable again to take up his chisel. He came to London for the benefit of medical advice, but failed to obtain relief, and died in London on the 8th of October, 1857. Crawford was a sculptor of a very high order of merit, not reaching to the first rank, but coming close to it. His works display originality and vigour rather than refinement; mental power rather than technical skill. Casts of some of his statues are in the Crystal Palace at Sydenham.

CREATINE. [Chemistry, *S.* 2.]

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CRESCENTIACEÆ, a natural order of plants, formerly included in the *Solanaceæ*, allied to *Gesneraceæ* and *Bignoniaceæ*. The species are trees of small size, with alternate or clustered simple leaves without stipules. The flowers grow out of the old stems or branches; the calyx free, undivided, eventually splitting into irregular pieces; the corolla monopetalous, irregular, somewhat 2-lipped, with an imbricated æstivation. The stamens are four in number, growing on the corolla, didynamous, with the rudiment of a fifth between the posterior pair, which are the longest; anthers 2-lobed, bursting longitudinally; ovary free, surrounded by a yellow annular disc, 1-celled, composed of an anterior and posterior carpellary leaf, with 2 or 4 equidistant parietal placentæ, which sometimes meet and produce additional cells; ovules 0-0, horizontal; style 1; stigma of 2 plates. Fruit woody, not splitting, containing a multitude of large amygdaloid seeds buried in the pulp of the placentæ; skin leathery, loose; embryo straight, without albumen, with plano-convex fleshly cotyledons, and a thick short radicle next the hilum.

CREX. [Rallidæ.]

CREWE, Cheshire, a town in the parish of Coppenhall and hundred of Nantwich, is situated in 53° 5′ N. lat., 2° 25′ W. long., distant 24 miles S.E. by E. from Chester, 166 miles N.W. from London by road, and 157½ miles by the London and North-Western railway viâ Trent Valley. The population of the town of Crewe in 1851 was 4491. The living is a perpetual curacy in the archdeaconry and diocese of Chester.

The town of Crewe owes its erection entirely to the formation of the London and North-Western line of railway. The inhabitants consist chiefly of persons in the employment of the railway company, with their families. The houses and shops are well built; the streets are wide, and the footpaths are laid with asphalte. The town is lighted with gas, and well supplied with water, a powerful steam-pump supplying at once the engines in the extensive workshops of the company, the locomotive engines, and the houses in the town. The water intended to be used by the inhabitants passes through two filtering processes before reaching the houses. Baths are also provided at a cheap rate. The town of Crewe has a council for the management of the affairs of the community; two-thirds of the council are elected by the workmen and inhabitants, and one-third by the directors of th railway company. A church has been erected by the company: the Wesleyan, Primitive, and New Connexion Methodists, Independents, Scotch Presbyterians, Baptists, an Roman Catholics have places of worship. Schools for boys girls, and infants have been provided by the company, and library and a mechanics' institution are supported by subscription. Medical attendance and medicine are secured fo the workmen and their families on payment of a smal weekly rate, the highest charge (that for a married man wit a family) being 2d. per week. A field in the neighbourhoo is used for cricket-playing. The railway station at Crewe i very spacious. From this place branch off five lines of railway, affording ready means of communication with all part of the country. The workshops and machinery of the Nort Western Railway Company at Crewe are on a very extensiv scale. Railway carriages and locomotive engines are manufactured and repaired. The number of carriages of all kind maintained at Crewe amounts to about 700, of which 100 a time are usually under repair. Crewe Hall, the seat Lord Crewe, is in Crewe township, about one mile from th railway station.

(Head, *Stokers and Pokers; Communication from Crew*

CRICH. [Derbyshire.]

CRIEFF. [Perthshire.]

CRINAN CANAL, Argyleshire, a canal connecting th Lochgilp branch of Lochfyne with the Sound of Jura, an constructed for the purpose of enabling vessels of small ou den to dispense with the rather dangerous passage round t

Mull of Cantyre. The project of forming this canal was first started about sixty years back, with the co-operation of the then Duke of Argyll. Sir John Rennie having surveyed the ground and reported favourably, an Act of Parliament was obtained, a company was formed in 1793, and the works were forthwith commenced. The canal was opened in 1801. The canal, although not more than 9 miles in length, has been of great service to the coasting trade of the west of Scotland and the Highlands; the original shareholders of the canal company, however, have never received any return for the outlay of their capital. The number of locks in the Coinan Canal is fifteen; the average breadth is 24 feet, and the depth of water 10 feet; if found necessary 12 feet depth of water could be maintained. Since 1818 the canal has been under the management of the Commissioners of the Caledonian Canal, with the navigation of which it is intimately connected; together, these canals form an important portion of the inland passage between Glasgow and Inverness. Vessels of 200 tons burden can pass through tho Crinan Canal.

CROKER, RIGHT HONOURABLE JOHN WILSON, was the representative of a branch of an ancient family which was settled for many generations at Lineham, in South Devon. A member of this family emigrated to Ireland about the year 1600, and his sons distinguished themselves at the capture of Waterford in 1650. Various descendants of this branch received grants of land in the south of Ireland, which they increased from time to time by marriages with influential families. Mr. Croker, the father of the subject of our present memoir, was for many years surveyor-general of Ireland, and in that position became extremely popular. By his marriage with Hester, daughter of the Rev. R. Rathborne, he had an only son, John Wilson Croker, who was born in Galway, December 20, 1780.

After receiving his early education at a school in Cork, where he displayed great precocity and an inquisitive disposition, he was entered at Trinity College, Dublin, at the age of sixteen, under the late Dr. Lloyd. He soon began to show extraordinary readiness and ability by the part which he took in the 'Historical Debating Society,' since suppressed, but which then was in active operation, drawing out and developing the characters of young men, and preparing them for their appearance afterwards on the stage of public life. So highly did the society esteem the share taken in its proceedings by Mr. Croker, that it voted him its first gold medal. Intended by his parents for the study of the law, Mr. Croker had no sooner taken his B.A. degree in 1800, than he was entered as a student at Lincoln's Inn; but he continued to reside in Dublin, and to mix with the society of that capital. He was called to the Irish bar in 1802. He had leisure hours on his hands, and these he devoted to literature. His first production as an author, if we except a short paper of mere ephemeral interest, was a series of 'Familiar Epistles to J. F. Jones, Esq., on the Present State of the Irish Stage,' which was published in 1803, and was followed in 1805 by his 'Intercepted Letter from China;' both anonymous. Both were clever and caustic satires, excited much curiosity and attention, and ran speedily through several editions.

In 1807 he published a work of a graver kind on 'The State of Ireland, Past and Present,' in evident imitation of the treatise of Tacitus 'De Moribus Germanorum.' In this pamphlet he strongly advocated Catholic emancipation. At the close of the preceding year Mr. Croker was employed as counsel for Sir Josias Rowley, at the election for Downpatrick. Sir Josias withdrew just before the election, and Mr. Croker was nominated in his place, but was defeated by a small majority. In the following May however he was returned for the borough, and confirmed in his seat on petition.

He had not been long in parliament when an opportunity offered for the display of his oratorical powers. Early in 1809 the Duke of York was brought practically upon his trial before the country for corrupt administration at the Horse Guards, and the best and most successful speech made in defence of his Royal Highness against Colonel Wardle's motion of censure, was delivered by Mr. Croker on the 14th of March. This speech contained a minute dissection of the evidence brought forward against the duke, and was couched in vigorous and pointed language. It may be presumed that the grateful sense which his Royal Highness thenceforth entertained for this support hastened the advance of Mr. Croker to office. In the course of the same session the late Duke of Wellington, then Sir Arthur Wellesley, and chief secretary for Ireland, being obliged to repair to Dublin, entrusted to Mr. Croker the parliamentary business connected with that country; and he fulfilled that trust with so much ability and discretion, that shortly afterwards Mr. Perceval, when he formed his ministry in 1809, offered to Mr. Croker the post of Secretary to the Admiralty. For upwards of twenty years Mr. Croker continued to discharge the duties of this post with unremitted application, under three successive First Lords of that department, and under King William IV. when Lord High Admiral. During this time he sat in parliament for various boroughs; amongst others for Aldborough, Yarmouth, and Bodmin; and in 1827 he had the satisfaction of being returned for the University of Dublin, on the elevation of Lord Plunket to the chancellorship and peerage, with whom he had twice unsuccessfully contested the seat: but his views being in favour of Catholic emancipation, Mr. Croker was subsequently defeated. He took a very active part in the parliamentary committee appointed to consider the question of erecting New London Bridge; and his zeal for science and literature was shown in another way soon afterwards, by founding the Athenæum Club. He was amongst the earliest advocates for a state encouragement of the fine arts. His speech on the proposed purchase of the Elgin marbles was much in advance of the general tone of parliament on such subjects. When the Reform Bill was proposed, Mr. Croker opposed it at every stage by powerful speeches and a ready pen, as he considered it a revolutionary measure.

The passing of the Reform Bill compelled Mr. Croker to withdraw from parliamentary life. Even during the most active portion of his parliamentary career, his pen was seldom unemployed. His printed speeches and pamphlets on current political questions amount to a very considerable number, and his contributions to the 'Quarterly Review,' extending over more than a quarter of a century, would alone fill several volumes. His most extensive work is an edition of 'Boswell's Life of Johnson,' in 4 vols., 8vo, published in 1831, which was handled with considerable severity by Mr. Macaulay in the 'Edinburgh Review.' His poems of 'Ulm and Trafalgar,' and 'Talavera,' are the best known and most admired of his productions in verse. His 'Stories from the History of England' is a highly popular book for children. The following is a list of the most important works not mentioned above, which were either published or edited by Mr. Croker: 'A reply to the Letters of Malachi Malagrowther;' 'Military Events of the French Revolution of 1830;' 'Letters on the Naval War with America,' and 'Songs of Trafalgar.' He was also the author of several lyrical poems of merit, including some touching lines on the death of Mr. Canning, to whom he was very firmly attached. Mr. Croker also edited the 'Suffolk Papers,' 'Lady Hervey's Letters,' 'Lord Hervey's Memoirs of the Reign of George II.,' and 'Walpole's Letters to Lord Hertford.' He died August 10, 1857.

CROKER, THOMAS CROFTON, was born January 15, 1798, in the city of Cork, Ireland. He was the only son of Major Thomas Croker, of the 38th regiment of foot. At the age of fifteen he became an apprentice in a mercantile establishment in Cork. Between the years 1812 and 1818 he made excursions occasionally on foot in the south of Ireland; and it was during these rambles that he commenced making his collections of the legends and songs of the peasantry in Ireland. In the year 1818, Moore, in an advertisement to the 7th number of the 'Irish Melodies,' expressed his obligations to him for about forty Irish airs which he had sent, for many curious fragments of Irish poetry, and for several interesting local traditions. Crofton Croker had also acquired considerable skill in making pen-and-ink sketches, and some of them were exhibited at Cork in 1818.

Major Croker died in 1818, and his widow soon afterwards made application to Mr. John Wilson Croker, then secretary to the Admiralty, who was a friend of the family, but no relation; and through his interest in February, 1819, Thomas Crofton Croker become a clerk in the Admiralty, with a salary of 2*l.* a week. While in this situation he contributed to the introduction of lithography into the Admiralty as a substitute for transcribing several copies of the same document, and for confidential circulars; and he had for many years the superintendence of the private lithographic press of the Admiralty. He subsequently became a clerk of the first class, with a salary of 800*l.*; and he retired in 1850 with a pension of 580*l.*

Mr. Crofton Croker's first literary work was his 'Researches in the South of Ireland,' published in 1824, in 4to, and consisting for the most part of the notes made during his early excursions in 1812-1818, and during a subsequent tour in 1821. His next work was the 'Fairy Legends and Traditions of the South of Ireland,' London, 1825, 3 vols. sm. 8vo. In the first edition of this work he was assisted by Dr. Maginn, Mr. Pigott, and Mr. Keightley; but the materials supplied by his assistants, or at least most of them, were afterwards omitted. A second edition was illustrated with etchings, after sketches by Maclise, then, as Croker states, "a young Irish artist of considerable promise." The 'Fairy Legends' appeared in 1834 in one volume, forming a part of the 'Family Library.' This work, when first published in 1825, produced a long complimentary letter from Sir Walter Scott; and on the 20th of October 1826, he was introduced to Sir Walter at the residence of Mr. Lockhart in Pall Mall. His personal appearance is thus described in Scott's Diary:—"Little as a dwarf, keen-eyed as a hawk, and of easy prepossessing manners, something like Tom Moore."

In 1829 Mr. Crofton Croker published 'Legends of the Lakes, or Sayings and Doings at Killarney, collected chiefly from the manuscripts of R. Adolphus Lynch, Esq., H.P., King's German Legion,' London, 2 vols. cr. 8vo. This work was followed in 1832 by two small novels—'The Adventures of Barney Mahoney,' and 'My Village versus Our Village,' of which the first was very favourably received, but the second less so. In 1839 he edited, with very copious notes, 'The Popular Songs of Ireland,' 12mo. He was a contributor to some of the annuals which were in fashion about 1830-40, especially to 'The Amulet,' and 'Friendship's Offering;' and he edited for two or three years 'The Christmas-Box.' He wrote many small articles, some for magazines, and some which were printed privately. He was a constant contributor to the early volumes of 'Fraser's Magazine,' frequently to 'The Literary Gazette,' and occasionally to 'The New Monthly Magazine.' He had always a taste for antiquities, and he was early elected a Fellow of the Society of Antiquaries. He was chosen a member of the Royal Irish Academy in 1827. He took part in the foundation of the Camden Society in 1839, and of the Percy Society in 1840. He was a member of the council of both these societies, and he edited some of the works published by them. When the British Archæological Society was founded in 1843, he became one of the committee. He was also a member of the United Service Institution, of the Irish Archæological Society, of the Numismatic Society, of the Hakluyt Society, and he was perpetual president of the club of antiquarians called the Society of Noviomagians. He had collected an extremely interesting museum of Irish antiquities, which was sold by auction after his death. He died at his residence, Old Brompton, London, August 8, 1854.

CROMFORD. [DERBYSHIRE.]

CRONSTEDITE. [MINERALOGY, *S.* 1.]

CROSSE, ANDREW, a celebrated experimenter on electricity, was borne at Fyne Court, in the parish of Bromfield, on the Quantock Hills in Somersetshire, on June 17, 1784. His father was the proprietor of the estate, to which he succeeded in 1800. He was educated at the school of the Rev. M. Sayers, at Bristol, where he had for school-fellows W. J. Broderip, the Rev. John Eagles, and other equally celebrated men. In 1802 he matriculated at Brasenose College, Oxford, where he was very uncomfortable, the habits, especially that of drinking, being particularly unsuited to him. He returned home in June 1805, on account of the illness of his mother, who shortly afterwards died. Even when at school he had become greatly attached to the study of electricity, and on settling on his paternal estate he devoted still more of his attention to the subject. He provided himself with electrical apparatus, and pursued his experiments wholly independent of theories, and searching only for facts. In a cavern near his residence, called Holwell Cavern, he observed the sides and roof covered with arragonite crystallisations, and his observations led him to conclude that the crystallisations were the effects, at least to some extent, of electricity. This induced him to make the attempt to form artificial crystals by the same means, which he began in 1807. He took some of the water from the cave, filled a tumbler, and exposed it to the action of a voltaic battery, excited by water alone, letting the platinum wires of the battery fall on opposite sides of the tumbler from the opposite poles of the battery. After ten days of constant action he procured crystals of cabonate of lime, and subsequently by altering the arrangements he produced them in six days. He found however that darkness was essential to the certainty and rapidity of their production. He carried an insulated wire above the tops of the trees around his house to a length of a mile and a quarter, afterwards shortened to a distance of 1,800 feet. By this wire, which was brought into connection with his apparatus in a chamber, he was enabled to see continually the changes in the state of the atmosphere, and could use the fluid so collected for a variety of purposes. In 1816, at a meeting of country gentlemen, he prophesied "that, by means of electrical agency, we shall be able to communicate our thoughts instantaneously with the uttermost ends of the earth." But though he foresaw the powers of the medium, it does not appear that he took any means towards fulfilling his prophecy, or even made any experiments in that direction; he continued to confine himself to the endeavour to produce crystals of various kinds, in which he eminently succeeded, having ultimately obtained forty-one mineral crystals, or minerals uncrystallised, in the form in which they are produced by nature, including one, sub-sulphate of copper, an entirely new mineral neither found in nature nor formed by art previously. His belief was, that even diamonds might be formed in this way. Still he worked alone; he published none of his experiments to the world, and he propounded no theories. At length, in 1836, the British Association for the Advancement of Science held its meeting in Bristol, and Mr. Crosse attended it, intending to be an auditor only; but having mentioned his discoveries to some of the scientific gentlemen there, he was induced to explain them publicly, and though unprovided with apparatus, they were so struck with the importance of them, that he was publicly complimented by the president, the Marquis of Northampton, and by Dr. Buckland, Dr. Dalton, Professor Sedgwick, and others. A few months after this meeting, while pursuing his experiments for forming crystals from a highly caustic solution out of contact with atmospheric air, he was greatly surprised by the appearance of an insect. Black flint, burnt to redness and reduced to powder, was mixed with carbonate of potash and exposed to strong heat for fifteen minutes. The mixture was poured into a black-lead crucible in an air furnace. It was reduced to powder while warm, mixed with boiling-water, kept boiling for some minutes, and then hydrochloric acid was added to supersaturation. After being exposed to voltaic action for twenty-six days a perfect insect, of the Acari tribe, made its appearance, and in the course of a few weeks about a hundred more. The experiment was repeated in other chemical fluids with the like results, and Mr. Weeks, of Sandwich, afterwards produced them in ferrocyanuret of potassium. This discovery occasioned great excitement at the time. The possibility was denied, though Mr. Faraday stated in the same year that he had seen similar appearances in his own electrical experiments; and he was accused of impiety, as aiming at creation. He was much hurt by these attacks, for he was a truly pious man. He says he was inclined to believe that the insects were formed from ova in the water, but failed to detect any; and adds, "I have formed no visionary theory that I would travel out of my way to support." He attempted to give no explanation of what he admitted he could not comprehend, and in answer to a person who had written to him, calling him "a reviler of our holy religion," he replied that he was sorry if the faith of his neighbours depended on the claw of a mite. These insects, if removed from their birthplace, live and propagate, but uniformly die on the first recurrence of frost, and are entirely destroyed if they fall back into the fluid whence they arose. This was the most remarkable of his discoveries; but his labours were in some instances more useful. He invented a method, which was patented by others, for purifying sea-water by electricity, which water possessed peculiar antiseptic properties; this process was also capable of being used for the improvement of wines, by removing the predominance of bitartrate of potash; to the improvement of spirits by removing acidity; and to the stopping of the fermentation of cider. He also made experiments of the effects of electricity on vegetation. He found that positive electricity advanced the growth, as was shown by the cultivation of two vines by Mr. Boys of Margate; and that negative electricity favoured the growth of fungi, and produced something like the rot in the potato. But Andrew Crosse did not confine his labours to scientific matters. Though living chiefly on his estate in the country, he took an earnest part in all local affairs. He was an active magistrate, just, but benevolent; he advocated the instruction of the poor, and he gave lectures on various subjects to the neighbouring institutes; he left a quantity of poetry, considerably above mediocrity, which he could not be induced to publish in his lifetime, but which has been given to the world by his widow, in a memoir of him written with much good taste; and he died, after a short illness, July 6, 1855, leaving behind him the character of a pious good man, and an indefatigable searcher for truth.

CROTCH, WILLIAM, Doctor of Music, was born in 1775, in the city of Norwich. While yet a child, he exhibited faculties of musical perception and execution which were quite marvellous, and rival those of Mozart. An account of his precocious talents was given by Dr. Burney, author of the 'History of Music,' and is printed in the 'Philosophical Transactions' for 1779, when the infant prodigy was only four years of age. Some anecdotes are also extant, written by the Hon. Daines Barrington, who says, "I first heard little Crotch on the 10th of December, 1778, when he was only three years and a half old." The following notices are extracted from the memoranda which he made on returning home: "Plays 'God save the King' and 'Minuet de la Cour' almost throughout with chords; reaches a sixth with his little finger; cries 'no,' when I purposely introduced a wrong note; delights in chords and running notes for the bass; plays for ten minutes extemporary passages, which have a tolerable connection with each other; seldom looks at the harpischord, and yet generally hits the right intervals, though distant from each other. His father is an ingenious carpenter of Norwich, and had made an organ. His organ rather of a hard touch. Many of his passages hazarded and singular, some of which he executed by his knuckles, tumbling his hands over the keys. The accuracy of this child's ear is such that he not only pronounces immediately what note is struck, but in what key the music is composed."

As Crotch advanced in years he became a profound theorist and a skilful composer. In 1797, at the early age of twenty-two, he was appointed Professor of Music in the University of Oxford, and the university also conferred on him the degree of Doctor of Music. In 1822 he was appointed Principal of the Royal Academy of Music. He performed in public for the last time in 1834 in Westminster Abbey, during the royal festival, when he presided at the organ on the third day. Dr. Crotch composed a very large number of pieces for the organ and pianoforte, the opera of 'Palestine,' and some pleasing vocal pieces, among which may be mentioned the fine ode for five voices, 'Mona on Snowdon calls.' He also published 'Elements of Musical Composition and Thorough-Bass,' 1812, and 'Specimens of various Styles of Music of all Ages,' 3 vols.

Dr. Crotch, during the latter years of his life, resided at Taunton, Somersetshire, with his son, the Rev. W. R. Crotch, master of the free grammar-school. He died December 29, 1847, when sitting at the dinner-table.

CROZIER, CAPTAIN FRANCIS RAWDON MOIRA, second in command of the ill-fated Franklin expedition, was born at Banbridge, county Down, Ireland. He entered the navy in June 1810, and, under the command of Sir Thomas Staines, he sailed in the Briton to the Pacific, and visited Pitcairn's Island, which was found peopled by the descendants of the mutineers of the Bounty. In 1824 he was appointed master's-mate of the Fury, and he accompanied Parry in three of his voyages to the Polar Sea.

In 1826 Mr. Crozier was made lieutenant, and was employed on the coasts of Spain and Portugal till December 1835, when he sailed with Captain (now Sir) James Ross, to search for the missing whalers in Baffin's Bay. His reputation for science, seamanship, and fertility of resource, secured his promotion; and he commanded the Terror in the expedition under Sir J. Ross for the exploration of the antarctic regions, which sailed in 1839, and was absent three years. In March 1845 he was re-commissioned to the Terror, and sailed with Franklin to discover the North-West Passage: since which time he has not been heard of. He was in the prime of life on his departure, and died probably in his fiftieth year. He was a Fellow of the Royal and Astronomical societies, and was distinguished as much for devotion to duty as for love of science.

CRUDEN, ALEXANDER, the author of the well-known Concordance, was born at Aberdeen in 1701. He studied at Marischal College, but whilst there, his conduct was marked by eccentricities similar to those which characterised his later years, and, as it was found necessary to abandon his intention of becoming a minister of the Church, he came to London in April 1724, and subsisted by giving lessons in Greek and Latin. Afterwards he obtained a situation as tutor, and in that capacity resided for some time in the Isle of Man. In 1732 he opened a bookseller's shop under the Royal Exchange, and occupied his leisure hours in the preparation of his 'Concordance of the Old and New Testament,' which appeared in 1737. It was dedicated to Queen Caroline, and Cruden had calculated sanguinely on her majesty's favour. The queen died however just after the publication of his book, and the disappointment brought out his latent insanity. He was removed to a private lunatic asylum at Bethnal-green, where he was confined from March 23 to May 21, 1738, when he escaped. He persisted in asserting that he was of sound mind, and brought an action against the keeper of the asylum and others; but as might be supposed, the jury was directed by the judge to find a verdict for the defendants.

Cruden published an appeal to the public, under the title of 'Mr. Cruden greatly Injured on account of a Trial between Mr. Alexander Cruden, bookseller to the late Queen, plaintiff, and Dr. Monro, Matthew Wright, John Oswald, and John Davis, defendants, in the Court of Common Pleas, in Westminster Hall, July 17, 1739, on an action of Trespass, Assault, and Imprisonment . . . . with an account of several other Persons, who have been most unjustly confined in Private Madhouses. The whole tending to show the great necessity there is for the Legislature to regulate Private Madhouses in a more effectual manner than at present,' 8vo, 1739. Cruden, who appears to have been treated while in the asylum with great brutality, now found employment as a reader of printers' proof-sheets, and in the occasional preparation of indexes. Among others he is said to have compiled the elaborate index to Newton's 'Milton.'

He now published the first part of a strange kind of autobiography, under the title of the 'Adventures of Alexander the Corrector.' A second time it was deemed necessary to place him under temporary restraint at Chelsea; and again he brought an action in the Court of King's Bench against the parties who had restrained him, with as little success as before. On obtaining his liberty he quietly returned to his ordinary occupations. Subsequently he published the second part of his Adventures, in which he gave the history of his second confinement, or 'Chelsea Campaign,' as he calls it in his title-page; and also an account of the trial, and endeavoured in vain to obtain an audience of the king, in order to present a copy of the two parts. He also, as he says, "pleaded very hard that the honour of knighthood might be conferred upon him," the object being "to fulfil the prophecy about being made a member of parliament for the city of London." He seems to have actually got himself nominated (April 30, 1754) as a candidate for the city; but he acknowledges that few hands were held up for him. In 1755 he published the third part of his Adventures, in which he relates the ill-success of a motion he made in person for a new trial; of his applications for knighthood, and for admission into the House of Commons; but the chief part is taken up with a 'History of his Love Adventures, with his Letters, &c., sent to the amiable Mrs. Whitaker, a lady of shining character and of great eminence,' in which he was as unlucky as in other matters. Impressed with a belief that he had a mission to reform the public manners, he went to preach to the prisoners in Newgate, and then made a journey to Oxford in order to preach to the students at the university. Disgusted at the reception he met with, he abandoned preaching, but arming himself with a large sponge, he went about the streets removing any expressions on the walls which appeared to him offensive to decency; and when the affair of Wilkes and No. 45 of the 'North Briton' was exciting so much public ire, his loyalty led him to the active use of his sponge in effacing the offensive number. His insanity seems to have expended itself in this harmless manner. He continued to pursue his ordinary employments, and found time to enlarge and revise his Concordance. He also published 'Alexander the Corrector's Humble Address;' and other pamphlets relating to the reformation of manners, the American war, &c., all marked by strong indications of insanity. He died at Islington in November 1770. Cruden's 'English Concordance' was far more complete and valuable than any preceding one, and it still retains its value. Three editions of it were published during Cruden's lifetime, the last and the best in 1769; it has since gone through innumerable editions of all degrees of correctness; one of the most esteemed is that of 1810.

CUBITT, THOMAS, was born in 1788, and was the son of a labouring man at Buxton, a village in Norfolk. Thrown early on his own resources, and denied the advantages of what is called a liberal education, he nevertheless rose into eminence by skill and industry combined with integrity, and amassed a large fortune by the improvements which he effected in the architecture and sanatary arrangement of London. His father died while he was still a youth. The trade to which he was brought up was that of a carpenter. He worked at the bench for some time, and then went out to India in the capacity of ship's carpenter. Having accumulated some small amount of money during his voyage out and home again, he became a master-carpenter and then a builder in Gray's-Inn-Road. He was here engaged to build the Metropolitan Institution in Finsbury-Circus. About 1823 he contracted for the improvement of the property of the late Duke of Bedford in the neighbourhood of Russell and Tavistock squares, and a year or two later entered into a similar engagement with the late Marquis of Westminster and Mr. Lowndes for erecting mansions on their property between Knightsbridge and Westminster. The skill with which he laid out and built what is now frequently called 'Belgravia,' recommended him to the late Mr. Kemp, who employed him to build Kemp Town at Brighton. He subsequently laid out and built Clapham Park, and Southern Belgravia, including Warwick and Eccleston squares at Pimlico. Mr. Cubitt was one of the first persons to propose a comprehensive scheme of draining London by carrying the sewerage to a point in the river Thames considerably below the city. He was also the author of other sanitary plans for the prevention of nuisances from smoke, &c., and the appropriation of open spaces in the suburbs of London as parks for the people. When her Majesty and Prince Albert determined on rebuilding Osborne in the Isle of Wight, the work was entrusted to Mr. Cubitt. For several years Mr. Thomas Cubitt held the honorary post of examiner of candidates for district surveyorships, and at one time was president of the Builders' Society. Himself originally a working man, he felt and laboured for the working classes. Thus he erected a workman's library and school-room near his establishment at Thames Bank, and devised a plan for supplying their families with the comforts of life from his own premises. On one occasion, when his large works at Thames Bank were burnt down, thinking nothing of his own loss, he commenced at once a subscription for replacing the tools of his workmen. He died rather suddenly at Denbies, Surrey, December 26, 1855, having just finished his mansion there, and completed his contracts in Belgravia. His brother, Mr. Alderman William Cubitt, formerly his partner in Gray's-Inn-Road, was sheriff of London in 1847, and has represented Andover in parliament since that date.

CUCKOO-FLOWER. [CARDAMINE, *S.* 1.]

CULLEN, Scotland, a royal and parliamentary burgh and sea-port in the parish of Cullen, on the northern coast of Banffshire, in 57° 42′ N. lat., 2° 50′ W. long., about 13½ miles W. from Banff. The population of the parliamentary burgh in 1851 was 1697, that of the royal burgh was 3165. The town is built on the western acclivity of a hill which slopes to the margin of the sea, and is nearly in the centre of the Bay of Cullen. The burgh is governed by 19 councillors, including a chief magistrate, three bailies, and a dean of guild; and with Elgin, Banff, Inverury, Kintore, and Peterhead, returns one member to the Imperial Parliament.

Cullen consists of two parts, the New Town, which stands on an elevation, and the Sea Town or Fish Town, which is situated on the shore, and inhabited chiefly by fishermen. In New Town the houses are good and the streets are regularly laid out and lighted with gas. The Sea Town is a collection of mean irregularly built houses. The harbour is good, though the depth of water at the pier head is only 8½ feet at neap tides. A few vessels belong to the port, varying from 40 to 100 tons. Besides the parish church, which is of considerable antiquity, there is another church of the Establishment, and a Free church. The Cullen hotel is a large building, to which are attached the assembly-room, a court hall, used for the sheriff and justice of peace courts, and the council chamber of the burgh. One third of the inhabitants of the town are engaged in the fisheries. The deep-sea fishing for cod, skate, and ling commences in February and ends in May. The June fishings are for haddocks, which are dried into speldings; the herring fishing occupies July and August. In the bay is a salmon fishery. The principal imports are coals, salt, and staves, with barley for distillation at a distillery in the neighbourhood; the exports are herrings, dried fish, oats, and potatoes. Boat building is carried on to a considerable extent. There is a parochial library. Cullen was erected into a royal burgh by Robert the Bruce, though traditionally its corporation privileges are said to be derived from Malcolm Canmore. The town was burned down in 1645 by Montrose. The Earl of Seafield is landlord of the whole parish.

CULROSS. [PERTHSHIRE.]

CUMBRAE. [BUTESHIRE.]

CUMBRIAN ROCKS. The succession of rocks, as pointed out by Professor Sedgwick in the Cumberland hills, is as follows:—

1. Skiddaw Slate, usually without fossils, but containing *Graptolites* in one locality.
2. Coniston Limestone, abounding in fossils.
3. Coniston Flagstone and Grit.

These rocks find their representatives in those called Cambrian in North Wales. These latter rocks are included by Sir Roderick Murchison in his 'Silurian System.' As the nomenclature of these rocks is still a disputed question, we subjoin the account of them published by Mr. Jukes, in his work on 'Physical Geology.'

"Cambrian or Cumbrian Rocks.—The word 'rocks' is used here instead of 'system,' or 'formation,' because we cannot yet precisely tell the value of the Cambrian division. Cambrian means the rocks of Wales; Cumbrian those of Cumberland and Westmoreland. In Wales these rocks consist of certain thick sandstones, gritstones, and conglomerates, with interstratified beds of green or green and purple slates. It is in the uppermost of the slate beds of this Cambrian group that the great Penrhyn and Llanberrie slate quarries are opened. They contain no fossils. These rocks are found to have a thickness of upwards of 20,000 feet in some places in North Wales; but as the base of them is never exposed, we know not how much greater thickness they may possess, nor what is below them. One portion of this division has been provisionally called the 'Barmouth and Harlech Sandstone Group.' Their upper boundary is a purely arbitrary line along the top of a certain set of beds drawn by the officers of the Geological Survey of Great Britain, under the direction of Sir H. T. De la Beche, C.B.; their reason for drawing it being simply that no fossils have as yet been found below that line, whereas fossils are pretty abundant in many places above it. It must not be forgotten that Professor Sedgwick (of whose peculiar department we are now speaking, he being the one geologist who has single-handed done far the most to unravel the structure of these older rocks) dissents from this placing of the boundary of the Cambrian Rocks; and himself places it much higher, so as to include the beds we shall subsequently speak of, as Lower Silurian, dividing his system into Upper and Lower Cambrian. There can be no doubt that if we neglect the fossils, and look only to the physical structure and position of the rocks of Wales, Professor Sedgwick is right. There can be no reason for drawing the boundary where it has been drawn, and along no other geological horizon in North Wales, except the fact that fossils have been found in all the rocks above that line of division, and in none of those below. Whether they may not hereafter be found is another question. If we go to Cumberland, Professor Sedgwick there describes the Cambrian, or, as he there calls them, Cumbrian Rocks, as likewise consisting of upper and lower, and gives the following abstract of them:—

		Feet.
Cumbrian, Upper	Coniston Flagstone	1500
	Coniston Limestone	300
	Slates and Porphyry	10,000
Cumbrian, Lower	Skiddaw Slate	6000

He describes these however as all fossiliferous, which, by the rule lately mentioned, would exclude them from being considered as Cambrian at all, more especially as the fossils of the upper beds are such as palæontologists seem agreed to consider of Silurian age. It is highly probable that the Skiddaw Slates are of the same age as the Barmouth and Harlech Sandstone Group of North Wales, which likewise contains the best roofing-slates of that country. In that case, according to the classification adopted by the Geological Survey, the Skiddaw slates would be considered Cambrian, and all above them as Silurian. The reader will see from these statements that this part of the classification of the stratified rocks is far from being settled. There is however no dispute about the things themselves; the rocks are all known, and their order completely ascertained; the uncertainty is merely as to the name by which certain portions of them shall be called."

CUMIDINE. [Chemistry, *S.* 2.]

CUMMINGTONITE, an American mineral belonging to the hornblende series. It is fibrous, of an ash-gray colour, with a slight silky lustre. It is found at Cummington and Plainfield, in Massachusetts. (Dana, ***Mineralogy.***)

CUMNER. [Berkshire.]

CUNITA, a genus of plants belonging to the natural order *Labiatæ*. It has a 13-nerved calyx, ovate, tubular, equal, 5-toothed, the throat villous inside. The corolla having the tube equalling the calyx, naked inside, and the limb bilabiate; the upper lip erect, flattish, usually emarginate; lower lip spreading, trifid, with nearly equal entire lobes, the middle lobe rather the largest and emarginate. The stamens 2, erect, exserted, without any rudiments of the upper two; filaments glabrous, toothless; anthers 2-celled, cells parallel, or at length divaricate. The style shortly bifid at the apex; the lobes nearly equal, subulate, minutely stigmatiferous at top; the achenia dry and smooth. The flowers small, white, or purplish. The species are herbs, shrubs, or under-shrubs.

C. Mariana, native of Canada to Carolina, on dry mountains, is a branched herb with short glabrous branches, but pubescent at the nodes. The corolla is about twice as long as the calyx, and is pubescent inside, and of a red colour. It is employed medicinally, where it grows, in slight colds and fevers, with a view to excite perspiration.

C. microcephala is also used medicinally in coughs and colds, in Brazil, where it grows. It has a procumbent stem, with scarcely pubescent branches; the leaves petiolate, oblong, or obovate, obtuse, quite entire, or subsinuately serrated, narrowed at the base, glabrous, and flat. The corolla is white; the throat villous inside.

There are several species of this genus, none of which are of any known use except those above mentioned.

CUPAR-ANGUS. [Perthshire.]

CUPULE, a kind of cup or involucre surrounding certain kinds of fruit, and composed of bracts more or less grown together. In the oak the cup of the acorn is the cupule; in the hazel-nut it is the husk; in the beech and chestnut the prickly shell; and in the hornbeam the lobed bract.

CURASSOW. [Cracidæ.]

CURRAN, JOHN PHILPOT, was born on July 24, 1750, at Newmarket, in the county of Cork, Ireland. His parents were respectable, but not wealthy; his father having been an officer to a manorial court, and possessing the advantages of a classical education. His mother, perceiving early indications of talent, was in hopes of his becoming a clergyman, and efforts were accordingly made to procure him a suitable education. Being Protestants, they first procured him some instruction from the Rev. Nathaniel Boyse, the resident clergyman, with whom he maintained a continued friendship. He was next sent to the Free Grammar-School at Middleton, and afterwards entered as a sizar in Trinity College, Dublin. After acquiring a considerable proficiency in classical learning at that university, he abandoned his first intention of entering the church, and determined to adopt the profession of the law. Accordingly, having passed through the university with great credit, he went to London, and entered himself at the Middle Temple in 1773. Here his straitened means occasioned him some inconveniences, but he studied law with considerable assiduity, and practised oratory at some debating societies, where he is said to have displayed his talent for energetic and sarcastic speaking. In one of the vacations, between the terms, he returned to Ireland, and married a daughter of Dr. Creagh in 1774. With her he received a small portion, which somewhat smoothed the remainder of his term of probation, and, in 1775, he was called to the Irish bar. His success was almost immediate. His style was precisely suited to the Irish courts; humourous, discursive, often flowery and poetical, vehemently appealing to the feelings, never wearying by dry legal arguments, but when urging them enlivening their dryness by occasional witty or satirical illustrations, and he soon obtained a leading business. His social habits also operated in his favour, and though he had already adopted a political belief in opposition to the reigning government, he was a general favourite even with his political opponents, while his independent bearing to the judges won him the favour of the public. The fearlessness of his addresses however sometimes brought its inconveniences. As counsel in an action for assault by the Marquis of Doneraile on a poor old Roman Catholic clergyman, he had styled Mr. St. Leger, one of the witnesses for the defence, "a renegado soldier, a drummed-out dragoon:" a duel followed, when he declined returning Mr. St. Leger's fire, and the affair ended. He had been always a warm politician, and in 1782 he was returned to parliament as member for Kilbeggan, on the interest of a Mr. Longfield. As a specimen of the state of the Irish parliament, we may mention that soon after entering the House of Commons he found himself differing in political opinions with his patron, and as he had no way of vacating his seat he coolly offered to buy another seat, to be filled by any one Mr. Longfield might choose to appoint. That gentleman declined the offer; but in the succeeding parliament Mr. Curran bought a seat for himself. In the House of Commons he soon took a leading part, generally acting with Mr. Grattan and the few liberal members who then had seats. His speeches were of a very similar character to those he made at the bar, and he was often appointed to make the reply from his readiness and happy facility in retorting charges or damaging the positions of his opponents. He supported the formation of the Irish Volunteers in 1788, and the unconditional appointment of the Prince of Wales to the regency on the occasion of the king's illness in 1789, and his attacks on the government led to a duel, first with Mr. Fitzgibbon, afterwards Earl of Clare, and then with Major Hobart, in which Mr. Curran was the challenger, in both of which neither party was injured. It was in 1794 and the few subsequent years that Mr. Curran's reputation attained its climax. In the House of Commons, Mr. Curran, Mr. Grattan, and others, had been continually pointing out to the government that their measures were driving the people towards rebellion. The warnings were unheeded, and in 1794 Mr. Hamilton Rowan was indicted for a seditious libel issued in the form of an address to the volunteers of Ireland from the society of United Irishmen (not the same as the rebellious societies which aftewards took this name), of which he was secretary. Mr. Curran was his counsel, and made an eloquent and vigorous defence, but Mr. Rowan was convicted and sentenced to imprisonment; and after the breaking out of the rebellion in 1798 he was the counsel generally employed by the accused, among whom the most remarkable were the two brothers Sheares, Theobald Wolfe Tone, and Napper Tandy. He had retired from the Irish House of Commons before the introduction of the measure for the Union, of which he strongly disapproved, and which he ever continued to lament. The insurrection of 1803 brought trouble into his family; Robert Emmet, one of its leaders had formed an attachment for Miss Sarah Curran, which was returned; and his correspondence with her, with his visits, sometimes secretly, to her father's house, led to a suspicion of Mr. Curran's loyalty, and to the searching of his house. He instantly waited upon the Attorney-General Standish O'Grady, and the privy council, by all of whom his perfect want of complicity was instantly admitted. Mr. Emmet had named him one of his counsel, but he did not act. Mr. Emmet was convicted and executed; his fate and his love adventure form the subject of two of Moore's 'Irish Melodies.' Upon the death of Mr. Pitt, in 1806, the Whig ministry under Lord Grenville created Curran Master of the Rolls in Ireland. This appointment did not give him satisfaction; it withdrew him from politics, and as his mind was not judicial, he felt himself out of place: he thought he had been neglected, and his health declined. He held the office till the early part of 1813, when he resigned; and he died in London on October 14, 1817. Mr. Curran in the course of his life wrote a considerable amount of verse of more than ordinary merit, but which bears no comparison with his eloquent speeches.

CURSITOR BARON. This office, or rather sinecure, was abolished by the statute 19 & 20 Vict. c. 86, which also makes provision for the performance of its almost nominal duties.

CUSHAT (*Columba dilopha*). [Columbidæ.]

CYAMELIDE. [Chemistry, *S.* 2.]

CYANOGEN, CHLORIDE OF. [Chemistry, *S.* 1.]

CYANURIC ACID. [Chemistry, *S.* 1.]

CYCLADIDÆ, a family of Lamellibranchiate ***Mollusca*** It is a group of fresh-water mollusks, whose shells resemble those of ***Kellia*** or of ***Astarte***, but whose soft parts present structures conspicuously distinguishing them from the tribes to which either of those genera belongs.

The shells are more or less tumid, equilateral or inequilateral, thin, as in our British forms, or thick, as in the foreign *Cyrenæ;* smooth or concentrically striated and furrowed, and covered with an epidermis. The hinge is furnished with cardinal and lateral teeth, and the ligament is external

The animals have plain-edged mantles open in front, siphonal tubes produced, and either partially separated or completely united to their unfringed extremities, and a large linguiform foot. They live buried in the mud of slow streams, lakes, ponds, ditches, and springs. Our native species are all ovoviviparous. They breed readily in confinement, and often exhibit considerable activity, ascending the sides of the vessel in which they are placed. (Forbes and Hanley.) This family contains two British genera, *Cyclas* and *Pisidium.*

Cyclas has the shell equivalve, thin, suborbicular, more or less inflated, slightly inequilateral, closed, smooth, or concentrically striated; cardinal teeth, one in the right and two in the left valve; lateral teeth developed; ligament external.

C. rivicola has the shell oval, globose, striated; umbones obtuse; dorsal area with a small lunular impression; ligament manifest.

The ordinary length of the finer specimens is 10½ lines, and its breadth about two-thirds of an inch.

The tubes of the animal are tinged with rose or tawny, and when fully protruded are nearly equal, the branchial, if either, being longest.

The foot is large, white, and linguiform; the mantle white; the labial palps long, triangular, and strongly striated. It is sluggish in its habits.

Forbes and Hanley give the following localities:—The most prolific is the river Thames; it is found likewise in the New River (Baily); the Trent (Jenyns); the Lea (S. H.); the canals about Leamington, in Warwickshire (Thompson); streams in Yorkshire (Bean). In a pond at Enville, Staffordshire, a young specimen (Jeffreys). It has not been taken either in Scotland or Ireland. On the continent it occurs in Germany, France, and Belgium; and as a fossil is found in the Pleistocene Fresh-Water Beds of the south of England.

C. cornea, Linn. Shell suborbicular, almost smooth; umbones obtuse; ligament inconspicuous. There is a subglobose variety (apparently the *Stagnicola* of Mr. Sheppard), which is flattened towards the ventral margin, and has the pellucid and swollen umbones peculiarly prominent. The dimensions of the larger typical form are six lines and a quarter in length, and five lines in breadth; of the variety five lines and a half in length, and four and three-quarters in breadth.

The animal is white, its sub-elongated siphonal tubes tinted with pale flesh-colour. Mr. Jenyns observes that the superior tube is sub-conic, with a small aperture, the inferior cylindric and truncate, with a wider aperture.

This very common species is a general inhabitant of rivers, ponds, and ditches throughout the country. It appears to thrive equally well both in running and in stagnant water. (Jenyns.)

It is also generally distribnted throughout Europe, and occurs fossil in fresh-water strata of the pleiocene age in the valley of the Thames.

C. caliculata has the shell more or less rhombic; umbones narrow, more or less prominent, capped.

This species is apparently less infrequent in the north than in the more southern parts of England. Mr. Alder has found it near Newcastle; Mr. Bean at Scarborough (where it is not scarce); Mr. Thompson at Lichfield; and Captain Brown records the vicinity of Manchester and the lakes of Westmoreland for its localities. Montagu met with it in Devonshire and Wiltshire; Mr. Jenyns at Bookham Common in Surrey, and more sparingly in Cambridgeshire; and Mr. H. Strickland at Hornsea in Yorkshire. Mr. Jeffreys has taken it in the Clumber Lake, Nottinghamshire, and in the neighbourhood of Bristol. In Ireland it is also rare. "On the Continent it occurs in Sweden, Germany, Belgium, France, and Italy. The *C. partumeia* of Say, in despite of the ventricosity of the adult, is very closely allied, especially in outline, to this species, and may be regarded as its transatlantic representative." (Forbes and Hanley.)

Pisidium has the shell equivalve, thin, usually tumid, sub-oval, inequilateral, smooth or concentrically striated; hinge with one tooth in the right and usually two in the left valve; also lateral teeth; ligament external, inserted at the shorter side.

The species are very small bivalves, living in similar localities with *Cyclas*, and not uncommon even in drains through meadows.

P. pusillum. Shell rounded, oval, not greatly inequilateral, not distinctly striated; valves not swollen, always a little compressed below; umbones usually broad, and but little projecting. This is by far the commonest of the smaller *Pisidia* in this country. It is found abundantly in ponds and ditches. It inhabits generally northern and central Europe.

P. pulchellum. Shell small, striated (not grooved); umbones simple and without appendages. There are many varieties of this shell. It has a great tendency to assume a multiplicity of forms. The average size is a line and a half long, and a line and a quarter broad. It is very common in many parts of Great Britain.

The other British species of this genus are *P. Henslowianum*, *P. nitidum*, *P. cinereum* and *P. obtusale.*

CYRILLACEÆ, *Cyrillads*, a natural order of Exogenous Plants. The order consists of shrubs with evergreen simple leaves without stipules. The flowers usually in racemes. The calyx 4-5-parted. It has 5 distinct petals, with an imbricated æstivation. The ovary is 2-3-4-celled, always composed of some number of carpels different from that of the calyx, corolla, and stamens; solitary pendulous ovules, a short style, the stigma with as many lobes as there are cells of the ovary. The fruit is a succulent capsule or a drupe; the seeds inverted; the embryo in the axis of a very large quantity of albumen, with a very long superior radicle. This order is related to *Olacaceæ* and *Pittosporaceæ.* All the species are inhabitants of North America. Nothing has been recorded of any uses to which they are applied.

CYTHERE, a genus of entomostracous *crustacea*, belonging to the legion *Lophyropoda*, the order *Ostracoda*, and the family *Cytheridæ.* The species are found very commonly in Great Britain. [BRANCHIOPODA.] Mr. Rupert Jones, in his 'Monograph of the Entomostraca of the Cretaceous Formation of England,' describes five fossil species belonging to this genus. [ENTOMOSTRACA.] The same author describes ten species of this genus as fossil in the Permian Rocks of England.

Cythereis is a genus separated from the group of species known as *Cythere* by Mr. R. Jones. It has the following characters:—The animal is unknown. Carapace-valves or shell of an almost regular oblong shape, the dorsal and ventral margins lying nearly parallel to each other. Surface of a very irregular appearance, being wrinkled, ridged, and beset with tubercles, and crenulated or strongly toothed on the margins.

Dr. Baird has described three recent species, whilst nine fossil forms have been described by Mr. Jones from the chalk.

Bairdia is a group of species formerly referred to *Cythere*, and separated by M'Coy. The valves externally are convex and smooth, sometimes finely pitted or spined, never ribbed or granulated; the hinge is simple.

This genus has no recent species. Six species have been found in the chalk.

Cytherella, a genus separated by Jones from *Cythere.* It embraces species of *Cytherina* of other authors. The carapace valves are oblong, and vary in the convexity and smoothness of the surface; the right valve is larger than the left, and its contact margin thicker than that of the opposite valve. Six fossil species have been described from the chalk.

(Rupert Jones, *Monograph of the Entomostraca of the Cretaceous Formations of England*; W. King, *A Monograph of the Permian Fossils of England*, both published by the Palæontographical Society; Baird, *Natural History of the British Entomostraca*—Ray Society.)

D

DACRIDIUM, a genus of Gymnogenous Plants belonging to the natural order *Taxaceæ*. One of the species, *D. taxifolium*, the Kakaterra-Tree of New Zealand, acquires a height of 200 feet. From its branches may be manufactured a beverage resembling in antiscorbutic qualities the well-known spruce-beer.

DADYLE. [CHEMISTRY, *S.* 2.]

DAGUERRE, LOUIS JACQUES MANDÉ, was born in 1789 at Cormeille in the department of Seine-et-Oise, France. At the outset of life he obtained a situation in a government office, but he early quitted that employment, and became a pupil of M. Degoti, scene-painter at the opera. As a scene-painter, Daguerre in a few years surpassed his instructor, and placed himself on a level with the first professors of that art in Paris, while he quickly extended the capabilities of the art by various ingenious contrivances, which he invented for producing increased pictorial effect. He also assisted M. Prévost in the preparation of his panoramic views of the great cities of the world. The experience he thus acquired suggested to M. Daguerre the idea of producing a kind of scenic exhibition, in which the illusion should be more perfect than in the panorama, and he invented, in conjunction with Bouton, a method of so throwing coloured lights and shadows upon the view, as to produce the appearance of changes of season, day and night, storm and sunshine, &c. This they termed a Diorama, and when exhibited, July 1822, in a circular structure erected for the purpose in Paris, the success was complete. The diorama in fact made what the Parisians term a sensation, and no long time elapsed before Messrs. Bouton and Daguerre erected a similar building in London, to which each picture was removed, when it had been exhibited for its season in Paris. For some seventeen years picture followed picture, each rivalling its predecessor, but in 1839 a fire destroyed the building, and the view then exhibiting in it. Daguerre's loss was very great, and the building was not re-erected, as the public interest in dioramas, which had now lost their novelty, was beginning to flag.

M. Daguerre had before this been directing his attention to a matter which was destined to secure for him a more permanent reputation than his scenery or his dioramas. This was the mechanical production of fac-simile delineations of objects by the chemical action of light. As early as about the middle of the 16th century, Fabricius had discovered the property which salts of silver possess of changing colour when exposed to the action of light, and this property had been the subject of many experiments by scientific men. Sir Humphry Davy, among recent chemists, had sought by various applications of this property to obtain copies of simple objects, but though he succeeded in doing this, he was unable to prevent them from being effaced when exposed to the light. In France M. Niepce began about 1814 to pursue a similar course of experiments, and he succeeded in rendering the images he obtained insensible to the subsequent action of the light; but his discovery remained very incomplete when Daguerre commenced similar experiments. About 1829 Niepce and Daguerre joined in the prosecution of their investigations. Niepce died in 1833, before they had made any decided approach to success. But Daguerre persevered, and at length his zeal and rare ingenuity met with an ample reward. He discovered in fact a method by which he was able so to prepare metallic plates, that by placing them in the darkened chamber of a camera-obscura, they received a distinct impression of the images thrown upon them by the lens of the camera, which he was enabled by a subsequent process to render indelible. Some account of the steps by which he arrived at this grand discovery, the method adopted for producing, rendering visible, and fixing this sun-picture, is given elsewhere. [PHOTOGENIC DRAWINGS; PHOTOGRAPHY, *S.* 1.] It will be enough to say that with remarkable patience and ingenuity he surmounted every difficulty, and eventually produced his discovery, as to its principles, perfect. Other experimentalists had in this country and elsewhere been at work, unknown to Daguerre, at the same idea, but to M. Daguerre is due the priority of publication of the discovery, and no doubt also the priority of discovery, as far as the producing sun-pictures upon metallic plates is concerned. What has proved to be the more generally applicable process of photography, was as unquestionably the result of the independent investigations of our own countryman, Mr. Talbot; but, as was to be expected, both the processes as now practised are very different from what they were when originally promulgated by their inventors or discoverers.

Great was the excitement among both learned and unlearned when in January 1839 M. Arago gave, at a sitting of the Académie des Sciences, an account of the new method by which, as was said, the sun himself became the artist, and some of the delineations, with all their wonderful delicacy of detail, were exhibited. At the same time Daguerre made a public exhibition of numerous pictures produced by what he termed the 'Méthode Niepce perfectionnée.' An examination of the merits of the new method was, at the suggestion of M. Arago, promptly ordered by the French government to be made, and in consequence of the favourable nature of the report, M. Daguerre was in June 1839 nominated an Officer of the Legion of Honour; and the project of a law was on the same day presented to the Chambers—by whom it was readily adopted—which accorded to M. Daguerre, on condition of the full publication of his method, an annuity for life of 6000 francs, and one of 4000 francs to the representative of M. Niepce. The rapid extension and improvement of the process of Daguerre (or the Daguerreotype, as it soon came to be generally called) after its being thus freely made public property, was due perhaps more to others than to M. Daguerre, who however never ceased to labour at its improvement during the remainder of his life. He died July 12, 1851, at Petit-Brie-sur-Marne, where a handsome monument has been erected by subscription to his memory.

M. Daguerre is the author of two short works—'Histoire et Description des Procédes du Daguerréotype, et du Diorama,' 8vo, Paris, 1839; and 'Nouveau Moyen de préparer la Couche Sensible des Plaques destinées à recevoir les Images Photographiques,' 8vo, Paris, 1844.

(Arago, *Rapport à l'Académie des Sciences;* A. de Lacaze, art. *Daguerre* in *Nouv. Biog. Gén.*)

DALBERGIA, a genus of Plants belonging to the natural order *Fabaceæ*, named in honour of Nicholas Dalberg, a Swedish botanist. It has a campanulate calyx, 5-toothed; a papilionaceous corolla, the petals of the keel connected to the apex; 8-10 stamens, sometimes all monadelphous, with the tube or sheath cleft in front, sometimes divided into two equal opposite bundles. It has a stipitate membranous compressed legume, which is flat, oblong, and tapers to both ends. The seeds, which vary from 1 to 3, are compressed and remote. The species are sometimes trees, but usually climbing shrubs, with impari-pinnate leaves.

D. Sissoo, has five alternate leaflets, glabrous above, pubescent beneath. It is a native of Bengal, where the timber is much prized, and is known by the name of Sissoo.

D. monetaria, another of the species, yields a resin very similar to Dragon's Blood.

There are about 22 species of this genus, none of which are of any known use except those mentioned.

DALKEITH, Edinburghshire, Scotland, a market-town and burgh of barony in the parish of Dalkeith, six miles S.E. from Edinburgh by road, and eight miles by the Edinburgh and Hawick railway. The population of the town was 5086 in 1851. The affairs of the burgh are administered by 15 trustees. The town stands on an elevated piece of ground, between the rivers North Esk and South Esk, and consists of one principal thoroughfare, and several small streets. The town is clean and generally well built; it is lighted with gas, and well supplied with water. Felt and beaver hats, straw hats, and woollen stuffs are manufactured, and there are corn-mills, a brewery, and a tan-work. The corn-market held here is one of the most important in Scotland. The parish church is an old Gothic building in the principal street. Attached to it is an ancient chapel containing the recumbent statues of an Earl of Morton and his lady. Adjoining this choir is the mortuary chapel of the Buccleuch family. A splendid new church, in the early English style of architecture, was built in 1840 by the Duke of Buccleuch. It is cruciform, and has a steeple 167 feet high. An elegant episcopal chapel is situated within the grounds of Dalkeith palace. The Free Church, United

Presbyterians, and Independents, have places of worship. In the town are two libraries and a savings bank. Dalkeith palace, the seat of the Duke of Buccleuch, is an extensive structure, surrounded by a splendid park and grounds. The mansion contains many fine paintings. The North Esk and South Esk unite their waters in the park, a little way beyond the palace, which is situated on an elevated peninsula formed by the two streams. The regality of Dalkeith belonged to the Grahams in the reign of David II. It afterwards passed into the hands of the Earls of Morton, and about two centuries ago was purchased by an ancestor of the Buccleuch family. Charles Edward spent two nights at Dalkeith after the battle of Preston Pans, and the palace has been visited by George IV. and Queen Victoria.

DALRYMPLE, JOHN, was born in the year 1804 at Norwich, where his father was a surgeon in general practice. He studied his profession under his father, in Edinburgh and in London. He commenced practice as a surgeon in London in 1827. During the latter part of his career he devoted himself entirely to ocular surgery. He died in 1852. As a surgeon-oculist he was better known for his work on the 'Anatomy of the Human Eye,' which was published in 1834. He was not however known only as a surgeon, but also as a naturalist and accurate microscopic observer. Amongst his papers on these subjects the following are the most important: 'On a Peculiar Structure in the Eye of Fishes,' published in the 'Magazine of Natural History,' sect. 2, vol. ii.; 'On the Vascular Arrangement of the Capillary Vessels of the Allantoid and Vitelline Membranes in the Incubated Egg' ('Transactions of the Microscopical Society,' vol. i.); 'On the Family of *Closterinæ*' ('Annals of Natural History,' vol. v.) In 1849 he read a paper before the Royal Society on a hitherto undescribed infusory animalcule allied to the genus *Notorumata* of Ehrenberg. This paper was interesting as confirming the discovery of the sexuality of the rotiferous animalcules, which had been made by Brightwell. This paper was published in the 'Philosophical Transactions,' and in 1850 Mr. Dalrymple was elected a Fellow of the Royal Society.

Mr. Dalrymple was one of the surgeons of the Royal London Ophthalmic Hospital. He was a Fellow of the Royal College of Surgeons of England, and in 1851 was elected a member of the council of that body.

DAMAGES. The stat. 1 Geo. IV. c. 87, enabling a landlord to recover damages in the action of ejectment by which he recovers possession, although not repealed, is superseded by provisions to the same effect in the 'Common Law Procedure Act,' 1852.

DAMAN. [Damaun.]

DANÆACEÆ, a small natural order of Plants related to the Ferns. They have all the habit of Dorsiferous Ferns, but their spore-cases are ringless and combined in masses, splitting irregularly by a central cleft. The species are all tropical. It embraces the following genera:—*Kaulfussia*, *Angiopteris*, *Danæa*, *Eupodium*, *Marattia*, and about fifteen species. *Angiopteris erecta* is said to be employed in the Sandwich Islands to perfume cocoa-nut oil. The rhizome of a species of *Marattia* is eaten by the Sandwich Islanders.

DANAITE. [Mineralogy, *S.* 1.]

DANBURITE. [Mineralogy, *S.* 1.]

DANEWORT. [Sambucus.]

DARNEL. [Lolium.]

DATE-PALM. [Phœnix.]

DAVILLA, a genus of Plants belonging to the natural order *Dilleniaceæ*. It has 5 very unequal sepals, which increase after flowering; from 1 to 6 petals, with linear filaments dilated upwards. The single carpel is testaceous, from 1 to 2-seeded, inclosed in the two inner concave valve-like sepals. The seeds are solitary, enveloped in an arillus, which is only open at the apex.

D. elliptica has a shrubby erect much branched stem, with hairy branchlets. The leaves are elliptical, obtuse at each end, entire, between crustaceous and leathery, rough and hairless above, downy and netted beneath; the petiole villous on the under side. The racemes are hairy and bracteolate; the sepals silky. The petals from 1 to 6, somewhat obcordate. This plant is an astringent, and furnishes the vulnerary called Sambaibinha in Brazil.

D. rugosa is also a native of the forests of Brazil, and has a twining stem with hairy twigs. The leaves are oblong, remotely and obsoletely serrated, rough and hairless above, shaggy beneath on the principal veins. The petioles are very shaggy beneath. The peduncles and pedicles hairy. It has two or three petals. Like the former species it is an astringent, and is used in South America in swellings of th legs and different parts of the body.

DAVYNE. [Mineralogy, *S.* 1.]

DE LA BECHE, SIR HENRY THOMAS, an eminen geologist. He was the only son of Colonel Thomas de l Beche, of Halse Hall, Jamaica, and represented the old famil of De La Beche, who lived at Aldworth, near Reading, in the 13t and 14th centuries. Sir Henry was born near London in 179 He went to Jamaica when young, where his father died, an whilst returning to Europe his mother and her young so suffered shipwreck. On reaching England they lived a Charmouth and Lyme Regis, where the young De la Bech seems to have acquired his first taste for geology. He wa educated at the military school at Great Marlow, which wa afterwards removed to Sandhurst. He entered the army i 1814. In 1817 he became a Fellow of the Geologica Society; he afterwards became Secretary and Foreig Secretary of this society, and eventually, in 1847, President In 1818 he married. Before this event he had begun t investigate the geology of Devon, Dorset, and Pembrokeshire He now travelled on the Continent, and dwelt for some tim in Switzerland. Here in 1820 he produced one of his earlies scientific papers, 'On the Temperature and Depth of the Lak of Geneva.' This was first published in the 'Bibliothèqu Universelle,' and afterwards in the 'Edinburgh Philosophica Journal.' The researches which led to the publication o this paper exercised an important influence on all his subsequent career. He subsequently returned to England, and renewed his labours on the geology of Wales and Devonshire. In conjunction with the late Rev. Mr. Conybeare, Dean o Llandaff, he first made known the singular form of the *Plesiosaurus*. This was done in a paper published in 1823 in the 'Transactions of the Geological Society,' and entitled 'On the Discovery of a new Fossil Animal, forming a link between the Icthyosaurus and Crocodile.'

In 1824 Mr. de la Beche visited his paternal estates in Jamaica. Here he made himself remarkable for attempting to introduce ameliorations in the condition of the slave. He suffered considerably from the Act of Emancipation. Whilst in Jamaica he lost no opportunity of pursuing his favourite science, and a paper published in 1826 in the 'Transactions of the Geological Society,' on the 'Geology of Jamaica,' was the result. Having returned to England, his papers on the geology of Dorset, Devon, and Wales, became very numerous, besides others on the general principles of geological inquiry. Such were his papers on the 'Classification of European Rocks,' 'On the Excavation of Valleys,' 'On the Geographical Distribution of Organic Remains,' 'On the Formation of Extensive Conglomerate and Gravel Deposits.' and many others. In 1831 he published his 'Geological Manual,' which went through several editions, and was translated into French and German soon after its appearance in England. In this year he also projected a plan of forming a geological map of England, in which all the details of the various formations should be accurately laid down. He began this gigantic undertaking on his own responsibility, and commenced a map of Cornwall. This resulted in the government instituting the Geological Survey, at the head of which he was placed. Whilst working out his plans he became possessed of a large collection of specimens of rocks and mineral substances used in the arts. This collection served as the nucleus of the Museum of Practical Geology, London, which was at first deposited in a house in Craig's Court. In 1834 he published 'Researches in Theoretical Geology,' and in 1835, 'How to Observe: Geology.' In 1845 the Geological Survey and Museum of Practical Geology were united, and the building in Jermyn Street, Westminster, erected for the reception of the rapidly increasing collection of the latter. Sir Henry succeeded in attracting to this institution a number of ardent young men of science, amongst whom we may mention the late Professor E. Forbes, and through their labours this institution rapidly became one of the most important scientific establishments in the country. In 1851 courses of lectures were given by the various members of the corps, and under the name of the Government School of Mines, they are carried on with increasing vigour and usefulness under the presidency of Sir Henry's successor, Sir Roderick Murchison.

For several years previous to his death, Sir Henry had suffered from a gradually increasing paralytic disorder, which, although it prevented him using his limbs, left his fine intellect almost unimpaired. Day after day it was evident that his frame became feebler, but his attention to the interests of the school he had founded did not diminish, and till within two days of his death he performed the active duties of his responsible position. He died on the 11th of April 1855.

The distinguishing feature of Sir Henry's mind was its eminently practical character. The establishment of the Geological Survey and the School of Mines was a proof of this. Wherever his knowledge could be made available for practical purposes, his services were at the command of the public. Thus we find him becoming a member of the Health of Towns Commission and also of the Commission of Sewers. He was chairman of one of the juries of the Great Exhibition in 1851. With Sir Charles Barry he formed one of a committee to select building-stone for the New Houses of Parliament. He was associated with Dr. Lyon Playfair in reporting to the government on the coals suited to the steam-navy, also with Dr. Playfair and Mr. Smyth in reporting on the gases and explosions in collieries. He was elected a Fellow of the Royal Society in 1819, in 1848 he had conferred on him the honour of knighthood, and in 1853 he was elected a corresponding member of the Academy of Sciences of Paris.

DEBENHAM. [SUFFOLK.]

DEBT, ACTION OF. The peculiarities connected with this action, which led to the use in ordinary cases of the action of *assumpsit*, have for all practical purposes ceased to exist. Wager of law having been abolished, and the pleadings in personal actions greatly simplified, nothing remains indeed to distinguish the action of *debt*, technically so called, from any other action for breach of contract. (Blackst. 'Comm.,' Mr. Kerr's ed., vol. viii. p. 162.)

DEDDINGTON. [OXFORDSHIRE.]

DEDHAM. [ESSEX.]

DEFAMATION. The jurisdiction of the Ecclesiastical Courts, or, as Blackstone says, of "a petty surrogate in the country" to punish "for railing or contumelious words" *pro salute animæ*, by means of the "brutum fulmen of ecclesiastical censures," having long been a subject of considerable ridicule, though frequently of grievous oppression to the poor, has at last been abolished by the statute 18 & 19 Vict. c. 41.

DELAROCHE, PAUL, an eminent French painter, was born at Paris in 1797. Early intending to follow art as a profession, he at first studied landscape, and was in 1817 an unsuccessful candidate for the Academy prize in landscape-painting. Convinced that landscape-painting was not his vocation, he entered the atelier of Baron Gros, under whose guidance he made rapid progress in the study of the figure. Gros had himself in a great measure thrown off the classic trammels which his master David had fixed on French art, and Delaroche entirely emancipated himself from their thraldom. But he did not, like Delacroix, go to the opposite extreme. He still adhered to the old laws, and many of the conventionalities of art. Choosing his subjects to a great extent from modern history, and painting without much regard to academic attitudes and arrangements, he yet sought to maintain something of the old sobriety and dignity of the historic style, and hence when his superiority in his chosen line came to be generally recognised, and Delaroche was the acknowledged chief of a school, that school received the name of the 'Eclectics,' in contradistinction to the Romantic School of Delacroix and the Classic School of David and his followers.

Paul Delaroche in 1819 and the following years exhibited some paintings of scriptural subjects, but it was not till 1824 that the earliest of that class of works by which he achieved his fame appeared; these were, 'St. Vincent de Paul preaching in the presence of Louis XIII.;' and 'Jeanne d'Arc interrogated in prison by Cardinal Beaufort,' which produced a considerable impression. In 1826 M. Delaroche exhibited the first of his very remarkable paintings from English history—'The Death of Queen Elizabeth.' This picture was purchased for the gallery of the Luxembourg, and is thought by French critics to display a wonderful knowledge of English history and English character. It is really the worst of his English pictures, and renders with abundant exaggeration the coarse notion of Elizabeth which alone continental artists and poets seem capable of conceiving: some of the draperies are, however, very well painted, as indeed his draperies mostly are. When M. Delaroche a few years later (1831) again trod on English ground he was a good deal more successful; his 'Children of Edward IV. in the Tower,' being of its class a very excellent picture; it is well known in this country by engravings. But of a far higher order was his next great English picture, 'Cromwell contemplating the Corpse of Charles I.' He has here imagined a circumstance in itself sufficiently probable, and he has treated it with a calm dignity worthy of the theme. M. Delaroche has been often charged with sacrificing his principal subject to the accessories by his excessive care in the rendering of them, but here the attention is at once arrested by the thoughtful head of the Protector, directed to the lifeless form he is brooding over, and it never wanders from the victim and the victor. The sombre colour and gloomy shades are entirely in unison with the prevalent impression. Simple as is the idea of the picture, it would perhaps be difficult to name another modern painting which so thoroughly succeeds in carrying the mind of the spectator into the very presence of the man represented. This fine picture was purchased by the late Earl of Ellesmere, but M. Delaroche painted, we believe, more than one repetition of it; it has been very popular also as an engraving.

His other more important pictures from English history are the 'Execution of Lady Jane Grey' (1834); 'Charles I. in the Guard-Room, insulted by the Parliamentary Soldiers' (1837), also purchased for the collection of the late Earl of Ellesmere, and well engraved by A. Martinel; 'Lord Strafford on his way to the Scaffold receiving the Blessing of Archbishop Laud' (1837), a companion picture to that of 'Cromwell contemplating the Corpse of Charles,' and equally well known by the engravings, but certainly far less impressive as a work of mind, and inferior in its technical qualities; the original is in the collection of the Duke of Sutherland. M. Delaroche also painted some illustrations of Scott's novels.

Among the subjects from French history may be named 'Une Scène de la St. Barthélemy' (1826); 'Le Cardinal de Richelieu sur le Rhône, conduisant au supplice Cinq Mars et de Thou,' and a companion, 'Le Cardinal Mazarin mourant' (1831), both of which, as pictures, and in the engravings by F. Giraud, were very popular; 'La Mort du Duc de Guise' (1835), one of his best pictures; 'La Reine Marie-Antoinette après sa Condamnation à Mort;' and finally his universally popular pictures of 'Napoleon at Fontainbleau,' and 'Napoleon crossing the Alps,' of which he was required to paint several repetitions and smaller copies. His other pictures and portraits are very numerous.

Perhaps the most remarkable of Delaroche's productions however is his painting of the hemicycle of the Palais des Beaux Arts, in which he has represented the great painters, sculptors, and architects, from the earliest time down to the present. From the centre, where Apelles, Phidias, and Ictinus are enthroned as the representatives of the arts in ancient Greece, and marshalled under figures which symbolise the principal eras in the history of art, the great sculptors and architects are ranged in groups, the painters occupying the extremities. The artists in some instances chosen, and those in more instances omitted, from this artistic Wallhalla, will probably raise a smile on the lips of the student of the history of art; but the work itself cannot fail to excite admiration, it is so elevated in style, treated with so much sobriety and refinement, and is so simple and effective in arrangement and execution. This great work employed the painter during the years 1837-41. A very beautiful version of it (in which M. Delaroche had introduced some alterations) on canvas, of considerable size, but of course small in comparison with the original, formed the chief attraction at the exhibition of French paintings in London in 1854.

M. Delaroche is justly regarded by the French as one of their greatest painters. His pictures never reach the highest order of art. They are rather melodramatic than epic or tragic. They are suggestive always of a certain kind of stage effect. You see that the painter is aiming at the actor's trick—that he is seeking to 'make a point.' But allowing for this, it must be granted that M. Delaroche was almost all his countrymen pronounce him to have been. He had undoubted genius, if it was not of the highest order; he was a master of his art; and he was always truthful, conscientious, correct in drawing, on the whole satisfactory as a colourist, and tells his story with admirable perspicuity.

M. Delaroche was named member of the Institute in 1832, and subsequently professor at the Ecole des Beaux Arts, in which capacity he educated a large number of pupils, several of whom have obtained eminence. He was created an officer of the Legion of Honour in 1834. He died Nov. 4, 1856, at Paris.

DELEGATES, COURT OF. All appeals to the Crown in council are now heard and determined by the Judicial

Committee of the Privy Council, which consists of the Lord President of the Council, the Lord Chancellor, the Chief Justices, and Chief Baron, the Master of the Rolls, and Lords Justices of the Court of Appeal in Chancery, the Judge of the High Court of Admiralty and of the Court of Probate, and certain other persons nominated by the Crown. In ecclesiastical causes, Bishops who are Privy Councillors are members of the committee. The proceedings of this tribunal, which is a Court of Record, have been regulated by various statutes (3 & 4 Will. IV. c. 41; 6 & 7 Vict. c. 38). The Judicial Committee has authority in various other matters, as to which see Patents, *S.* 2; Judicial Committee, *S.* 2. (Blackst. 'Comm.,' Mr. Kerr's ed., vol. vi. p. 225.)

DENIZEN. Letters of Denization are now disused, aliens generally having recourse to the simpler and more advantageous certificate of naturalisation granted by the Secretary of State. [Alien, *S.* 1.]

DENTEX, a genus of Fishes belonging to the Family *Sparidæ*. It has the following characters:—Body deep, compressed; dorsal fin, single; head large; teeth conical, placed in a single row, four in the front above and below, elongated, and curved inwards, forming hooks; teeth on the branchial arches, but none on the vomer or palatine bones; nose and suborbital space without scales; branchiostegous rays 6. There are several species of this genus.

D. vulgaris, the Four-Toothed Sparus, is regarded as a native of England. Only one specimen, however, seems to have been taken in this country, and that by Mr. Donovan in 1805 off Hastings. It is a very common fish in the Mediterranean, and is the *Dentex* of the Romans. It is remarkable for the great length of the four anterior teeth in each jaw. It acquires sometimes a large size weighing from 20 to 30 pounds, and measuring 3 feet in length. Mr. Donovan's specimen weighed 16 pounds. "A more voracious fish," says Mr. Donovan, "is scarcely known; and when we consider its ferocious inclination and the strength of its formidable canine teeth, we must be fully sensible of the great ability it possesses in attacking other fishes even of superior size, with advantage. It is asserted, that when taken in the fisherman's nets, it will seize upon the other fishes taken with it, and mangle them dreadfully. Being a swift swimmer it finds abundant prey, and soon attains to a considerable size. Willughby observes that small fishes of this species are rarely taken, and the same circumstance has been mentioned by later writers. During the winter it prefers deep waters, but in the spring or about May it quits this retreat, and approaches the entrance of great rivers, where it deposits its spawn between the crevices of stones and rocks.

"The fisheries for this kind of *Sparus* are carried on upon an extensive scale in the warmer parts of Europe. In the æstuaries of Dalmatia and the Levant, the capture of this fish is an object of material consideration, both to the inhabitants generally as a wholesome and palatable food when fresh, and to the mercantile interests of those countries as an article of commerce. They prepare the fish according to ancient custom, by cutting it in pieces and packing it in barrels with vinegar and spices, in which state it will keep perfectly well for twelve months."

DENTINE. [Tissues, Organic, *S.* 1.]

DEODAND. Juries and judges having (as stated in the 'Penny Cyclopædia,' vol. viii. p. 411) alike condemned this species of forfeiture, the law has been altered by the statute 9 & 10 Vict. c. 62, and deodands are now entirely abolished.

DEPOSITIONS (*in Criminal Cases*). The statute 11 & 12 Vict. c. 42, has prescribed with great care and exactitude the mode in which the depositions of witnesses are to be taken in criminal cases. The statute requires a deposition to be put in writing, to be read over to the witness, and to be signed by him. Unless these formalities are complied with, and the deposition has been taken in presence of the accused, and he has had full opportunity of cross-examination, it is not admissible in evidence against him.

DEPOSITIONS (*in Equity*). Evidence is now taken in Chancery by deposition before an officer called an Examiner, not by written interrogatories, but *orally*, in the presence of the parties, the witness being subject to cross-examination and re-examination. This new system, in imitation of that public examination of witnesses pursued in courts of common law, which is justly considered a great test of truth, was introduced as part of the practice of the Court of Chancery by the stat. 15 & 16 Vict. c. 86. (Blackstone's 'Commentaries,' Mr. Kerr's ed., vol. iii. p. 520.)

DEPPING, GEORGE BERNARD, was born at Münster, May 11, 1784. Having completed his educational course, he visited Paris in 1803, when, forming acquaintances there, and observing the facilities which the city afforded for the prosecution of literary studies, he determined to make it his permanent residence. The rest of his life was spent there in the uneventful career of a busy littérateur.

For many years M. Depping mainly occupied himself in preparing juvenile and popular works chiefly on geographical subjects, in translating, and in writing for magazines and encyclopædias. His first important original work was one written for a prize offered by the Institute on the 'Expédition Maritime des Normands en France au Dixième Siècle.' It won the prize, was printed in 1826, and revised in 1844: it is a work of sterling value, and contains the fruits of extensive researches in Scandinavian literature. A more important work, for which this had prepared the way, was his 'Histoire de la Normandie,' from the Conqueror to the re-union of Normandy with France (1066 to 1204), 2 vols. 8vo, 1835. Among his other more important works may be named—'Histoire du Commerce entre le Levant et l'Europe, depuis les Croisades jusqu'à la Fondation des Colonies d'Amerique,' 2 vols. 8vo, Paris, 1830; 'Les Juifs dans le Moyen Age, Essai Historique sur leur État Civil, Commercial, et Littéraire,' 8vo, 1840; 'Règlements sur les Arts et Métiers, rédigés au Triezième Siécle, et connus sous le nom de Livre des Métiers d'Etienne Boileau,' &c., 4to, 1837; 'Geschichte des Kriegs der Münsterer und Kölner . . . 1672-1674,' 8vo, Münster, 1840: 'Correspondance Administrative sous le Règne de Louis XIV.' (forming vols. i. to iii. of the 'Collection des Documents Inédits de l'Histoire de France'), 4to, 1850-53; 'Romancero Castellano,' 1 vol. 12mo, Paris, 1817, and, greatly enlarged, 2 vols. 12mo, Leipzig, 1844. Some of the above works have been translated into German and Dutch, while several of his juvenile works have been translated into most of the European languages. M. Depping wrote many of the more important articles in the 'Biographie Universelle,' 'L'Art de Vérifier les Dates,' &c. He died in Paris, September 5, 1853.

DERMATINE. [Mineralogy, *S.* 1.]

DESIGN, SCHOOLS OF. [Science and Art, Department of, *S.* 2.]

DESMIDIEÆ, a group of organised beings regarded by some naturalists as Animals and by others as Plants. The botanists who have adopted them into the vegetable kingdom have regarded them as *Algæ*, and allied to the *Diatomaceæ*. Some however who admit the vegetable characters of *Desmidieæ* deny them to *Diatomaceæ*. Dr. Lindley admits the *Desmidieæ* as a sub-order of the *Diatomaceæ*, which he characterises as crystalline angular fragmentary bodies, brittle, and multiplying by spontaneous separation. Amongst this group of beings the *Desmidieæ* are characterised as being 'cylindrical.' The following is the definition of this family as given by Mr. Ralfs in his 'British Desmidieæ,' a work which has greatly increased our knowledge of these obscure beings: "Freshwater figured, mucous, and microscopic *Algæ*, of a green colour. Transverse division mostly complete, but in some genera incomplete. Cells or joints of two symmetrical valves, the junction always marked by the division of the endochrome, often also by a constriction. Sporangia formed by the coupling of the cells and union of their contents." It will be seen from this definition that Mr. Ralfs regards these beings as plants. The principal points on which he relies for establishing this position are the occurrence of conjugation and swarming, and the presence of starch amongst the *Desmidieæ*.

The occurrence of a union or conjugation of the two filaments for the production of spores, has long been known amongst certain forms of *Confervæ*. This has been seen by many observers to occur amongst the *Desmidieæ*. In the *Euastrum rupestre* (*fig.* 3 represents the genus) Nägeli describes this process. Two individuals are placed close together, and push out short processes, which meet, and by the absorption of the wall constitute a canal, into which the entire contents of the two cells thus connected enter, and combine together to form one mass which constitutes a single cell. This process is not always identical in different species. In *Closterium* (*fig.* 6) the middle of the cell-membrane dehisces with a transverse fissure, and the entire contents from two contiguous opened cells coalesce into a single round or angular mass. Siebold says, with regard to the spores or green bodies which result from the union of the cells, that they are not in all cases developed into a single *Closterium* like spores; but that, as in the case of other *Algæ*, such as *Vaucheria* and *Œdogonium*, there are two sorts of spore-formations, and that under certain circumstances these green bodies represent a germ, capsule, or sporangium, in which, by a process of division, several young *Closteria* come to be perfected. The union of the cells of *Didymoprium Borreri* is seen in *fig.* 1.

The process above described appears to be one entirely confined to the vegetable kingdom, as it has never been observed amongst unicellular organisms, which are regarded as decidedly animal.

The process of swarming is one which, although a few years ago its distinguishing feature would have been regarded as entitling the organism exhibiting it to a place in the animal kingdom, is by Mr. Ralfs and other English naturalists regarded as purely vegetable. It has been observed in many species of *Confervaceæ*, more especially in *Achlya prolifera* and *Conferva ærea*. The following is M. Agardh's account of this curious phenomenon in the latter plant. After describing the green matter in the joints, he says:—"The granules of which it is composed detach themselves from the mass one after another, and having thus become free they move about in the vacant space of the joint with an extreme rapidity. At the same time the exterior membrane of the joint is observed to swell in one point till it there forms a little mamilla, which is to become the point from which the moving granules finally issue. By the extension of the membrane for the formation of the mamilla, the tender fibres of which it is composed separating, cause an opening at the end of the mamilla, and it is by this passage that the granules escape. At first they issue in a body, but soon those which remain, swimming in a much larger space, have much more difficulty in escaping; and it is only after innumerable knockings (titubations) against the walls of their prison that they succeed in finding an exit. From the first instant of the motion, one observes that the granules or sporules are furnished with a little beak, a kind of anterior process always distinguishable from the body of the sporule by its paler colour. It is on the vibrations of this beak that the motion, as I conceive, depends; at least I have never been able to discover any cilia. However I will not venture to deny the existence of these; for with a very high power of a compound microscope one sees the granules surrounded with a hyaline border, as we find among the ciliated *Infusoria* on applying a glass of insufficient power. The sporules during their motion always present this beak in front of their body, as if it served to show them the way; but when they cease to move, by bending it back along the side of their body, they resume the spherical form; so that before and after the motion one sees no trace of this beak. The motion of the sporules before their exit from this point consists principally in quick dartings along the walls of the articulation, knocking themselves against them by innumerable shocks; and in some cases we are almost forced to believe that it is by this motion of the sporules that the mamilla is formed. Escaped from their prison, they continue their motion for one or two hours; and retiring always towards the darker edge of the vessel, sometimes they prolong their wandering courses, sometimes they remain in the same place, causing their beak to vibrate in rapid circles. Finally they collect in dense masses, containing innumerable grains, and attach themselves to some extraneous body at the bottom or on the surface of the water, where they hasten to develop filaments like those of the mother plant." This process, to which the name swarming has been given, has been observed by Mr. Ralfs, Dr. Hassall, and others in various species of *Desmidieæ*, more especially in *Sphæroplea crispa* and *Draparnauldia tenuis*. No similar movements to these have been anywhere observed amongst the ova of the animal kingdom.

The presence of starch in the *Desmidieæ* is a third point relied on by Mr. Ralfs as distinguishing the vegetable kingdom. The existence of this substance is easily ascertained by the well-known reaction of iodine upon it. Meyen first discovered this substance in the *Algæ*, and Mr. Ralfs and others have confirmed the correctness of his observations. At the same time it should be stated that starch, although not found present in the tissues of the lower animals, has recently been detected in the brain of man by Mr. Busk ('Microscopical Journal,' vol. ii. p. 105). This may lead to the discovery of the existence of this substance more generally in the animal kingdom than has been hitherto supposed.

The following reasons are given by Mr. Dalrymple, after giving an account of the structure of *Closteria*, for placing the species of this genus amongst animals:—

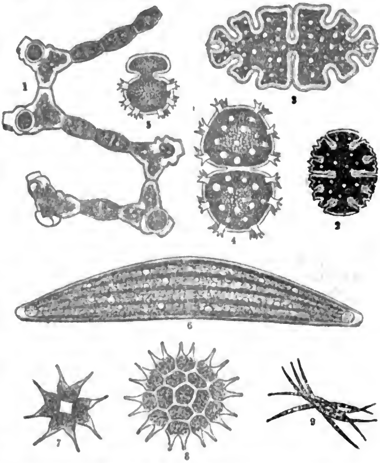
1st. That while *Closterium* has a circulation of molecules greatly resembling that of plants, it has also a definite organ unknown in the vegetable world, in which the active molecules appear to enjoy an independent motion, and the parietes of which appear capable of contracting upon its contents.

2nd. That the green gelatinous body is contained in a membranous envelope, which, while it is elastic, contracts also upon the action of certain reagents, whose effects cannot be considered purely chemical.

3rd. The comparison of the supposed ova with cytoblasts and cells of plants precludes the possibility of our considering them as the latter, while the appearance of a vitelline nucleus, transparent but molecular fluid, a chorion, or shell, determines them as animal ova. It was shown to be impossible that these eggs had been deposited in the empty shell by other *Infusoria*, or that they were the produce of some Entozoon.

4th. That while it was impossible to determine whether the vague motions of *Closterium* were voluntary or not, yet the idea the author had formed of a suctorial apparatus forbade his classing them with plants.

On these reasons, Mr. Ralfs remarks, that the peculiar organ—the terminal globules—of the *Closteria* are as much vegetable as animal. That the throwing off the contents of the cell through chemical reagents, is as much vegetable as animal. "If fresh water touches *Griffithsia setacea*, the joints burst and spirt out their contents." That the supposed ova contain starch, and are therefore vegetable. That he cannot discover that the orifices at the extremities of some of the *Desmidieæ* are tubes, or that they possess a suctorial power.



1. *Didymoprium Borreri*, with the cells uniting to form the green matter. 2. *Micrasterias crenata*. 3. *Euastrum oblongum*. 4. *Xanthidium armatum*. 5. The same with a frond acquiring a new segment by division. 6. *Closterium Lunula*. 7. *Pediastrum simplex*. 8. *Pediastrum Boryanum*. 9. *Ankistrodesmus falcatus*.

The *Desmidieæ* are all of an herbaceous green colour, and from this circumstance are easily discovered amongst the other microscopic beings with which they occur. They are mostly inhabitants of fresh water. Mr. Thwaites records two or three species from brackish water. They are remarkable for the very definite outline which their forms assume, especially in the genera *Micrasterias* (*fig.* 2), *Euastrum* (*fig.* 3), *Xanthidium* (*fig.* 4), and *Pediastrum* (*figs.* 7, 8). Their most obvious characteristic however is their evident division into two valves or segments. The point of union between the two segments is in general very definitely marked. In *Pediastrum* and *Scenedesmus* it is less obvious than other genera. It is at this point of union that the cell opens and discharges its contents. "An uninterrupted gradation," says Mr. Ralfs, "may be traced from species in which these characters are inconspicuous to those in which they are fully developed: thus in *Closterium* and some species of *Penium* there is no constriction; in *Tetmemorus*, in some *Cosmaria*, and in *Hyalotheca*, it is quite evident, although still but slight; in *Didymoprium* and *Desmidium* it is denoted by a notch at each angle; but in *Sphærozosma*, *Micrasterias* (*fig.* 2), and some other genera, the constriction is very deep, and the connecting portion forms a new cord between the segments, which appear like distinct cells, and are so considered by Ehrenberg and others." He further adds, "That the frond in *Euastrum* (*fig.* 3) and allied genera is really a constricted cell, and not a binate one, will, I am persuaded, be apparent to any one who traces the gradations mentioned above."

The manner in which the cells of the *Desmidieæ* are multiplied, is by means of repeated transverse divisions. This process may be seen in *Euastrum*, the new segments appearing at the constricted part of the original segments. At first the new segments appear as two roundish hyaline bodies formed of the substance of the connecting tube. These lobules increase in size, acquire colour, and gradually put on the appearance of the old portions. As they increase in size the original segments are pushed away from each other, and at length an entire separation takes place, each old segment taking with it a new segment to supply the place of the old one. This process is seen going on in *fig.* 5. This process is repeated again and again, so that the older segments are united successively, as it were, with many generations. This multiplication however has its limits, for the time comes when the segments gradually enlarge whilst they divide, and at length the plant ceases to grow. When this occurs no more segments are produced, the internal matter changes its appearance, increases in density, and contains starch-granules. The spore is now formed, which is to give birth to a new individual, and the old one perishes. The separate cells formed by this process of segmentation must be regarded as continuations of the same individual. They are like the grafts and buds from a tree; they continue the individual.

The reproduction of the *Desmidieæ* seems to take place in two ways: first, by the formation of granular contents in the cell, which have the power of moving, burst the cell, and produce the phenomena of swarming above referred to; and secondly, by the formation of a sporangium, or case containing spores, after the union or conjugation of the cells before described. The sporangia assume a variety of forms, and are sometimes covered with spines, and Mr. Ralfs says, "That the orbicular spinous bodies so frequent in flint are fossil sporangia of *Desmidieæ*, cannot, I think, be doubtful, when they are compared with figures of recent ones."

Movements of the cell-contents of *Desmidieæ*, similar to the cyclosis of higher plants, have been observed by Dalrymple, Bailey, and others. These movements consist of definite currents of the cell-contents, passing in two opposite directions, the one along the side of the cell, and the other along the periphery of the gelatinous mass in their interior. Labarzewski, a German observer, states that these currents are intermittent, lasting each time for about seven seconds.

The part fulfilled by the *Desmidieæ* in creation is little known. They undoubtedly purify the water in which they live in the same manner as other plants, and furnish food to a number of fresh-water animals. As they do not attach themselves to external objects they are seldom found living in running streams. They are sometimes found in the beds of large rivers, and several species are enumerated by Drs. Lankester and Redfern, in their report on the 'Microscopical Characters of the Water of the Thames.' The best places for procuring them are small shallow pools which do not dry up in the summer. Mr. Ralfs says, however, that the same species never occur in the same pools two years in succession. They prefer open moors and exposed places, and are rarely found in woods, shady places, or deep ditches. They are seldom found in turbid water of any kind. In this respect they are the opposite of their congeners the *Diatomaceæ*, which almost as a rule are found where the *Desmidieæ* are not.

The best way of procuring them for examination is to take a piece of linen, lay it on the ground in the form of a bag, and then, by the aid of a tin box or ladle, scoop up the water, and strain it through the bag. After this process has been repeated a few times, the specimens of *Desmidieæ* will be found in great abundance on the linen, which, if kept moist, will allow of the growth and development of these beautiful objects for many months.

The study of this family will undoubtedly amply repay the naturalist for years to come. Comparatively little is known of the species beyond the continent of Europe. The following is an analysis of the genera found by Mr. Ralfs in the British Islands:—

*

Plant an elongated jointed filament. Sporangia orbicular, smooth.

1. *Hyalotheca.*—Filament cylindrical. Two species.
2. *Didymoprium.*—Filament cylindrical, or sub-cylindrical. Joints with two opposite or dentate projections. (*Fig.* 1.) Two species.
3. *Desmidium.*—Filament triangular, or quadrangular; joints connected by a thickened border. Two species.
4. *Aptogonum.*—Filament triangular or plain, with foramina between the joints. One species.
5. *Sphærozosma.*—Filament plane, margins incised or sinuated; joints with junction-glands. Two species.

**

Frond simple from complete transverse division, distinctly constricted at the junction of the segments, which are seldom longer than broad; sporangia spinous or tuberculated, rarely if ever smooth.

6. *Micrasterias.*—Lobes of the segments incised or bidentate. (*Fig.* 2.) Thirteen species.
7. *Euastrum.*—Segments sinuated, generally notched at the end, and with inflated protuberances. (*Fig.* 3.) Eighteen species.
8. *Cosmarium.*—Segments in front view neither notched nor sinuated; in end view elliptic, circular, or cruciform. Thirty-three species.
9. *Xanthidium.*—Segments compressed, entire, and spinous. (*Figs.* 4 and 5.) Six species.
10. *Arthrodesmus.*—Segments compressed, and having only two spines or mucros. Two species.
11. *Staurastrum.*—End view angular, radiate, or with elongated processes which are never geminate. Forty species.
12. *Didymocladon.*—Segments angular, each angle having two processes, one inferior and parallel with the similar one of the other segment, the other superior and divergent. One species.

***

Frond simple, from complete transverse division, generally much elongated, never spinous, frequently not constricted at the centre. Sporangia smooth.

13. *Tetmemorus.*—Frond straight, constricted at the centre, and notched at the ends. Three species.
14. *Penium.*—Frond straight, scarcely constricted at the centre. Eight species.
15. *Docidium.*—Frond straight, much elongated, constricted at the centre, truncate at the ends. Seven species.
16. *Closterium.*—Frond crescent-shaped or arcuate, not constricted at the centre. (*Fig.* 6.) Twenty-two species.
17. *Spirotænia.*—Frond straight, not constricted at the centre; endochrome spirally twisted. Two species.

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Cells elongated, entire, fasciculated.

18. *Ankistrodesmus.*—Cells aggregated into faggot-like bundles. (*Fig.* 9.) One species.

*****

Frond composed of few cells, definite in number, and not forming a filament. (Sporangia unknown.)

19. *Pediastrum.*—Cells arranged in the form of a flattened star, their outer margin bidentate. (*Figs.* 7 & 8.) Eleven species.
20. *Scenedesmus.*—Cells oblong or fusiform, entire, placed side by side in a single row, but during division into two rows. Six species.

(Ralfs and Jenner, *British Desmidieæ;* Siebold, *On Unicellular Plants and Animals*, in *Mic. Journal*, 1853; Meneghini, *On the Animal Nature of Diatomaceæ*, translated by Ray Society, 1854; A. Braun, *On Rejuvenescence in the Plant*, translated by Ray Society, 1854; Lindley, *Vegetable Kingdom;* Nägeli, *Gattungen einzelliger Algen physiologisch und systematisch bearbeitet*, Zurich, 1849; Cohn, *On the Natural History of Protococcus pluvialis*, translated by Ray Society, 1854.)

DETINUE. In this action the defendant could, until recently, in all cases retain the chattels which the plaintiff sought to recover, on payment of the damages awarded by the jury as the alternative of not giving them up to the owner. If the plaintiff, therefore, was desirous of recovering the very chattel itself, he was obliged to seek relief in a court of equity, which, on the palpable ground of the remedy at law being insufficient, interfered, and compelled the defendant to make a specific delivery to the plaintiff of his property. It is no longer necessary to resort to the Court of Chancery for this purpose, the Superior Courts of Common Law having now the same powers as the Court of Equity to enforce the specific delivery of the chattels recovered in the action of detinue. ('Common Law Procedure Act,' 1854.)

DEXTRIN. [CHEMISTRY, *S.* 1; TISSUES, ORGANIC, *S.* 1.]

DIALLAGE. [AUGITE.]

DIANÆA. [PULMOGRADA.]

DIASPORE. [MINERALOGY, *S.* 1.]

DIASTASE. [CHEMISTRY, *S.* 1.]

DIATOMACEÆ, or DIATOMEÆ, a group of organised beings which naturalists have placed in the animal and vegetable kingdoms, according as they have regarded their structures as most allied to the one kingdom or the other. These organisms consist of a single cell, and are remarkable for possessing a hard shell-valve or frustule, which is composed of silex or flint, and which remains permanent after its organic tissues have perished.

The following is a definition of this group of beings by one of the most recent writers on this subject;—Plant a frustule; consisting of a unilocular or imperfectly septate cell, invested with a bivalve siliceous epidermis. Gemmiparous increase, by self-division; during which process the cell secretes a more or less siliceous connecting membrane. Reproduction, by conjugation, and the formation of sporangia. (W. Smith.)

The *Diatomaceæ* are endowed with the power of motion; and when this function was supposed to be peculiar to the animal kingdom, it is not to be wondered at that the first observers of these organisms referred them to the animal kingdom. Ehrenberg, in his great work on the 'Infusorial Animalcules,' greatly enlarged our knowledge of this family, and added to the forms that were already known. He regarded them, as well as the *Desmidieæ*, and other beings which are now generally referred to the vegetable kingdom, as animals. The following are the principal points on which he relied for assigning to them this position:—

1st. The *Diatomaceæ* exhibit a peculiar spontaneous movement, which is produced by certain locomotive organs.

2nd. A large number of them have in the middle of the lateral surface an opening about which round corpuscles are situated, which become coloured blue when placed in water containing indigo, just as many of the Polygastric *Infusoria*.

3rd. The shells of the *Diatomaceæ* resemble in structure and conformation those which are seen in the *Mollusca* and other animals.

These arguments are met on the other side by the statement, that spontaneous movement is now known not to be specially animal, as the spores of many *Algæ*, and their entire fronds are known to be actively motile. In the next place the colouring of the interior by indigo also takes place in truly vegetable structures.

The complex structure of the minute siliceous frustules of the *Diatomaceæ* is a fact that has struck many observers. It certainly is without a parallel in the vegetable kingdom. Schleiden in his 'Principles of Scientific Botany,' after giving a minute analysis of the siliceous structure of *Navicula viridis* (*fig.* 6 represents this genus), says, "Such an artificial and complicated structure amongst plants has no explanation and is entirely without significance. In all true plants we find the silica present in a very different form, as minute scales or drops, and distributed through the substance of the cell-wall." Again, in another place he says, "This curious structure is wholly without analogy in the vegetable kingdom, and cannot be derived from the laws of vegetation with which we are at present acquainted."

More recently Professor Meneghini has come forward as an advocate of the animal nature of *Diatomaceæ*. In a very lucid and remarkable essay, published at Venice in 1845, he says:

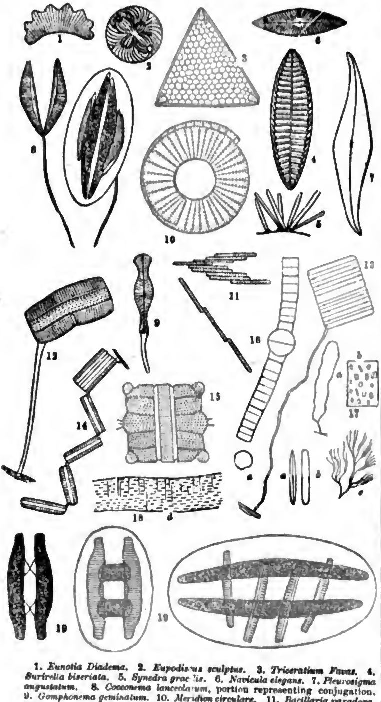
"If we suppose them to be plants, we must admit every frustule, every navicula, to be a cell. We must suppose this cell with walls penetrated by silica, developed within another cell of a different nature, at least in every case where there is a distinct peduncle or investing tube. In this siliceous wall we must recognise a complication certainly unequalled in the vegetable kingdom. It would still remain to be proved that the eminently nitrogenous internal substance corresponded with the gonimic substance, and that the oil-globules could take the place of starch. The multiplication would be a simple cellular deduplication (sdoppiamento), but it would remain to be proved that it takes place, as in other vegetable cells, either by the formation of two distinct primitive utricles or by the introflection or constriction of the wall itself. Finally, there would still remain unexplained the external motions and the internal changes, and we must prove Ehrenberg's observations on the exterior organs of motion to be false. But, again, admitting their animal nature, much would remain to be investigated, both in their organic structure and their vital functions; excepting this, so far as we know, we have only one difficulty to overcome, that of the probably ternary non-azotised composition of the external gelatinous substance of the peduncles and investing-tubes. But as the presence of nitrogen is not a positive character of animal nature, so the absence of it is not a proof of vegetable. And in order that the objection should really have some weight, it would be well to demonstrate that this substance is isomeric with starch. For then, supposing all the arguments in favour of the animal nature of *Diatomeæ* were proved by new and more circumstantial observations, this peculiarity, if it deserve the name of objection, might still be regarded as an important discovery. We should then have in the animal as well as in the vegetable kingdom a ternary substance similar to that forming the basis of the vegetable tissue."

Of the chemical composition of the *Diatomaceæ* little satisfactory has at present been made out. Professor Frankland of Manchester, according to the Rev. W. Smith, whose work on the British *Diatomaceæ* is one of the last that has hitherto been published, has found that a large amount of iron exists in the state of a silicate or protoxide in the siliceous frustules, which probably accounts for the brown or yellow colour of these organisms. On the application of tincture of iodine the internal membrane contracts on its contents, and converts these from a golden-yellow to a bright green. On the addition of sulphuric acid they exhibit a deep brown hue.

The fact which is most relied on to support the vegetable nature of the *Diatomaceæ*, by those who advocate this view, does not appear to have been known to Meneghini, and that is the conjugation of the cells of which they are composed in the same manner as in the *Desmidieæ*. [DESMIDIEÆ, *S.* 2.] This discovery was made by Mr. Thwaites, and observed in species of *Eunotia* (*fig.* 1), in *Epithemia gibba* and *E. turgida* (*fig.* 19), *Fragilaria pectinalis*, and other species. This process takes place as follows:—Two individuals closely approximated dehisce in the middle of their long diameter, whereupon four protuberances arise, which meet four similar ones in the opposite frustule. These indicate the future channels by which the endochrome of the two frustules becomes united, as well as the spot where subsequently the double sporangium is developed (*figs.* 8, 19). From the sporangium the new individuals are developed. This process is precisely analogous to what takes place in the *Desmidieæ*, so that the frustules of the Diatoms must be regarded as cells of the same individual. "If we duly consider this fact," says Mr. Thwaites, "how much does it exalt the lower tribes of plants in our estimation! since we may contemplate an individual plant of them not as the single phyton—not as the single frond—not as the single cell—but it may be as the aggregate of thousands of these;—view it occupying as much space and exercising as great an influence in the economy of nature as the largest forest-tree!"

The mode by which the cells are multiplied amongst the *Diatomaceæ* appears to be strictly in accordance with what occurs generally in the vegetable kingdom. This process is one of self-division. The first step is the fission or division of the internal cell, "probably by the doubling-in of its membranous wall, and consequently the separation of the endochrome, or cell-contents; the central vesicle or cytoblast also dividing into two parts, which remove to a little distance from each other; these movements being simultaneous with a retrocession of the epidermal valves and the formation of the siliceous connecting-membrane already described. In the centre of the enlarged frustule, in exact apposition to the original valves and closely applied to them, there are now found two new valves, covering the surface of the cell-membranes along the line of fission. The divided portions of the endochrome spread themselves along the membrane which is embraced by the new valves, and there result two half-new frustules bound together by the connecting-membrane, generated during the process we have described.

"During the healthy life of the Diatom the process of self-division is being continually repeated; the two half-new frustules at once proceed to divide again each into two frustules, and thus the process continues. I have been unable to ascertain the time occupied in a single act of self-division, but supposing it to be completed in twenty-four hours, we should have, as the progeny of a single frustule, the amazing number of one thousand millions in a single month; a circumstance which will in some degree explain the sudden or at least rapid appearance of vast numbers of these organisms in localities where they were but a short time previously either unrecognised or only sparingly diffused." (Smith, p. 25.)



1. *Eunotia Diadema.* 2. *Eupodiscus sculptus.* 3. *Triceratium Favus.* 4. *Surirella biseriata.* 5. *Synedra gracilis.* 6. *Navicula elegans.* 7. *Pleurosigma angulatum.* 8. *Cocconema lanceolatum*, portion representing conjugation. 9. *Gomphonema geminatum.* 10. *Meridion circulare.* 11. *Bacillaria paradoxa.* 12. *Achnanthes longipes.* 13. *Striatella unpunctata.* 14. *Diatoma vulgare*, the frustules united. 15. *Biddulphia pulchella.* 16. *Melosira varians*; the enlargement is peculiar to the genus; *a*, side view. 17. *Dickieia ulvoides*; *a*, frustule; *b*, frond. 18. *Schizonema Smithii*; *a*, frustule; *b*, ditto; *c*, frond, natural size; *d*, frond magnified. 19. *Epithemia turgida*, illustrating the process of conjugation. From a drawing by Mr. West.

The structure of the siliceous portion of the *Diatomaceæ* is the most remarkable part of their organisation. The following is Meneghini's account of this organ:—

"Every Diatom is formed of a siliceous shield and a soft substance therein contained. According to Kützing, this shield consists of pure silica, or, in some cases, perhaps, of silica combined with alumina. Nägeli further says that the silica is deposited in the outside of an organic membrane, which he believes to be of a vegetable nature. In fact, an organic membrane ought to exist, for the silica could not become solid except by crystallising or depositing itself o some pre-existing substance. On the other hand, we canno admit, with Nägeli, that it has been deposited externally for in many genera, and especially in the *Achnanthidia*, th siliceous shield is covered with a very delicate dilatabl membrane, itself containing silica, as is proved by its sustaining unchanged the action of fire and acids. Therefore, comparing this shield with other organic formations whether animal or vegetable, containing in like manne either silica or some other so-called mineral element, we ma reasonably consider it to be formed of an organic tissue permeated by silica. This permeation may occur either in th wall of a simple cell, as is seen in the epidermal cells o many plants, or within minute cells, as in various plants an animals. The action of heat or of acid, in these cases, destroying the organic matter and leaving the silica untouched does not alter the apparent form of the organ, because th skeleton remains unaltered.

"Externally to the shield Kützing observed a thin stratum which he denominated cement, which may be made visible either by desiccation or by calcination; and produces either a simple opacity, or lines, points, and maculæ, sometimes irregularly disposed, sometimes regularly. He supposes it to be a silicate of iron or of alumina. Independently of the chemical materials which it may contain, this outside integument seems to me the more important, inasmuch as even without resorting to the means indicated by Kützing, I observe it to be constant, not merely in the species enumerated by him, but also in many others, and I could almost assert that it exists in all. For to me it appears to correspond with that fine membrane of the *Achnanthidia* above mentioned, which, according to Kützing's own observations, is always visible whenever the two new individuals (into which every Diatom is resolved in its multiplication by deduplication) (sdoppiamento) begin to separate. The lines and points supposed to belong to the subjacent shield belong very frequently to this kind of covering.

"The shield itself is formed of at least four pieces, or valves, united together in a four-sided figure—a tetragon. The mode of union is unknown. But the existence of a kind of articulation which permits an opening and closing, like the valves of a shell-fish described by Corda in a species of *Surirella*, has been denied by other observers. Be this as it may, whether spontaneous after death or induced by external means, this separation does take place in a regular manner. Now, if we suppose an organic cell with a wall permeated by silica, and with a four-sided figure, we can easily suppose that all the sides will mechanically support each other. Moreover, we shall meet with numerous facts by a different kind of analogy, namely, that with solid animal tissues belonging either to the internal skeleton or the external tegument.

"The four valves are equal in length, but in many species and genera one pair exceeds the opposite pair in breadth. In order to establish an uniform language it is convenient to term those primary valves or surfaces which exhibit along the middle the line of division in the act of deduplication, which, since it is formed here in a normal manner, runs parallel to the other two surfaces, denominated lateral. Along the primary surfaces we frequently see longitudinal lines, which terminate at the two extremities in small apertures. From their internal surface there project into the cavity linear marks variously formed but always longitudinal; these are termed vittæ.

"The lateral surfaces have frequently a round aperture of greater or smaller size in the centre, and from this a fissure extends towards each extremity. This fissure either loses itself gradually or expands into the regular terminal apertures. When this occurs each of these surfaces is divided into two distinct valves. On these lateral surfaces we observe the striæ, lines, and transverse costæ, no less admirable for their beautiful appearance than for their constant regularity in number, direction, and proportion. When many individuals are united together to form one compound being, like a polyp for instance, it is always by the lateral surfaces that they touch each other; and since all other characters sometimes fail, we can affix to them the denomination 'lateral' from this principal one.

"Besides the vittæ before mentioned, in some genera (*Biddulphia*, *fig.* 15, *Climacosphenia*, *Terpsinoë*) there are other solid substances in their internal cavities: these are variously arranged.

"These essential peculiarities of the shield may perhaps be regarded as indicating a complex structure, very different therefore from what would be prescribed by a simple cellular wall. Ehrenberg deduces from it an argument to compare it with the shell of *Mollusca*. The *Arcellinæ* may be cited among the *Infusoria*. Kützing states, in reply, that among vegetable cells there is found a peculiar conformation of the walls, with prominences, depressions, points, lines, papillæ, and perforations, disposed in a regular manner; he refers to grains of pollen, as an instance. He might have added the more appropriate instance of the *Desmidieæ*, which would be very closely allied to the *Diatomeæ*, if the latter, like the former, could be referred to the vegetable kingdom. If not equal in constancy and regularity, the *Desmidieæ* display a greater degree of complication; and we must remember the different nature of their substance, for in the vegetable cell, when lime or silica predominates, the wall becomes uniform and regular (?) (uniforme ed irregolare)."

The siliceous epiderm presents an extraordinary variety of forms, which in every genus and species offer the best possible means of distinction and identification: striæ, or lines frequently moniliform, dots arranged in a radiate or concentric manner, and minute divisions presenting perfectly hexagonal outlines, are amongst the most frequent occurrences. Great difference of opinion exists as to the nature of these. Mr. Smith says, "I am disposed to regard them all as modifications in the arrangements of the silex of the valve, arising from the mode of development peculiar in each case to the membrane with which the silex is combined." He also denies that there are any perforations in the valve, as supposed by Ehrenberg and Kützing. These foramina are also denied by Schleiden. Mr. Smith denies also that the valves are externally covered with any organic membrane.

The delicacy of the markings on many of the *Diatomaceæ* render them objects peculiarly adapted for testing the powers of the object-glasses of the microscope. The following table, drawn up by Messrs. Sollitt and Harrison of Hull, to whom microscopy is indebted for having first pointed out this method of testing the powers of the microscope, was presented by them at the meeting of the British Association at Hull in 1853:—

Focal length of object glass.	Species.	Striæ in inch.	Angle of Aperture.
½	*Navicula strigilis* . .	34·000	40°
¼	*N. Hippocampus* .	42·000	60°
	N. Spencerii . . .	50·000	70°
	N. liniata . . .	60·000	80°
	N. angulata . . .	60·000	80°
⅛	*N. strigosa* (large) .	70·000	90°
	N. strigosa (small) .	80·000	95°
	Ceratoneis Fasciola	90·000	110°
	Navicula sigmoidea	105·000	120°
1/12	*N. arcus*	130·000	150

The *Diatomaceæ* possess the power of moving. "The cells have no special organs for these movements. But as, in consequence of their nutritive processes they take in and give out fluid matters, the cells necessarily move when the attraction and the emission of the fluids is unequally distributed on parts of the surface, and is so active as to overcome the resistance of the water. This motion consequently is observed more particularly in those cells which, in consequence of their taper forms, easily pass through the water; these cells moreover move only in the direction of their long axis. If one half of a spindle-shaped or ellipsoidal cell chiefly or exclusively admits material, the other half, on the contrary, giving it out, the cell moves towards the side where the admission takes place. But, as in these cells both halves are physiologically and morphologically exactly alike, so it is that it is first the one and then the other half which admits or emits, and consequently the cell moves sometimes in one, sometimes in the opposite direction." (Nägeli.)

This is perhaps as satisfactory an explanation of these movements as can be given in the present state of our knowledge. All observers agree that they can find no evidence to support Ehrenberg's notion of a pedal or motile organ projected from the interior of the siliceous shield. The Rev. W. Smith has also detected cyclosis in the *Diatomaceæ*. "A distinct movement," he says, "of the granular particles of the endochrome, closely resembling the circulation of the cell-contents in *Closterium Lunula*, noticed by Mr. Ralfs [Desmidieæ], and which I have frequently detected in the same species, has occasionally fallen under my notice in some of the larger forms of *Diatomaceæ*." He has observed it in *Surirella biseriata*. (*Fig.* 4.) "This circulation," he continues, "has not however the regularity of movement so conspicuous in the *Desmidieæ*, and is of too ambiguous a character to furnish data for any very certain conclusions, save one, namely, that the Diatom must be a single cell, and cannot contain a number of separate organs, such as have been alleged to occupy its interior; since the endochrome moves freely from one portion of the frustule to another, approaching and receding from the central nucleus, unimpeded by any intervening obstacle."

The *Diatomaceæ* are the most abundant and extensively distributed of unicellular organisms. They are found in the ocean, at the mouths of rivers, in brackish waters, in rivers, lakes, ponds, ditches, pools, and cisterns. In fact, wherever a few drops of water are allowed to remain exposed to the air, we may expect to find forms of *Diatomaceæ*. Their forms are not less abundant than their presence. In the first volume of his 'Synopsis of the British Diatomaceæ,' the Rev. W. Smith has described upwards of 220 species, and the second will contain nearly 100, so that the number of species known in Great Britain is considerably above 300. The facility with which their forms are preserved, give to these objects a great advantage, and a handful of sand from the sea or mud from a river in the most remote district of the world may be expected to reward the observer with an abundance of new forms. They occur in great abundance in the river Thames, and its mud affords a large variety of the frustules of those which have ceased to exist. In a report on the 'Microscopical Examination of the Thames and other Water,' by Drs. Lankaster and Redfern, upwards of forty species were observed.

The mode of collecting living specimens for observation is simply to allow the water in which they exist to stand for a few hours, when, by carefully decanting the water, a portion remains at the bottom of the vessel more turbid than the rest, and which generally contains in large numbers the objects sought for.

In describing showers of coloured dust which have occurred in various parts of the world, Ehrenberg has demonstrated that various forms of *Diatomaceæ* have been found present. In some seasons these organisms occur in such numbers in the waters of rivers as to give to their banks a peculiar physical aspect. In the autumn of 1841 the stones and pebbles in the nearly dried-up bed of the Annan, in Dumfriesshire, presented an appearance as though they were white-washed. The substance which gave the stones this appearance could be scraped off, and looked like some form of calcareous matter. On submitting this powder to the microscope, Dr. Lankester found that it consisted entirely of the siliceous shields of a species of *Synedra*. (*Fig.* 5.) In the first volume of the new series of the 'Transactions of the Microscopical Society,' Mr. Shadbolt has given an account of the examination of portions of mud given him by Mr. Busk from Port Natal. This mud was recent, and from the nature of the specimens in it, Mr. Shadbolt thinks it probable that it was obtained not far from the mouth of some river. In this mud he made out fifty-five distinct species of *Diatomaceæ*, twenty of which he has described as entirely new species. In the 'Microscopical Journal' for July, 1853, Mr. Brightwell of Norwich has described nine new species of one genus—*Triceratium*. Six of these are recent. He says, "We have detected nearly all the recent species described in this memoir in material obtained from the surface of the large sea-shells of the genera *Hippopus* and *Haliotis* before they have been cleaned. Many of them in this state are covered with small zoophytes, minute algæ, and other parasites; and by a careful examination of these, *Triceratia* and other *Diatomaceæ* have been obtained."

One of the most singular positions in which Diatoms are found is in the guano brought from America and Africa. Their history is curious. They must first have been swallowed by fish and subsequently by birds; their shields, however, have been able to withstand this double process of digestion, and they are found in large numbers in every pure specimen of guano. Some of the forms which have been thus presented to the naturalist are entirely new, and are amongst the most singular of the family. It has been suggested that the silex thus introduced into the guano may contribute to its fertility, as it is well known that this substance is present in the stems of all our cereal grasses, and is necessary to their growth.

If they occur thus abundantly in recent deposits, it would be expected that they should be found in many of the older formations of the earth's surface. This is very extensively the case; although it may be doubted whether, from the fact of their being occasionally found in igneous rocks, that they were amongst the first organisms on the earth's surface. Ehrenberg has been able to detect their presence in some of the earliest rocks of the Palæozoic series. How *Diatomaceæ* may be present in igneous rocks has been suggested by Dr. Hooker. During his voyage with Sir James Ross in the Antarctic Ocean he says, "This order occurred in such countless myriads as to stain the sea everywhere of a pale ochreous-brown, in some cases causing the surface of the ocean, from the locality of the ships, as far as the eye could reach, to assume a pale-brown colour." This immense mass of organisms perishing are producing a sub-marine deposit, or bank, of vast dimensions, resting on the shores of Victoria Land, and hence on the sub-marine flanks of Mount Erebus, an active volcano upwards of 12,000 feet high. "Knowing as we do that *Infusoria*, *Diatomaceæ*, and other organic constituents, enter into the formation of the pumice and ashes of other volcanoes, and are still recognisable in those minerals, it is perhaps not unreasonable to conjecture that the subterranean and subaqueous forces which kept Mount Erebus in activity, may open a direct communication between this Diatomaceous deposit and its volcanic fires."

Ehrenberg has described a large number of forms of *Diatomaceæ* from the oolite, cretaceous, and other secondary rocks. A formation occurring in Barbadoes, and described by Sir Robert Schomburgk in the 'Reports of the British Association' for 1847, furnished him with an entirely new group of beings apparently related to this family. The following is Sir Robert's account of this discovery:—

"In the white marls and other rocks of Scotland district, Professor Ehrenberg of Berlin discovered a new and great group of siliceous-shielded animalcules, which, in a report read before the Royal Academy of Sciences, he described as *Polycystina*. The regular apertures and articulation of the minute shells which cover these animalcules distinctly bespeak an independent animal structure and development. They possess large apertures at the extremity of the body, which has no analogy among plants, but occur very commonly among animals. These siliceous loricated organic forms from the rocks in Barbadoes differ alike from *Polygastrica* and *Polythalamia*, but develop an important relation to these two groups, which Professor Ehrenberg considers, not upon conjecture but from actual investigation, to form two separate types. They approach most nearly in systematic arrangement to *Polythalamia*, and would occupy a separate group among animals possessed of vessels but without a heart and pulsation, and provided with a simple tubular intestinal canal. The forms developed in the highest degree in that division would be *Holothuriæ* and *Echinoideæ*.

"The minute forms of organic life in the rocks of Barbadoes, as far as investigated by Professor Ehrenberg in February, 1847, consist of the following groups:—

	Species.
Polycystina	282
Polygastrica	18
Phytolitheria	27
Geolithia	27
Polythalamia	7
	361

Of these more than 300 are new forms.

"The great discovery of the *Polycystina*, which might be almost called a new class, since they amount to upwards of 280 species, a larger number of specific forms than is contained in some classes of animals, may guide us to form an idea of the geological age of the rocks in Scotland district, by comparing these forms with similar fossil animalcules from rocks upon the age of which geologists have agreed. Ehrenberg considers that the *Polycystina* from the rocks of Barbadoes resemble more the animalcules from rocks of the secondary period than the tertiary."

Amongst the varieties of quartz rock the mineralogist recognises, under the name of tripoli and polishing powder, certain pulverulent and earthy forms of silex. On placing these substances under the microscope they are found to be entirely composed of the siliceous frustules of *Diatomaceæ*. The polishing powder or slate (polirschiefer) found at Bilin in Bohemia is used for the purpose of producing a polish on fine surfaces. The angularity and hardness of the frustules of the Diatoms well adapt them to this purpose.

Another deposit in which the *Diatomaceæ* have been found in great abundance is the Bergmehl of Sweden [BERGMEHL, *S.* 1.] The Diatoms found by Ehrenberg in this formation are principally species of *Navicula*. (*Fig.* 6.)

Amongst the tertiary deposits, beds of *Diatomaceæ* are very common. They have been observed in Italy, in Germany, and in several of the States of America. "The city of Richmond in Virginia is said to be built upon a stratum of Diatomaceous remains, 18 feet in thickness." (Smith.) Professor Gregory of Edinburgh has recently described, in the 'Transactions of the Microscopical Society,' a Diatomaceous earth, discovered about two years ago by the Duke of Argyle in the Isle of Mull. It constitutes a bed, resembling marl in appearance, lying in a rough piece of ground between Loch Baa and the sea. The lake is about 30 feet, the land about 40 feet, above the sea-level. At one part there is a hollow, which in winter used to become a small loch, in summer only a stagnant pool, and in draining this the bed of marl was discovered. The bed rests upon gravel, which appears to belong to the diluvial period, and the Diatomaceous earth is probably of recent origin. Professor Gregory has examined the contents of this earth with great care, and has given a list of upwards of 130 species, which he has been able to make out ('Quarterly Microscopical Journal,' January, 1854). Of these upwards of twenty are altogether new species, or species that are new in a British locality.

From these facts it will be seen that the subject of fossil *Diatomaceæ* promises an almost boundless field for further inquiry. It appears that we may say of these organisms, what we can say of no other family or group of organised beings, that once created they exist for ever. Myriads of species of soft-bodied animals have perished, never to be recognised, but each individual cell of the Diatom leaves its siliceous wall as a record of its existence—a record that the ordinary forces of nature seem to have little or no power in obliterating.

We now turn to the subject of arrangement. It would of course be impossible here to give any account of individual species, and systematic arrangements are being constantly modified by new discoveries. The following is an arrangement of the families or tribes by Kützing:—

Tribe I. STRIATÆ.

Order I. *Astomaticæ.*

Without a central opening on the secondary valve.

* Transverse striæ unbroken.

Family 1. *Eunotieæ.*
Family 2. *Meridieæ.*
Family 3. *Fragilarieæ.*

** Striæ broken (interrupted) in the median line.

Family 4. *Meloseireæ.*
Family 5. *Surirelleæ.*

Order II. *Stomaticæ.*

With the central opening.

α *Monostomaticæ.*

Having a median aperture on only one of the two secondary surfaces.

Family 6. *Cocconeideæ.*
Family 7. *Achnantheæ.*

β *Distomaticæ.*

With a median aperture on each secondary surface.

Family 8. *Cymbelleæ.*
Family 9. *Gomphonemeæ.*
Family 10. *Naviculeæ.*

Tribe II. VITTATÆ.

Order I. *Astomaticæ.*

Without central opening on secondary side.

Family 11. *Licmophoreæ.*
Family 12. *Striatelleæ.*

Order II. *Stomaticæ.*

With a large distinct aperture.
Family 13. *Tabellarieæ.*

Tribe III. AREOLATÆ.

Order I. *Disciformes.*

Family 14. *Coscinodisceæ.*
Family 15. *Angulifera.*
Family 16. *Tripodisceæ.*

Order II. *Appendiculata.*

Doubtful forms.
Family 17. *Biddulphieæ.*
Family 18. *Angulatæ.*
Family 19. *Actinisceæ.*

The Rev. W. Smith, in his 'Synopsis of the British Diatomaceæ,' gives the following arrangement of the genera:—

Tribe I. Frustules naked; not imbedded in gelatine nor inclosed in membranaceous tubes.

Sub-Tribe 1. Connecting membrane deciduous; frustules solitary, or during self-division in pairs; rarely in greater numbers, adherent or free, dispersed, or aggregated into a mucous stratum.

22 Genera—

Epithemia (*fig.* 19)	16 species.
Eunotia (*fig.* 1)	7 species.
Cymbella	6 species.
Amphora	8 species.
Cocconeis	6 species.
Coscinodiscus	3 species.
Eupodiscus (*fig.* 2)	5 species.
Actinocyclus	1 species.
Arachnodiscus	1 species.
Triceratium (*fig.* 3)	3 species.
Cyclotella	4 species.
Campylodiscus	7 species.
Surirella (*fig.* 4)	20 species.
Tryblionella	6 species.
Cymatopleura	5 species.
Nitzschia	23 species.
Amphiprora	5 species.
Amphipleura	2 species.
Navicula (*fig.* 6)	36 species.
Pinnularia	24 species.
Stauroneis	10 species.
Pleurosigma (*fig.* 7)	26 species.

Sub-Tribe 2. Connecting membrane subpersistent; frustules after self-division attached by a gelatinous cushion, or dichotomous stripes.

7 Genera—

Synedra (*fig.* 5)	24 species.
Doryphora	2 species.
Cocconema (*fig.* 8)	4 species.
Gomphonema (*fig.* 9)	12 species.
Podosphenia	5 species.
Rhipidophora	3 species.
Licmophora	2 species.

Sub-Tribe 3. Connecting membrane evanescent, or obsolete; frustules after self-division united into a compressed filament.

12 Genera—

Meridion (*fig.* 10)	2 species.
Bacillaria (*fig.* 11)	1 species.
Himantidium	7 species.
Odontidium	4 species.
Denticula	4 species.
Fragilaria	3 species.
Eucampia	1 species.
Achnanthes (*fig.* 12)	6 species.
Diadesmis	3 species.
Rhabdonema	2 species.
Striatella (*fig.* 13)	1 species.
Tetracyclus	1 species.

Sub-Tribe 4. Connecting membrane subpersistent; frustules after self-division united into a zigzag chain.

6 Genera—

Diatoma (*fig.* 14)	4 species.
Grammatophora	2 species.
Tabellaria	2 species.
Amphitetras	1 species.
Biddulphia (*fig.* 15)	4 species.
Isthmia	2 species.

Sub-Tribe 5. Connecting membrane subpersistent as a siliceous annulus; frustules after self-division united into a cylindrical filament.

3 Genera—

Podosira	2 species.
Melosira (*fig.* 16)	6 species.
Orthosira	6 species.

Tribe II. Frustules invested with a gelatinous or membranaceous envelope.

Sub-Tribe 6. Frond indefinite; mammillate; frustules scattered.

1 Genus—

Mastogloia	3 species.

Sub-Tribe 7. Frond definite; compressed or globular; frustules scattered.

2 Genera—

Dickieia (*fig.* 17)	3 species.
Berkeleyia	1 species.

Sub-Tribe 8. Frond definite; filamentous; frustules in rows.

3 Genera—

Encyonema	2 species.
Colletonema	4 species.
Schizonema (*fig.* 18)	16 species.

Sub-Tribe 9. Frond definite, filamentous; frustules fasciculated.

1 Genus—

Homœcladia	3 species.

(Smith, *Synopsis of British Diatomaceæ*, vols. i. & ii.; Meneghini, *On the Animal Nature of Diatomeæ*, translated by Ray Society; Kützing, *Species Algarum;* Siebold, *On Unicellular Plants and Animals*, translated in *Quarterly Journal of Microscopical Science*, vol. i.; Pritchard, *A History of Infusorial Animalcules, Living and Fossil;* Dujardin, *Histoire Naturelle des Zoophytes Infusoires;* Hassall, *British Fresh-Water Algæ;* Ehrenberg, *Die Infusions-Thierchen;* Hooker, *British Flora*, vol. ii.; Agardh, *Conspectus Criticus Diatomacearum;* Papers in vols. i. & ii. of *Quarterly Journal of Microscopical Science*, by T. Brightwell, G. Shadbolt, Professor Gregory, Messrs. Sollitt and Harrison; Papers in *Annals and Magazine of Natural History*, by J. Ralfs, Rev. W. Smith, G. H. K. Thwaites; *Reports of British Association;* Professor J. W. Bailey in *Smithsonian Contributions to Knowledge*.)

DIBDIN, REV. THOMAS FROGNALL, the most conspicuous English writer on Bibliography in the earlier half of the nineteenth century, was born at Calcutta in 1776. His father, Captain Thomas Dibdin, the commander of a sloop of war in the Indian Ocean, was the elder brother of Charles Dibdin, the celebrated naval song-writer. [DIBDIN, CHARLES.] Both he and his wife, whom he had first met in the East Indies, died on their passage home in the year 1780, and Frognall Dibdin first landed on the English shore an orphan of four years old. His mother's brother, Mr. Compton, took charge of him from that age to man's estate; and of other relations he saw so little, that, he tells us in his 'Reminiscences,' he conversed with his famous uncle Charles but once in his life, though Charles lived till 1814, when Frognall was eight-and-thirty. He was sent to St. John's College, Oxford, but quitted the university without taking a degree, and studied the law under Mr. Basil Montagu, whose office he left to practise in the unusual character of a provincial counsel at Worcester.

Finding no prospect of success, he soon abandoned the law for the church; and a passage in his 'Reminiscences,' in which he describes his studies, furnishes the key-note of much of his subsequent career. "In Greek Testaments my little library was rather richly stored. I revelled in choice copies of the first Erasmus, and of the first Stephen, and defied any neighbouring clergyman to match me in Elzevirs and in Tonson." In London, to which he speedily returned, and where he became a preacher at some fashionable chapels at the west-end, he was less known in the clerical than in the literary or rather the bookselling world. At that time, the 'bibliomania,' as it was called, or fancy for purchasing rare and curious books at extravagant prices, was advancing to a height which it had never before attained in England or elsewhere. It reached its culminating point at the celebrated sale of the library of the Duke of Roxburghe, in June 1812, where a copy of an early edition of Boccaccio, printed by Valdarfer, at Florence, in 1471, was sold to the Marquis of Blandford, afterwards Duke of Marlborough, for the sum of 2260*l.*; and it was afterwards discovered that an imperfect copy of the same book was in the Sunderland library at Blenheim, at the very time of the purchase, but had three times over escaped being mentioned in the catalogue.

Dr. Dibdin proposed, at a dinner party at Baron Bolland's, even before the Valdarfer was sold, the establishment of a club, to dine together in honour of Bibliography. The club was established under the name of the Roxburghe Club: and he became the first vice-president. This club afterwards adopted the rule that each of its members should every year reprint a book, to be presented to every member; and this practice seems to have led to the establishment of the numerous printing and publishing clubs now in existence, more liberal in their regulations than the original. The rise and progress of the bibliomania was stimulated and recorded by different publications of Dr. Dibdin: an 'Introduction to the Greek and Roman Classics,' in 1802; a dialogue, entitled 'Bibliomania,' in 1809, which was reprinted, with great enlargements, in 2 vols., in 1811; and the 'Bibliographical Decameron,' in three large vols., in 1817. A new edition of Ames's 'Typographical Antiquities' was also commenced by him, and carried as far as four volumes, between 1810 and 1819; and a minute account of the rare books in Earl Spencer's library, under the title of the 'Bibliotheca Spenceriana,' which occupied four volumes, and was extended by the 'Ædes Althorpianæ,' a description of Earl Spencer's seat at Althorp; and by an account of the Cassano library purchased by him; in the whole, seven volumes. In 1818, Dr. Dibdin made a tour abroad, to purchase books for the same patron, and the result was, a 'Bibliographical, Antiquarian, and Picturesque Tour in France and Germany,' 3 vols. 8vo, 1821. These works, particularly the 'Bibliographical Decameron' and the 'Tour,' present beautiful specimens of typography and engraving, produced at an expense which the author was never weary of proclaiming. In 'The Library Companion; or, Young Man's Guide and Old Man's Comfort in the Choice of a Library' (1824), he apparently aspired at producing something of more general and permanent use; but the result was disastrous. The flippant and frivolous character of his remarks, and the inaccurate and superficial character of his information, were commented upon in so severe a tone by some of the leading reviews, in particular the 'Quarterly' and the 'Westminster,' that his reputation never recovered the shock. In the preceding year he had obtained, by the patronage of Earl Spencer, his first preferment in the church—the living of Exning, near Newmarket; he was afterwards appointed to the rectory of St. Mary, Bryanstone Square, London; and his publications for some years were chiefly of a theological character. He returned to the field of bibliography in his 'Reminiscences of a Literary Life' (2 vols. 1836), and in his 'Bibliographical, Antiquarian, and Picturesque Tour in the Northern Counties of England and in Scotland' (3 vols. 1838). He also made, not long before his death, a tour in Belgium, of which he also intended to publish an account. He died on the 18th of November, 1847, after a long illness, of paralysis of the brain. His latter years had been much clouded with pecuniary difficulties.

Many of the publications of Dr. Dibdin have already been enumerated, but it will be necessary to recur to some of them to afford a fuller notion of their character. The most important is the 'Typographical Antiquities of Great Britain.' The meritorious work of Ames on that subject, professing to give an account of all the works printed in England from the introduction of the art to the year 1600, had been expanded from one volume to three by Herbert, who made such extensive additions that the work might justly be regarded as no longer Ames's, but his own. There was still room for extensive improvement on Herbert—a very simple alteration even in the arrangement would have much increased its value to nearly all who consulted it. The titles of the books are disposed under the names of the printers: had they been disposed instead, according to Panzer's plan, in his 'Annals of German Literature,' in the plain order of date, a host of particulars would have presented themselves in combination which are now scattered and inaccessible. It would have been far from uninteresting to observe what books issued from the press in England during the year in which Henry broke up the monasteries, in which Mary lighted the fires of Smithfield, or in which Shakspere first came to London. Dibdin has preserved the old arrangement, and has so much augmented the matter that the four volumes of his edition, which was left imperfect, carry the record no further than the middle of the second volume of Herbert's three. Some of the matter which he has added is of interest, in particular his more minute account of the productions of Caxton, but much is mere idle surplusage—biographies of book-collectors of the 18th century, illustrated with their portraits, which have nothing whatever to do with the history of printing in the 15th and 16th centuries. Much too of the additional matter for which he has obtained credit is taken from the manuscript notes which Herbert had prepared for a second edition, and inserted in a copy of his work which is now in the British Museum. It is to be hoped that the whole subject will be resumed ere long by some competent scholar, with the numerous additional materials now at his command in our public libraries, when, with some industry and intelligence, a work may be produced which will interest not only the bibliographer but all who have a tincture of feeling for literary matters. The 'Bibliotheca Spenceriana,' from its containing particulars of many books not accessible to the public in general, is often used as a work of reference: but those who have consulted it the oftenest regard it with the most distrust. Such was Dr. Dibdin's habit of inaccuracy, that in two accounts of the origin of the Roxburghe Club, to him a matter of great importance and interest, given in two of his works, the dates are utterly irreconcileable. In the 'Decameron' (vol. iii. p. 69), he distinctly states that the dinner at which he proposed it was on the 4th of June; in the 'Reminiscences' (p. 367), he states no less distinctly that it was "on the evening before the sale of the 'Boccaccio' of 1471, which took place on the 17th of June, 1812." It may easily be conceived that his accounts of the dates of rare books are not to be depended on till after they have been verified. It may be remarked also that his way of describing a book has too little of the scholar and the man of letters, and too much of the bookseller and the bookbinder. The width of the margin, and the kind of leather in which a book is coated, attract as much of his attention as the particulars which all copies of the book have in common. The 'Tours' are a singular compound of anecdotes of rare interest mixed up with the most idle and irrelevant matter. The 'Decameron' is by far the best of Dr. Dibdin's works, as comprising the least of detail and the most of anecdote; and it is written in many portions with a degree of care and spirit often wanting in his other works. The 'Reminiscences' afford singular proof that, although the author of an 'Introduction to the Classics,' his acquaintance with some of them was more than usually deficient. On the whole, though his bibliographical works abound with much that the reader wishes away, they are indispensable in any large library of English literature. His other productions, which are numerous, will be found mentioned in his own 'Reminiscences.'

DICHROITE. [Mineralogy, *S.* 1.]

DICK, THOMAS, LL.D., was born in 1772. He was educated for the Christian ministry in connection with the Secession Church of Scotland, and was a preacher in connection with that body in the early part of his career, but it is as a popular writer on physical science that he is best known to the world. The works by which he first became generally known were the 'Christian Philosopher,' and the 'Philosophy of Religion.' These were followed by works on the 'Improvement of Society by the Diffusion of Knowledge,' the 'Mental Illumination of Mankind,' 'The Philosophy of a Future State,' a 'Treatise on the Solar System,' 'Celestial Scenery,' 'The Sidereal Heavens,' 'The Practical Astronomer,' and an essay on 'Christian Beneficence, contrasted with Covetousness,' written in competition for the prize which was conferred on Dr. Harris for his work, entitled 'Mammon: or Covetousness the Sin of the Christian Church.' Dr. Dick was a man of singularly unobtrusive disposition, and was content to labour perseveringly for the public instruction, although his immediate reward was but small. His principal works were reprinted at low prices, and had extensive circulation, yet the author derived little pecuniary benefit from them. A public subscription on his behalf, as an acknowledgment of the benefits he had conferred upon society, was projected a few years since by some of his admirers, but realised a very small amount, most of it being raised in the town of Dundee, where the subscription was commenced. Dr. Dick's works have been reprinted and very extensively sold in the United States. Dr. Dick resided in the small village of Broughty-Ferry, on the left bank of the river Tay, in Forfarshire. Besides instructing the public by his pen, Dr. Dick had been in the habit of accepting occasional appointments to preach in neighbouring churches, and also to deliver popular lectures on scientific subjects. A few years ago a small pension was granted to him by the government in acknowledgment of his services in the advancement of popular science. He died July 29, 1857.

DICTYOGENÆ, a class of plants, proposed by Lindley, and adopted in his 'Vegetable Kingdom.' It embraces a number of orders standing between the larger classes of Exogens and Endogens. They have a monocotyledonous embryo, but they have also a broad net-veined foliage, which usually disarticulates with the stem. The following are the natural orders of *Dictyogenæ*:—

Flowers unisexual. Perianth free. Carpels 00; one seeded	*Triuridaceæ.*
Flowers unisexual. Perianth adherent. Carpels consolidated; several seeded	*Dioscoreaceæ.*
Flowers bisexual. Carpels several, quite consolidated. Placentæ axile. Flowers hexapetaloideous	*Smilaceæ.*
Flowers bisexual. Carpels several, quite consolidated. Placentæ parietal. Flowers 3-6-petaloideous	*Philesiaceæ.*
Flowers bisexual. Carpels several, half consolidated. Placentæ axile. Flowers 3-petaloideous	*Trilliaceæ.*
Flowers bisexual. Carpels solitary, simple, many-seeded, with long-stalked anatropal seeds, and a basal placenta	*Roxburghiaceæ.*

DIDYMIUM. [CHEMISTRY, *S.* 1.]

DIDYMOPRIUM. [DESMIDIEÆ, *S.* 2.]

DIEGO, SAN. [CANADA, *S.* 2.]

DIGENITE, a native Sulphuret of Copper.

DILMAN, a town in Persia, is situated on the caravan route from Tabriz to Erzerum, 70 miles W. from Tabriz, 10 miles W. from the north-west angle of Lake Urumiyeh, and has about 15,000 inhabitants. It is situated in the wide and fertile plain of Selmas, which stretches westward from the lake to the base of the Kurdistan Mountains. The town is surrounded by gardens and orchards, and has clean streets. The plain about it is inhabited by Nestorians, Armenians, Catholics, Kurdish Leks, and Russian emigrants. About 4 miles to the westward is the old town of Dilman, a great portion of which is in ruins. From the number of mounds in the neighbourhood it seems to have been once of considerable extent, and it is described by St. Martin as being a very ancient Armenian city. (Colonel Sheil, in *London Geographical Journal*, vol. vi.)

DINORNIS, a genus of birds probably extinct, the remains of several species of which have been found in New Zealand.

In November, 1839, Professor Owen exhibited, at a meeting of the Zoological Society of London, the fragment of the shaft of a femur, 6 inches in length, and 5½ inches in its smallest circumference, with both extremities broken off. This bone of an unknown struthious bird of large size, presumed to be extinct, was put into the Professor's hands for examination, by Mr. Rule, with the statement that it was found in New Zealand, where the natives have a tradition that it belonged to a bird of the eagle kind, which has become extinct, and to which they give the name Movie or Moa. Similar bones, it was said, were found buried on the banks of the rivers.

After a minute description of the bone, Professor Owen made the following statement:—"There is no bone of similar size which presents a cancellous structure so closely resembling that of the present bone as does the femur of the ostrich; but this structure is interrupted in the ostrich at the middle of the shaft, where the parietes of the medullary or rather air-cavity, are smooth and unbroken. From this difference I conclude the struthious bird indicated by the present fragment to have been a heavier and more sluggish species than the ostrich; its femur, and probably its whole leg, was shorter and thicker. It is only in the ostrich's femur that I have observed superficial reticulate impressions similar to those on the fragment in question. The ostrich's femur is subcompressed, while the present is cylindrical, approaching in this respect nearer to the femur of the emeu; but its diameter is one-third greater than that of the largest emeu's femur with which I have compared it. The bones of the extremities of the great *Testudo elephantopus* are solid throughout; those of the crocodile have no cancellous structure like the present bone. The cancellous structure of the mammiferous long bones is of a much finer and more fibrous character than in the fossil. Although I speak of the bone under this term, it must be observed that it does not present the characters of a true fossil; it is by no means mineralised; it has probably been on or in the ground for some time, but still retains most of its animal matter. It weighs 7 ounces 12 drachms avoirdupois.

"The discovery of a relic of a large struthious bird in New Zealand is one of peculiar interest, on account of the remarkable character of the existing Fauna of that island, which still includes one of the most extraordinary and anomalous genera of the struthious order; and because of the close analogy which the event indicated by the present relic offers to the extinction of the Dodo of the island of the Mauritius. So far as judgment can be formed of a single fragment, it seems probable that the extinct bird of New Zealand, if it prove to be extinct, presented proportions more nearly resembling those of the Dodo than of any of the existing *Struthionidæ*. Any opinion however as to its specific form can only be conjectural. The femur of the Stilt-Bird (*Himantopus*) would never have revealed the anomalous development of the other bones of the leg; but so far as my skill in interpreting an osseous fragment may be credited, I am willing to risk the reputation for it on the statement that there has existed, if there does not now exist, in New Zealand, a struthious bird nearly if not quite equal in size to the ostrich."

It was not long before an opportunity occurred of testing this very remarkable statement, and of proving the sagacity of the naturalist who had thus staked his reputation upon his conviction of the truth of the general principles of the science of comparative anatomy. Professor Owen received a communication from the Rev. W. Cotton describing several other remains of animals of the same kind, and in 1843 a collection, comprising vertebræ and bones of the hinder extremities, pelvis, &c., were transmitted by the Rev. W. Williams to the dean of Westminster (Dr. Buckland); and in 1846 many specimens were sent to England by Dr. Mackellar, Mr. Percy Earle, and Colonel Wakefield. These were placed in the hands of Professor Owen, and form the subject of his first and second 'Memoirs on the Dinornis,' in the 'Zoological Transactions,' vol. iii.

In these Memoirs Professor Owen pointed out that the bones which had been thus sent over from New Zealand contained the remains of no less than nine species of a remarkable group of birds, which he at first supposed belonged to the family of *Struthionidæ*. Subsequent examination however has led Professor Owen to the conviction that, although wingless, these birds have as little connection structurally and physiologically with the ostriches as with any other group of recent birds.

From an examination of the various bones thus collected, Professor Owen was enabled to point out that the fragment of bone which he had first received belonged to a species of the genus not only much larger than any of the other species indicated by these remains, but larger than any form of existing bird. To this species he gave the name of *Dinornis giganteus*, and found that the height of this bird must have been from 10 feet to 10 feet 6 inches. The other species described were—*D. ingens*, attaining a height of 9 feet; *D. struthiides; D. didiformis*, 4 feet; *D. dromæoides*, 5 feet; *D. struthioides*, upwards of 6 feet. In addition to these were described—*D. curtus, D. crassus, D. otidiformis*, and *D. casuarinus*. Thus these remains showed the existence of a number of birds, varying in size from the almost flightless Bustard to birds of the size of the Dodo, the Emeu, and the Ostrich, and one larger than all.

On a subsequent examination of the bones of *D. ingens* and *D. dromæoides*, Professor Owen discovered a back toe which he had seen nowhere in the other species, and for these he proposed the generic name *Palapteryx*. To these two was afterwards added a third species, *P. geranoides*. Dr. Mantell gives the following account of a further discovery of the remains of birds in New Zealand:—

"In 1846 and 1847 my eldest son, Mr. Walter Mantell, of Wellington, who had resided several years in the colony, explored every known locality of these fossil bones within his reach in the North Island, and went into the interior of the country, and located with the natives, for the purpose of collecting specimens, and of ascertaining whether any of these gigantic birds were still in existence, resolving, if there appeared to be the least chance of success, to penetrate into the unfrequented regions, and obtain a live Moa. The information gathered from the natives offered no encouragement to follow up the pursuit, but tended to confirm the idea that this race of colossal bipeds was extinct, the last individuals having in all probability, like the Dodo, been exterminated by human agency within a comparatively recent period; or that if any of the species whose bones occur in a fossil state are still living, they will prove to be of comparatively small types, related to the *Apteryx*, the living diminutive representative of the stupendous ostrich-like birds which once trod the soil of New Zealand. My son succeeded however in forming the most interesting collection of these remains hitherto obtained. It comprised between 700 and 800 bones belonging to birds of various species and genera, and differing considerably in magnitude and age, some belonging to very young individuals, in which the epiphyses of the long bones are distinct from the shaft, while others are those of adult and aged birds." The chief part of this collection is now deposited in the British Museum.

The locality from which these specimens were obtained is thus described by Mr. Mantell:—"Near Waikoriati, 17 miles north of Otăgo, there is a headland called Island Point, about three-quarters of a mile in length and 150 in height; it consists of sandy clay distinctly stratified and traversed by dykes of columnar trap, the columns being at right angles to the sides of the veins. In a little bight, south of Island Point, on the side of the bar which unites that headland to the mainland at the entrance of the River Waikoriati in front of the native Kaika, named Makuku, is situated the exposed parts of the so-called turbary deposit, whence bones of Moas and other birds of various kinds have been obtained in such number and perfection. This bed is about 3 feet in depth and not more than 100 yards in length, and lies immediately on a stratum of tertiary blue clay; its inland boundary is obscured by vegetation, and appears to be of a very limited extent; the bed is entirely submerged, and only visible when the tide has receded. It consists almost wholly of decayed vegetable matter, and its surface is studded with the undisturbed roots of small trees, which appear to have been burnt to the ground at some remote period. It is a light, sandy, elastic earth, of a blackish-brown colour, and emits a strong fetid odour when first collected; from the large quantity of animal matter it contains I conceive it was originally a swamp or morass, in which the New Zealand Flax (*Phormium tenax*) once grew luxuriantly. It is now covered by a thin layer of sand when exposed at low water. . . Although bones of several species of Moa, especially of the largest kinds, have been collected from this locality in considerable numbers and in great perfection, yet as the bed is rapidly diminishing from the inroads of the sea, there is great reason to fear that it will be entirely washed away, without yielding to the palæontologist all the desired information respecting the extinct animals whose relics it enshrines; for the natives and whalers are well aware of the interest attached to the bones by Europeans, and they seize indiscriminately on any specimen exposed by the receding tide, and if it cannot be readily extracted they break it off, and thus many a valuable relic has been destroyed. Their cupidity and avarice have too been so much excited by the large rewards injudiciously given by casual visitors, that the cost of specimens has increased to an unreasonable amount."

In their general aspect the bones which have been obtained from these spots closely resemble those obtained from the ossiferous caverns in Germany. Professor Owen gives an analysis of their chemical composition, and from this infers that they may have been recently deposited. Mr. Mantell obtained bones also from North Island:—"On the western shore of the North Island, about sixty miles south-west of New Plymouth, there is a stream called Waingougou, which empties itself into the sea at about a mile and a half south of Waimate in the Ngátirúanûi district. Part of the neighbouring country is elevated table-land, with deep tortuous gullies, through which the torrents and streams take their course to the sea. That of Waingougou, which is as tortuous as any of them, takes its rise in the neighbouring volcanic ridge, and has evidently at a former period discharged itself far distant from its present embouchure, as is proved by the existence of a line of cliffs which extends inland, and has manifestly been produced by the corroding action of the river. Driven from its course probably by a change in the relative level of the land and sea, the stream has formed its present channel, which cuts through a bed of loose conglomerate, 100 feet thick, overlying a deposit of finely-laminated sand, which covers a thick stratum of blue clay full of shells. The conglomerate consists of pebbles and large boulders of an infinite variety of volcanic rocks; the clay is the lowermost visible bed; the shells it contains are marine, and resemble species existing in the South Pacific Ocean; but I suspect many will be found specifically distinct from any recent forms. Between the two bluffs near the embouchure of the river there is a sand-flat about 200 yards across, and this on my first visit was strewn with bones of men, moas and other birds, and two species of seals. I had some deep openings made near the foot of the ancient cliff on the top of which is the Pa or native village of Ohawetokoloko, and at the same level as the flat on which I had observed the strewn fragments of bones I came to a regular ossiferous deposit. The bones however though perfect were as soft and plastic as putty, so that if grasped strongly they changed as it were by magic into pipeclay; and it was necessary to dig them up with great care, and expose them to the air and sun to dry, before they could be packed and removed. . . Unfortunately the natives soon caught sight of my operations, and came down in swarms, men, women, and children, trampling on the bones I had carefully extracted and laid out to dry, and seizing upon every morsel exposed by the spade. My patience was tried to the utmost, and to avoid blows I was obliged to retreat and leave them in the possession of the field; and to work they went in right earnest, and quickly made sad havoc. No sooner was a bone perceived than a dozen natives pounced upon it, and began scratching away the sand, and smashed the specimen at once. It was with great trouble, and by watching the opportunity of working in the absence of the Maoris, that I procured anything worth having."

The remains thus procured by Mr. Mantell were placed at the disposal of Professor Owen by Dr. Gideon Mantell, who was thus enabled to supply many deficiencies in his former descriptions of these remarkable birds. They afforded specimens of the bones of *Dinornis curtus*, *D. didiformis*, and *D. casuarinus*; also of *Palapteryx ingens*, variety *robustus*, and of a new species, *P. geranoides*. Notwithstanding the great number of bones that have thus been examined, one fragment only of the wings or humerus has been detected. This indicates the rudimentary condition of the wings in these birds. The humerus found Professor Owen regards as belonging to a species of *Palapteryx*. The following is a summary of the nature of this collection by Professor Owen:—"There are not less than 190 phalanges of the toes referrible to five or six species of *Dinornis*, *Palapteryx*, and *Notornis*, and there are 8 tarso-metatarsals, with the articular surface for a very strong hind toe, and of a conformation more nearly resembling those of the Dodo than of the *Dinornis* and *Palapteryx*, but shorter and thicker in proportion, and appertaining to the same bird as the tibia and fibula described in my Memoir of 1843 under the name of *D. otidiformis*. The proximal articulation of this remarkable form of tarso-metatarsal exactly fits the distal end of the tibia figured, and also that of a corresponding fractured tibia in Mr. Mantell's collection; which also contains the proximal end of another tibia, a fibula, an entire femur, and distal ends of two other femora, of the same species. The large surface for the hind toe; the strong calcaneal process forming a complete bony canal for the flexor tendons at the back part of the proximal end of the tarso-metatarsal; the perforation above the interspace between the outer and middle metatarsals for the tendon of the adductor muscle of the fourth toe, and the more posterior position of the condyle for the inner toe—all concur to indicate the generic distinction of the bird to which it belonged from either *Dinornis* or *Palapteryx*; and I propose to distinguish the new genus by the name of *Aptornis* and the present species *A. otidiformis*." ('Zool. Trans.' iii. p. 347.)

With the remains of the bones found on the banks of the river Waingougou were mixed the fragments of egg-shells. The eggs to which the fragments belonged were supposed to be about the size of a tea-cup. In connection with this subject the recent discovery of a large egg in Madagascar is interesting.

In a report to the French Academie de Sciences, M. Isidore Geoffroy St. Hillaire described three enormous fossil eggs from Madagascar, and some bones belonging to the same bird. The captain of a merchant-vessel trading to Madagascar one day observed a native using for a domestic purpose a vase which much resembled an egg, and upon examination proved to be one. The native stated that many such were to be found in the interior of the island, and eventually procured the eggs and bones exhibited by M. St. Hillaire. The largest of these eggs is equal in bulk to 135 hens' eggs, and will hold two gallons of water. M. St. Hillaire proposes the name of *Epiornis* for the monster biped of which these marvellous eggs and bones are the first evidence brought under the notice of naturalists. Casts of these eggs have been sent to this country, and are to be seen in various museums.

Amongst the bones sent home by Mr. Mantell, the remains of a new genus, *Notornis*, were found. It belongs to the same family as the *Brachypteryx* and the *Rallidæ*, and the interest that attaches to it in this relation is the fact that Mr. Mantell succeeded in obtaining a single living specimen. Many persons had reported the existence of a wingless bird as large as a fowl, and with red beak and legs, with a cry sounding like 'Keo Keo.' The following is Dr. Mantell's account of the discovery of this bird:—"On my son's second visit to the southern part of the Middle Island (as Government Commissioner for the settlement of native claims), he fell in with some sealers who had been pursuing their avocations along the little frequented islets and gullies of Dusky Bay on the south-western shores, and from them obtained the skin of a recent specimen of *Notornis Mantelli.* It appeared that when frequenting the coasts in search of seals and other game, these men observed on the snow, with which the ground was then thickly covered, the foot-tracks of a large and strange bird, and after following the trail for a considerable distance, they caught sight of the object of their search, which ran with great speed and for a long while distanced their dogs, but was at length driven up a gully in Resolution Island, and captured alive. It uttered loud screams, and fought and struggled violently; it was kept alive three or four days on board the schooner and then killed, and the body roasted and eaten by the crew, each partaking of the dainty, which was said to be delicious. The skin, with the skull and bones of the feet and legs, was preserved, and fortunately obtained by my son while in good condition, and thus perhaps the last of the race of Mohos was preserved for the naturalists of Europe. Upon comparing the head of the bird with the fossil crania and mandibles, my son was at once convinced of the specific identity of the recent and fossil specimens; and so delighted was he by the discovery of a living example of one of the supposed extinct contemporaries of the Moa, that he wrote to me and stated that the skull and beaks were alike in both, and that the abbreviated and feeble development of the bones and plumage of the wing were in perfect accordance with the indications afforded by the humerus and sternum found by him at Waingougou and now in the British Museum, as pointed out in the 'Zoological Transactions,' vol. iii. To the natives of the pahs, or villages, my son visited on his homeward route to Wellington, the *Notornis* was a perfect novelty, and excited great interest. No one had seen such a bird, but all agreed that it was the traditional Moho or Takahé, which they had believed was utterly extinct.

"This beautiful bird is about two feet high, and much resembles in its general form the *Porphyrio melanotus*, but it is larger and stouter, and generically distinct; the characters predicated by Professor Owen from the fossil remains being clearly marked in his recent volume. The beaks are short and strong, and as well as the legs were of a bright scarlet in the living animal. The neck and body are of a dark purple colour, the wings and back being shot with green and gold. The wings are short and rounded, and remarkably feeble both in structure and plumage. The tail is scanty, and white beneath. The specific identity of the recent and fossil *Notornis* is confirmed by Mr. Gould, who has published a coloured figure the size of the original in a supplementary number of his splendid work on the 'Birds of Australia.'"

In addition to the bones of the animals mentioned, remains of other birds were found in the Mantellian collection. These were of a species of nocturnal Parrot, belonging to the genus *Nestor*, of a probably extinct species of *Apteryx*, of a species of Albatross allied to *Diomedea chlororhynchus*, and also of the Penguin.

For the structure of the *Apteryx* and its relations to other birds, see the article STRUTHIONIDÆ.

In 1851 Professor Owen received from Governor Grey a large collection of specimens from New Zealand of the bones, and more especially the skulls, of several of the species, which he described in a fifth memoir presented to the Zoological Society. An almost perfectly restored skeleton of the *Dinornis giganteus* exists in the Museum of the College of Surgeons. Professor Owen concludes one of the memoirs referred to with the following general remarks:—"The extraordinary number of wingless birds and the vast stature of some of the species peculiar to New Zealand, and which have finally become extinct in that small tract of dry land, suggest it to be the remnant of a larger tract or continent over which this singular Struthious Fauna formerly ranged. One might almost be disposed to regard New Zealand as one end of the mighty wave of the unstable and ever-shifting crust of the earth, of which the opposite end, after having been long submerged, has again risen with its accumulated deposits in North America, showing us in the Connecticut Sandstones of the Permian period the foot-prints of the gigantic birds which trod its surface before it sank; and to surmise that the intermediate body of the land-wave along which the *Dinornis* may have travelled to New Zealand has progressively subsided, and now lies beneath the Pacific Ocean."

(Owen, *Memoirs on the Dinornis; Zoological Transactions*, vol. iii.; Owen, *Proceedings of Zoological Society*, in *Annals of Natural History;* Mantell, *Petrifactions and their Teachings.*)

DIOMEDEINÆ, a family of birds, to which the Albatrosses belong. The characters of the genus *Diomedea* are given under ALBATROSS. In that article three species of this genus are referred to. We now give a complete list of the species of this important genus:—

Diomedea exulans, Linn. This bird is abundant between 30° and 60° S. lat., and equally numerous in all parts of the ocean bounded by those degrees; its range, however, extends much farther south, even to within the antarctic circle.

D. melanophrys, Temm. It is the most abundant species of the southern seas; equally numerous in every part between the 30th and 60th degrees.

D. cauta, Gould. This species was procured by Mr. Gould off the south coast of Van Diemen's Land.

D. chlororhynchos, Lath. It occurs between 30° and 60° S. lat., in both the Atlantic and Pacific Oceans.

D. culminata, Gould. This bird is rather abundant both in the Pacific and Atlantic Oceans, between 30° and 50° S. lat.

D. fuliginosa, Gmel. It occurs in all parts of the ocean between 30° and 60° S. lat.; equally common off Van Diemen's Land, Cape Horn, and the Cape of Good Hope.

D. brachyura, Temm. Found in the North Pacific Ocean.

D. gibbosa, Gould. An inhabitant of the North Pacific Ocean.

D. olivaceorhyncha, Gould. China seas (?).

Mr. Gray, in his 'Genera of Birds,' also gives *D. spadicea* as a species. He also makes *D. gibbosa* (Gould) synonymous with *D. nigripes*, Audubon, 'Orn. Biog.,' vol. v. p. 327, and adopts the latter name as having the priority.

DIOPSIDE. [AUGITE.]

DIPHTHERITE. [MATERIA MEDICA, *S.* 2.]

DISRAELI, ISAAC, was born at Enfield, Middlesex, in 1766. His father, Benjamin Disraeli, was the descendant of a family of Spanish Jews, who, driven from the Peninsula in the 15th century by the persecutions of the Inquisition, had settled in Venice, and there, to mark their race, had exchanged the Gothic Spanish name they had hitherto borne for that of Disraeli—"a name never borne before or since by any other family" (the name was originally written D'Israeli; but in his later years the subject of this memoir was in the habit of omitting the apostrophe). He had come over to England from Italy in 1748, and made a considerable fortune by commerce. He married in 1765 "the beautiful daughter of a family" of his own race "who had suffered much from persecution." She was a person of strong sense but no imagination, whose ruling feeling was "a dislike for her race." The only child of this union was the subject of our notice. His sensitive and poetical character as a boy puzzled both his parents, and, in particular, occasioned continual discord between him and his mother. His father destined him for commerce; but from the first he showed a decided aversion to an active life. Educated first at a school near Enfield, and then at Amsterdam, where the only advantage he received was that derived from access to a large library, he was not more than eighteen when, in spite of all that his father could say or do, he signified his intention of being a literary man. "He had written a poem of considerable length, which he wished to publish, against commerce." His father naturally opposed this intention, and accordingly "he enclosed his poem to Dr. Johnson with an impassioned statement of his case, complaining that he had never found a counsellor or literary friend. He left his packet himself at Bolt Court, where he was received by Mr. Francis Barber, the doctor's well-known black servant, and told to call again in a week." When he did call the packet was returned to him unopened, with a message that the doctor was too ill to read anything The doctor, in fact, was then on his deathbed. In 1788 Disraeli's father sent him to travel in France. On his return, finding Peter Pindar's satires in everybody's mouth, he ventured anonymously to publish by way of corrective some verses "On the Abuse of Satire," which Walcot attributed to Hayley. About this time he became acquainted with Mr. Pye, afterwards poet laureate, who was of service to him in many ways, and who persuaded his father to allow him to follow his own inclinations. Accordingly from about 1790, without any further opposition on the part of his family, and with sufficient means supplied by his father (who survived till 1819, when he was nearly ninety years of age), he was free to devote himself entirely to literature. His first efforts were in poetry and romance. His early verses are forgotten; but a volume of romantic tales, including one called 'The Loves of Mejnoun and Leila,' published by him some time before the close of the 18th century, reached a second edition. But though he had much poetic taste, he was not fitted to be a poet or creative writer; and he was not long in finding out that his true destiny was "to give to his country a series of works illustrative of its literary and political history"—in other words, to prosecute researches in literary history and gossip. It was in the year 1790 that he published anonymously a little volume entitled 'Curiosities of Literature.' The success of this volume determined him to prosecute the walk which he had there entered upon. Accordingly, with the exception of the volume of romance above alluded to, and we believe, one other anonymous publication, all Mr. Disraeli's further productions during his long life consisted of the fruits of his literary and historical researches. These researches were prosecuted partly in the British Museum, where he was a constant visitor at a time when the readers who had access to its treasures were not more than half-a-dozen daily; partly in his own library, which, especially in the end of his life (when he resided on his own manor of Bradenham in Buckinghamshire) was very extensive. The results of these researches were put forth from time to time either as additions to his 'Curiosities of Literature' (which thus eventually attained, in the eleventh edition published in 1839, the bulk of six volumes); or as independent publications. Among the independent publications may be mentioned his 'Essay on the Literary Character' originally published in 1795; his 'Calamities of Authors,' his 'Quarrels of Authors, or Memoirs of Literary Controversy,' and his 'Inquiry into the Literary and Political Character of James the First'—works originally published between 1812 and 1822, and since then published collectively under the title of 'Miscellanies of Literature;' and his 'Life and Reign of Charles the First,' published in five volumes at intervals between 1828 and 1831. In acknowledgment of this last work he was made D.C.L. by the University of Oxford. He contemplated a 'Life of Pope,' and also 'A History of the English Free-thinkers,' and had collected materials for both; but a paralysis of the optic nerve which attacked him in 1839 prevented him from executing either. With the assistance of his daughter he selected from his manuscripts three volumes, which were published in 1841 under the title of 'Amenities of Literature.' His last years were spent in revising and re-editing his former works; and he died in 1848 at the age of 82. "He was," says his son, from whose memoir, prefixed to a new and posthumous edition of his 'Curiosities of Literature,' we have derived the foregoing particulars, "a complete literary character, a man who really passed his life in his library. Even marriage produced no change in these habits: he rose to enter the chamber where he lived alone with his books, and at night his lamp was ever lit within the same walls." In his old age his appearance was mild and venerable; he had then become rather corpulent.

DISS. [Norfolk.]

DIVORCE. The subject of the law of divorce has for several years engaged the attention of the legislature, and a commission having been appointed to consider the question, made a report which was presented to both houses of Parliament by command of Her Majesty in 1853. The statute 20 & 21 Vict. c. 85, which came into operation on the 11th day of January, 1858, has carried the recommendations of the commissioners into effect. For information as to the previous state of the law, see Divorce.

In the first place the jurisdiction in matters of divorce and causes matrimonial is taken away from the Ecclesiastical Courts, by which it was formerly exercised, and transferred to a new court, called the 'Court for Divorce and Matrimonial Causes,' the jurisdiction of which is exercised in the name of the Sovereign. The judges in this court are the Lord Chancellor, the Lord Chief Justice of the Court of Queen's Bench, the Lord Chief Justice of the Court of Common Pleas, the Lord Chief Baron of the Court of Exchequer, the senior puisne judge in each of the three Common Law Courts, and the judge of the Court of Probate. The last-mentioned functionary is entitled the 'Judge Ordinary of the Court of Divorce and Matrimonial Causes,' and he is invested with power to determine alone all matters, except petitions for dissolving or annulling marriage, application for new trials, bills of exception, special verdicts, and special cases.

The Act abolishes the old decree of divorce *à mensâ et thoro*, but enables the judge to pronounce a sentence of 'judicial separation,' which is nearly the same thing, and which sentence may be obtained either by husband or wife, on the ground of adultery or cruelty, or desertion without cause for two years or upwards. Desertion was not a ground for legal separation under the old system, which only offered to the party wronged such remedy as was afforded by a decree for the restitution of conjugal rights. The great advantage which the sentence of judicial separation has over the old divorce *à mensâ et thoro*, consists, however, in this, that from the date of the sentence, and whilst the separation continues, the wife is considered as a *feme sole* with respect to property of every description which she may acquire, or which may devolve upon her. The wife is also a *feme sole* for the purposes of contract, and may sue and be sued alone, so that her husband during the separation is free from all liability which she may incur. The marriage tie does indeed continue to subsist, as was the case in divorces *à mensâ et thoro*, but the injustice which frequently arose from that anomalous kind of relation has been effectually removed. Applications for the restitution of conjugal rights may still be made as before. The state of separation may be put an end to, either by the reversal of the decree or by the mutual consent and actual cohabitation of the parties, but in the latter case the property of the wife acquired subsequently to the separation is still "held to her separate use," subject to any agreement which the husband and wife may have entered into while separate.

Applications for judicial separation and restitution of conjugal rights may be made to the judges of assize, whose sentences are subject to appeal to the Court in London.

The Ecclesiastical Courts would in no case whatever dissolve a marriage once lawfully contracted. They would pronounce a marriage void *ab initio*, on the ground of some antecedent incapacity of the parties to contract, such as relationship within the forbidden degrees, a previous marriage, corporal imbecility, or mental incompetency. The total dissolution of a legal marriage could only be decreed by a special Act of the legislature, and in order to obtain this, it was necessary first to have obtained a decree of divorce *à mensâ et thoro*, in the Ecclesiastical Courts, and in almost all cases a verdict in a court of law in an action of *crim. con.* It is the object of the new Divorce Act to simplify this cumbrous and expensive process, and the new Court of Divorce is accordingly clothed with power to entertain petitions for divorce, either on the part of the husband or wife, and to pronounce a decree of dissolution or otherwise, according to the justice of the case. The husband may petition on the ground of the wife's adultery, the wife on the ground that her husband has been guilty of incestuous adultery, adultery with bigamy, adultery combined with cruelty or desertion for two years, or adultery combined with rape or unnatural crimes; simple adultery on the part of the husband not being sufficient to enable the wife to obtain a dissolution of the marriage. Connivance or collusion or the condonation of the petitioning party are grounds for refusing to interfere. On a dissolution being decreed, the husband may be compelled to make a suitable provision, when necessary, for the wife. When a husband petitions for dissolution of marriage, he may at the same time claim damages from the adulterer, who must be made a respondent. The damages are ascertained by the verdict of a jury, the old action of *crim. con.* being abolished by the statute. The adulterer may also be condemned in the costs of the whole proceedings.

After a decree of dissolution has been duly pronounced, either party is at liberty to contract a new marriage. Out of respect, however, to the religious scruples of a part of the community, clergymen of the established church are not compelled to solemnise marriages of persons who have been released from the bonds of a former matrimony. In case of a general refusal on the part of the clergy to celebrate marriages under such circumstances, parties so situated may of course marry with the other formalities by which that contract may be solemnised.

DÖBRENTEI, GABOR or GABRIEL, an Hungarian author and antiquary of distinguished merit, was born at Nagy-Szöllös, in the county of Veszprim, in 1786. He showed very early not only a remarkable zeal for the Hungarian language and literature, but a singular social talent for enlisting others in his views. At Oedenburg, a town not far within the frontier from Austria, and chiefly inhabited by Germans, he succeeded in getting up an Hungarian literary society, of which he became the secretary; and under his superintendence, when a youth of nineteen, a volume of 'Transactions' was published. At twenty he studied at Wittenberg and Leipsic, and in 1807 was recommended by Kazinczy, then the almost acknowledged head of Hungarian literature, to the post of tutor to Count Louis Gyulay, a nobleman of Transylvania, which made him for some years a resident in that country. With the literary contributions of some of his Hungarian and Transylvanian friends, and the pecuniary contributions of the Transylvanian magnates, he set on foot and edited a magazine, the 'Erdélyi Muzéum,' of which the first number was issued at Klausenburg and the remaining nine at Pesth, after which it ceased for want of support; but it contained so many articles of interest that no Hungarian library is considered complete without it. In 1820 Döbrentei removed to Pesth, where he continued to reside for the remainder of his life, in the occupation of several highly-respectable official posts of a legal character, and in such constant literary activity that he became the acquaintance or friend of almost every person of any note connected with Hungarian literature. Indeed almost all the information that has been put in circulation on that subject in England had its origin in Döbrentei. He was the friend and correspondent of Dr. now Sir John Bowring, to whom he supplied much of the information for his 'Poetry of the Magyars;' he also communicated to Miss Pardoe materials for her account of Hungarian literature and authors in her 'City of the Magyar,' and he wrote the article on the subject in the Leipsic 'Conversations-Lexikon,' which, by its being translated in Lieber's 'Encyclopædia Americana,' and the translation reprinted in the Glasgow 'Popular Encyclopædia,' has become familiar to thousands of English readers. As a poetical writer, Döbrentei was not successful; his original poems appear to have been pleasing, and no more; and though his translation of Shakspere's 'Macbeth' was acted at Presburg in 1825, it did not receive such a welcome as to encourage the publication of his versions of the other masterpieces of Shakspere, which were reserved in Hungarian for the more successful pen of a lady, Emilia Lemouton, who is, we believe, the only translatress of our great poet in any language. Döbrentei was more at home in his exertions to establish a 'Casino' at Pesth, an establishment of nearly the same kind as an English club of our own days, but borrowed both in plan and name from Italy, where it is made use of not to render more exclusive the society of the capital, but to enliven the dullness of the provincial towns. He was, after Count Stephen Szechenyi, the most influential person in promoting this institution, and was for some years its secretary, but relinquished the post to take that of one of the secretaries of the Hungarian Academy in 1831, of which he was also a zealous promoter. Kohl, the traveller, bears testimony to the extraordinary influence of these establishments on the whole tone of society even in Hungarian villages, where they were imitated on a small scale. In 1837 Döbrentei received an intimation from the government that his holding the post of secretary to the Academy any longer would be incompatible with his official duties, and he then devoted himself to the editorship of his great work, the 'Régi Magyar Nyelvemlékek,' or 'Ancient Monuments of the Magyar Language,' the first volume of which, a substantial quarto, was published at Buda in 1825, and the fifth was in preparation at the time of Döbrentei's death. His labours on this work were the delight of his life, he pursued them with irrepressible ardour, and on the result his reputation rests securely. When he began, hardly anything was known of the history of the Magyar language for centuries, and a subject that he found in darkness he left environed with light. He was indefatigable in discovering the existence of old correspondence or documents in family archives; when he had once discovered them, he was no less eager in obtaining permission to copy and make use of them, and he was not a man to take easily a refusal. By this combination of qualities he amassed a quantity of materials which nobody before him had ever supposed to exist, and he made such good use of them that the works of subsequent authors are full of constant references to Döbrentei's 'Nyelvemlékek,' which has become one of the principal monuments of Hungarian literature. How the revolution of 1848 affected him we have not seen stated, but it is well known that his friend and fellow-promoter of progress, Count Stephen Szechényi, became a maniac. Döbrentei was still engaged in collecting materials for his great work when surprised by death on the 27th of March 1851, at the age of 65. He was the author of numerous lives of Hungarian worthies, both in the periodicals to which he contributed and in the 'Esmeretch Tára,' or Hungarian translation of the Leipsic 'Conversations-Lexikon,' with original additions to the Hungarian articles, and in editions of Berzsenyi and other authors published under his superintendence, but no extended account of himself appears to have been published since his death.

DOBRUDSCHA, a district in European Turkey, forms the north-eastern part of Bulgaria, and comprises the country north of the eastern rampart called Trajan's Wall, between the Danube on the west and north, and the Black Sea on the east. Trajan's Wall leaves the Danube between Rassova and Czernavoda, and runs across to the Black Sea a little south of Kustenje, a distance of about 35 miles. In its western part the wall skirts a small stream, the Kara-Su (Black Water), that connects several small lakes, and enters the Danube above Czernavoda. At the head of the valley of the Kara-Su, near Bourlak, a line of hills or downs, composed chiefly of a porous limestone rock, runs north and south 164 feet above the level of the Black Sea. Along the coast at Kustenje also there is an uninterrupted range of low hills and cliffs, so that it is certain the Danube never had an outlet across the Dobrudscha in this direction. The formation of a canal from Czernavoda to Kustenje has been long a favourite project; but on the summit-level, which consists of porous limestone, no water ever rests to feed such a canal if it were cut. Besides, the only water communication between these two points that would be of much use would be a ship-canal, or, in other words, the opening of a new bed for the Danube; and this the nature of the ground renders all but physically impossible.

The low undulating down runs northward all through the Dobrudscha, forming a small watershed between the Danube and the sea; on the north it joins a lofty mountainous mass which covers the north of the district between Baba-Dagh and Matchin. On the eastern side the Dobrudscha is marshy, and contains several lakes. There is a great scarcity of drinkable water in this district. It contains however many fertile spots, although in the hot season of the year, like all the countries near it, it resembles a desert. In the spring, on the melting of the snows, the soil is saturated with wet, and in most parts is converted into a sea of mud. The inhabitants are chiefly Bulgarians, Tartars, and runaway Cossaks, who rear sheep and buffaloes. Eagles, bustards, cranes, wild geese, partridges, kites, ducks, wild swans, and wild dogs, are extremely numerous in the Dobrudscha. Along the Danube are the fortresses of Hirsova, Matchin, Isaaktcha, and Tulcha. Tulcha stands at the head of the St. George mouth of the Danube, which forms part of the boundary between the Dobrudscha and Russia. In the interior is the town of Baba-Dagh, between the mountains of that name and Lake Rassein. Kustenje is a mere village. In 1854 a Russian army entered the Dobrudscha. The Turkish army fell back to the fortress of Silistria, where they defended themselves successfully.

DOG-FISH. [SQUALIDÆ.]

DONINGTON. [LINCOLNSHIRE.]

DONINGTON, CASTLE. [LEICESTERSHIRE.]

DONIZETTI, GAETANO, was born September 25, 1798, at Bergamo, in Northern Italy. He studied in the Lyceum of that town, and his father having originally destined him for the law, it was somewhat late before he commenced his musical studies. He received his first instruction at the Musical Institute of Bergamo, of which Simone Mayer was then director. Here he remained three years, and in 1815 removed to Bologna, where his musical education was completed under Pilotti and Mattei. In consequence of some dispute with his father, he entered into the army, and while in garrison with his regiment at Venice in 1818 produced his first opera, 'Enrico di Borgogna.' He continued to write for the theatre, and in 1822 left the army. His earliest pieces are forgotten, or at least are no longer performed, and it was not till 1830, when he produced 'Anna Bolena' at Milan, that he began to take rank with the higher class of musical composers. In the course of these first twelve years of his career he composed 31 operas. During the fourteen years from 1830 to 1844, when his last opera, 'Catarino Cornaro,' was performed, he produced 33 operas, of which several have sunk into oblivion, but others still retain their places on the stages of Italy, Germany, France, and England. Some are especial favourites, and frequently performed. Among these more fortunate productions may be mentioned 'Anna Bolena,' Milan, 1830; 'L'Elisire d'Amore,' Milan, 1832; 'Lucrezia Borgia,' Milan, 1833; 'Marino Faliero,' Paris, 1835; 'Lucia di Lammermoor,' Naples, 1835; 'Betly,' Naples, 1836; 'La Fille du Régiment,' Paris, 1840; 'La Favorite,' Paris, 1840; 'Linda di Chamouni,' Vienna, 1842; 'Don Pasquale,' Paris, 1843; 'Maria di Rohan,' Vienna, 1843. Most of these later operas, besides his usual grace and facility, exhibit strength, solidity, command of the resources of counterpoint, and skill in instrumentation, much superior to his earlier productions. His artistic powers were thus manifestly improving and expanding towards the termination of his musical career. Soon after the performance of his 'Lucia,' which excited great admiration, he was appointed Professor of Counterpoint in the Royal College of Music at Naples, and after the production of 'Linda' at Vienna, he was named chapel-master and composer to the imperial court. In 1845, while in Paris, symptoms of mental decay, arising chiefly from habits of intemperance, began to show themselves, and he was for some time in a lunatic asylum. In October 1847 he was removed to his native town of Bergamo, where he died on the 8th of April 1848. (*Nouvelle Biographie Générale.*)

DONOSO CORTÉS, JUAN, an eminent Spanish statesman and author, was born in 1809, of wealthy parents, at the town of El Valle in Estremadura. He was so precocious that at the age of eleven he studied logic at Salamanca, and had completed his legal studies at Seville long before he was competent to be admitted as advocate at the age of twenty-four. He was known to a large circle of friends at Seville as a promising poet, and an ode which he published on the nuptials of King Ferdinand with Maria Christina was particularly distinguished among all those on the occasion. In 1832, when the temporary revocation by Ferdinand of the decree for the succession of the present Queen Isabel awakened the apprehensions of the liberal party that all progress would be checked, a large number of the principal young men of Madrid waited on Queen Christina to offer her their lives in defence of the rights of her infant daughter, and at their head was Donoso Cortés. From this time he was distinguished by the favour of Queen Christina, and entered upon a political career before he was of age to enter on a legal one. A pamphlet however which he composed under the title of a 'Memoir on the Rights of Isabel the Second,' was suppressed by the advice of his friends as containing ideas so ultra-liberal as to be certain to give offence. He was appointed in the same year to a post in the ministry of Grace and Justice, and in the next published his 'Considerations on Diplomacy and its Influence on the Political and Social State of Europe, from the time of the Revolution of July to that of the Quadruple Alliance.'

In 1835 he was sent as a royal commissioner with General Rodil to bring back to obedience his native province of Estremadura, and acted with such success as to receive the grand cross of Carlos III. and a higher official station; but dissatisfied with the turn that affairs were taking, he resigned his post, and for some time occupied himself in combating the party which supported the revolution of La Granja. He founded the newspaper 'El Piloto,' in which he was assisted by Alcalá Galiano, and was for some time editor of the 'Revista de Madrid,' a review or rather magazine established on the plan of the French 'Revue des Deux Mondes,' his first article in which was one of a series on 'Spain since 1834.' He delivered in 1837 at the Athenæum of Madrid, a series of lectures on the science of politics, which attracted much attention. He was in France in 1840 at the time of the expulsion of Queen Christina, hastened to offer her his services on her arrival in that country, and is said to have been the author of the manifesto which she issued from Marseille. He afterwards went to Madrid on a commission from her to defend her rights against Espartero, but his efforts were unsuccessful. He then returned to France and occupied himself with the composition of a 'History of the Minority of Queen Isabel II.,' passages of which were published in the 'Revista de Madrid,' and have received high applause from Spanish critics. He returned to Spain in 1844 after the fall of Espartero, and was named plenipotentiary to invite Queen Christina back to Madrid, when his services were rewarded with the title of Marquis de Valdegamas. His pen, which never ceased to be active, was by this time active in an entirely different cause from that in which he had first won his laurels. From an ultra-liberal Donoso Cortés had become a Catholic conservative, and after Balmes, the most distinguished literary advocate of Catholicism in Spain. He was ambassador to Prussia at the time of the revolution in 1848, and afterwards ambassador to France, a country for which he always avowed a strong partiality. It was while holding that post, and very soon after he had officiated as Spanish ambassador at the marriage of Louis Napoleon with a Spanish consort, that he was seized with an attack of pericarditis, which carried him off, after about a month's illness, on the 3rd of May 1853, at Paris.

A select collection of his writings, 'Coleccion Escogida de los Escritos del Excelentisimo Señor Don Juan Donoso Cortés,' was published in two volumes at Madrid in 1848. It comprises none of his poetry but most of his political writings that we have mentioned, and several of his articles from the reviews, which seem, like those of Macaulay, to be considered the brightest ornaments of his literary coronet. For brilliancy of style they are remarkable among the general flatness of Spanish composition, but for soundness of thought they are not, we think, likely to acquire a high reputation in England. One of them, on Pius IX., talks of the "singular privilege which Italy enjoys in conjunction with Spain of drawing towards itself the attention of the civilised world," and goes on to affirm that "the nations always keep their eyes fixed by instinct on the Italian and the Spanish race." There is much that is as questionable on most of the subjects on which he touches.

DOON. [Ayrshire.]

DORCHESTER. [Oxfordshire.]

DORNOCH. [Sutherland.]

DOUBLEDAY, EDWARD, a naturalist of eminence, was born in 1810, and died in London in 1849. The family of Doubleday are honourably distinguished for their devotion to natural history pursuits, and the subject of this notice early distinguished himself by his contributions to the literature of Ornithology and Entomology. His first papers were devoted to the subject of entomology, of which many were published in the volumes of the 'Entomological Magazine.' In the early part of his life he made a tour through the United States of America, and made many important observations on the animals of that country. These he published in a paper 'On the Natural History of America,' in the fifth volume of the 'Entomological Magazine.' On his return from America he was appointed one of the curators of the British Museum. The large collections in this institution afforded him abundant materials for increasing his knowledge and developing his views of the structure of insects. The results he made known in a variety of papers, but more especially in his work 'On the Genera of Diurnal Lepidoptera.' This work, which was published in parts and left unfinished at the author's death, consisted of descriptions, with coloured illustrations of great beauty and accuracy by Mr. Hewitson, of all the genera of butterflies. This family of insects was studied by Mr. Doubleday with the greatest industry, and his contributions to our knowledge of their forms are the most valuable of his labours. He devoted also considerable attention to ornithology, and assisted his brother Henry in publishing a work on this subject. He also contributed a paper 'On the Occurrence of Alligators in East Florida,' to the 'Zoologist.' A list of his papers will be found in the second volume of Agassiz's 'Bibliographia Zoologica,' published by the Ray Society.

DOWNHAM. [Norfolk.]

DRACONINA, a sub-family of Saurians belonging to the family *Agamidæ*, the tribe *Strobilosaura*, and the sub-order *Pachyglossæ* of Dr. J. E. Gray's arrangement. The family of Agamas, or *Agamidæ*, is thus defined by Dr. Gray:—"Teeth implanted on the end of the jaws. Tongue short, depressed, apex entire or slightly nicked. Eyelids connivent, valvular. Feet, for walking. Toes all free, unequal; the thumb of the hind feet on the same plane as the other toes; the little toes lower down on the ankle than the thumb. The thumb is anterior and internal, and the great toe of the hind feet occupies the same position, the thigh and foot being bent forwards. This is proved by analogy; this toe being the one that is clawless in the *Gecko*, which have the clawless thumb, and in *Anolis*, where the thumb and great toes are simple, and not dilated beneath, like the other toes."

The synopsis of the genera of this family, according to the 'British Museum Catalogue,' is as follows:—

I. Body compressed. Living on trees.

A. Femoral and pre-anal pores none. Scales imbricate. Asiatic.

a. Ribs elongated, exserted, supporting wing-like lateral expansions. Throat with 3 pouches.

1. *Draco.*—Ears naked. Nostril below the face-ridge.
2. *Dracocella.*—Nostril above the face-ridge.
3. *Dracunculus.*—Ears covered with scales.

b. Ribs simple. Back crested.

* Toes 4 or 5. Ears exposed.

4. *Sitana.*—Males with an elongated pouch. Females without any pouch.

** Toes 5—5. Tail with elongated keeled scales beneath. Scales of back small, often with scattered larger ones.

† Ears hidden under the skin.

5. *Lyriocephalus.*—Head lyrate. Muzzle with a round tubercle in front. Scales unequal.
6. *Ceratophora.*—Head square. Muzzle with a prolonged horn-like process. Scales unequal.
7. *Otocryptis.*—Head squarish. Muzzle nearly flat, simple. Eyebrows bluntly angular behind.

†† Ears exposed.

8. *Gonyocephalus.*—Scales of the belly smooth, of the back unequal. Eyelids angular, produced.
9. *Dilophyrus.*—Scales of the belly smooth; of the back equal. Eyebrow rounded, simple.
10. *Tiaris.*—Scales of the belly keeled, of the back unequal. Eyebrows and parotids unarmed.
11. *Acanthosaura.*—Scales of the belly keeled, of the back unequal. Eyebrows and parotids armed.

*** Toes 5—5. Tail with broad rhombic keeled scales beneath. Scales of back uniform.

12. *Bronchocela.*—Nuchal crest simple. Scales in descending series.
13. *Salea.*—Nuchal crest double. Scales large, in longitudinal series.
14. *Calotes.*—Back crested. Scales in ascending series. Head swollen behind, with one or two ridges of spines.

**** Toes 5—5. Tail with truncated keeled scales beneath. Scales small, keeled, in cross rings.

15. *Chelasonia.*—Parotids swollen, armless. Throat lax. The nape and back with a low crest. Tail rather compressed. Face-ridge rounded, with small scales.
16. *Charasia.*—Parotids swollen, with some spines above. The nape and back with a low crest. Tail tapering. Face-ridge distinct, with enlarged imbricated scales.
17. *Gindalia.*—Parotids rather swollen, with 2 or 3 spines above. Nape and back not crested. Tail tapering, round. Face-ridge indistinct.

B. Femoral pores distinct.

a. Scales rhombic, placed in rings. Toes fringed on each side. Back crested. Throat lax, folded across.

18. *Lophura.*—Back and tail with a fin-like crest, supported by bony rays. Head squarish.
19. *Phrysignathus.*—Back and tail with a crest of compressed scales. Head swollen behind.

b Scales irregular, imbricate. Australian.

* Neck with a frill-like expansion on each side.

20. *Chlamydosaurus.*—Head rhombic.

** Neck simple.

21. *Hatteria.*—Back and tail crested. Head elongate. Pre-anal pores numerous. Scales small.
22. *Lophognathus.*—Back crested. Head elongate. Pre-anal pores 2—2. Femoral pores 2—2.
23. *Diporophora.*—Back keeled. Head short. Pre-anal pores 1—1. Scales rhombic, of belly larger.
24. *Amphibolurus.*—Back crested, with longitudinal series of larger keeled scales. Femoral pores numerous.
25. *Grammatophora.*—Back not crested, with cross rows of larger scales. Femoral pores numerous.

II. Body depressed. Back with imbricate scales. Throat with a cross fold. Terrestrial.

a. Pre-anal pores distinct. Femoral pores none. Ears exposed.

* Pre-anal and abdominal pores in several rows.

26. *Landakia.*—Tail with rhombic keeled scales. Parotids spinose.
27. *Stellio.*—Tail with rings of large spinose scales. Parotids spinose.

** Pre-anal pores in a single line. Abdomen poreless.

28. *Agama.*—Parotids spinose. Scales rhombic, keeled.
29. *Trapelus.*—Parotids unarmed. Scales minute. [Agama.]

b. Pre-anal and femoral pores none.

* Ears exposed. Body and limbs with large spinose tubercles.

30. *Moloch.*—Neck with a convex tubercle above.

** Ears hidden. Scales small, granular. Back not crested.

31. *Phrynocephalus.*—Angle of mouth simple. Toes toothed on the sides.
32. *Megalochilus.*—Angle of mouth fringed. Toes fringed on the sides.

c. Femoral pores distinct. Pre-anal pores none. Ears exposed. Scales small, granular. Back not crested.

33. *Uromastyx.*—Tail broad, depressed, with complete rings of spinose scales.
34. *Saara.*—Tail broad, depressed, with scales of the upper part of the rings spinose; of lower, armless.
35. *Leiolepis.*—Tail round, elongate, tapering, with whorls of smooth scales.

The genera and species of the family *Draconina* are as follows:—

1. *Draco.*—Head small. Nostril in a scale, rather tubular on the side of the face-ridge. Tympanum of the ear visible, opaque, white. They live on trees, walking with agility with their wings folded on their sides, but they expand them and use them as a parachute when they throw themselves from the tops of trees. They spread out their pouches as they lie on the trunks of the trees. Scales unequal, some larger, keeled. Nape crested. For skeleton of *Draco*, see Dragon.

D. volans, Linn., the Flying Lizard. It is the *D. major* of Lamarck, *D. viridis* of Daudin, *D. Bouroniensis* of Lesson, and the *D. Daudini* of Duméril. The scales of the back are rather broad, generally smooth; of the throat granular, of the same size; the lateral pouches of the males moderate, rounded at the end, covered with ovate keeled scales: the throat black-spotted; wings gray, fulvous, or brown, spotted and marbled with black, sometimes forming four or five oblique black bands near the outer edge: the sides with a series of large broad keeled scales.

D. Timorensis, the Timor Flying Lizard. It is the *D. viridis Timorensis* of Schlegel. It has flat scales, rather large, smooth, unequal, with a row of rather larger keeled scales upon and on each side of the vertebral line; wings reddish, brown-spotted; lateral pouches (of male) moderate, rounded at the end, covered with large keeled scales; sides with an interrupted series of large keeled scales.

D. fimbriatus, Kuhl, the Fringed Flying Lizard. Scales of the back small, equal, mostly smooth; the throat with many circular spaces, covered with large granular scales; head white, brown-netted; lateral pouches of male elongate, angular, acute, covered with large keeled scales; wings with short whitish longitudinal lines; sides with a series of small triangular keeled scales, placed in groups of two or three; nostrils sub-superior. For figure of *Draco fimbriatus*, see Dragon.

2. *Dracocella.*—Head small, covered with small unequal scales; the nostrils roundish, in a scale, erect, vertical on the face-ridge; tympanum exposed, and opaque.

* Nape crested.

D. Dussumieri, Dussumier's Dragon, has moderate scales, rather rhombic; the sides with a series of rather larger scales, placed in roundish groups; orbit with a small bony point at back and front angle; wings with large brown spots near the body, and largely marbled near the outer edge; a black band across the throat; base of the pouch blue-black; the limbs moderate.

** Nape not crested.

D. Nacuratopogon, the Red-Throated Dragon. The orbit with a small bony point above, upon the front and back edge; scales of the back equal, smooth, the sides with a series of large keeled scales; nape not crested; a large round black spot on each side of the base of the pouch; wings brown-spotted; the limbs elongate.

3. *Dracunculus.*—Head quadrangular, covered with small unequal scales; nostrils lateral, on the face-ridge; tympanum hid under the skin, covered with scales. Weigmann described *D. lineatus*, as having but five exserted ribs, but the specimens in the British Museum, like the other dragons, have six on each side.

* Nape not crested, with a longitudinal fold.

D. quinquefasciatus, the Banded Flying-Lizard. Wings with five cross bands; scales of the back keeled; nape with a longitudinal fold, not crested; nostrils superior, erect; ears covered with many equal granular scales.

** Nape crested. Ears slightly concave.

D. lineatus, the Lined Flying-Lizard. Head gray, white-spotted; wings dark-banded, with small white longitudinal lines; the sides and throat bluish-black, with large white spots; the ears indistinctly marked, covered with three flat scales; base of the tail rounder above, with a slight crest on each side.

D. ornatus, the Banded-Head Dragon. Gray; head black, cross-banded; chin black, dotted; wings gray, reticulated with black, and with broad black bands at the edge; scales rhombic, of the middle of the back larger, keeled, of the sides smaller, smooth; ears covered with small equal granular scales; tail slender, compressed, with five keels above and two stronger keels beneath, rather depressed at the base, with five slight keels above.

D. maculatus, the Spotted-Winged Dragon. Gray, black-spotted; wings black-spotted; throat gray; pouch of the male elongate; scales of the back rather unequal, rhombic, keeled, of the sides rather smaller; sides with a series of large keeled scales; ears rather sunk, with unequal flat scales; tail slender, with a central keel above and five more small ones on the sides; base dilated, with five nearly equidistant equal keels above.

D. spilopterus, Weigmann's Flying-Lizard. Wings reddish near the body, with large brown spots, yellow near the edge; throat yellow, black-spotted. This may be the same as the former species, but the wings are subelliptic, and the scales do not exactly agree.

DRAGON-FLY. [Libellula, *S.* 1.]

DRAGONET. [Callionymus.]

DRAKÆA, a genus of plants belonging to the natural order *Orchidaceæ*. *D. elastica* has a single flower placed at the end of a slender smooth erect scape from 12 to 18 inches long, and its labellum, which is hammer-headed and placed on a long arm with a moveable elbow-joint in the middle, is stated by Mr. Drummond to resemble an insect suspended in the air and moving with every breeze.

DREELITE. [Mineralogy, *S.* 1.]

DRONFIELD. [Derbyshire.]

DROZ, FRANCIS-XAVIER-JOSEPH, was born at Besançon on the 31st of October, 1773. Having visited Paris for a few months in 1792 he witnessed the massacres of September; after which he returned to Besançon, and enlisted as a volunteer during the national enrolments. His comrades, according to the fashion of the times, elected him as their captain. But after a short service of little better than three years, he quitted the army for ever in 1796, and devoted the rest of his life to study. About the same time he obtained by his family influence the appointment of Professor de Belles Lettres to a public school in his native town; and in 1799 he published his 'Essai sur l'Art Oratoire.'

In 1802 his school having been suppressed, he went to Paris, where he settled definitively, and became connected with Villemain, Cabanis, and all the leading literati of the time. By the advice of Cabanis, he published his 'Lina,' a work of fiction in 1804, to attract attention to his philosophical writings. In 1806 appeared his 'Essai sur l'Art d'être Heureux,' which was followed by an 'Eloge de Montaigne,' in 1811, for which a medal was awarded to him. From 1816 to 1820 he wrote for several newspapers, inculcating his temperate views of moral philosophy, but refraining from politics. He then joined Picard in writing his 'Mémoires de Jacques Fauvel,' a tame imitation of Gil Blas; the work appeared in 1823. The next year he carried off the Montyon prize for his treatise 'De la Philosophie morale, ou des différents Systèmes sur la Science de la Vie.' In 1825 he was elected a member of the French Academy.

He had long desired to hold a professorship, and at length in 1832 he was appointed to lecture, by authority, at the Institute, on Moral and Political science. In 1839 he published his best work, 'L'Histoire du Règne de Louis XVI.' His gentle and unambitious life came to a close on the 4th of November, 1850, when he died as peaceably as he had lived. Although his works are written in a very unpretending style, they will be found well stored with suggestive ideas, and all the principal critics of his country have mentioned them with esteem.

DUCK-WEED. [Lemna.]

DUFRENITE. [Mineralogy, *S.* 1.]

DUFRENOYSITE, a mineral, consisting of an arseniuret and sulphuret of lead. It occurs in dodecahedrons of a dark steel-gray colour in the Dolomite of St. Gothard. The specific gravity is 5·55.

DULWICH COLLEGE. Under Alleyn, William, in the 'Penny Cyclopædia,' vol. i., p. 347, an account was given of the college of his institution. As the value of the property with which he had endowed it had enormously increased, it had been long felt that the income was no longer employed in accordance with the donor's intentions. An Act was therefore passed, 20 & 21 Vict. c. 84, for its better management. According to this Act, the educational branch of the college is very largely extended; two schools are established, an upper and a lower school, in which the classical and modern languages, mathematics, history and geography, physics, chemistry, civil engineering, and other departments of knowledge are to be taught to daily scholars, on the payment of a small fee, with no limit to the number except the amount of funds required and the means of accommodation. A certain number of boys, to be elected by competition (at present not to exceed twenty-four, but to be increased when there are sufficient funds), are to be foundation scholars, to be provided with board and lodging free; and there are eight exhibitions of 100*l.* a year each provided for the scholars of the upper school, tenable for five years while studying at an English university or for a profession; and twelve of 40*l.* for boys of the lower school, tenable for four years for the like purposes.

The life interests of the present master, warden, fellows, and poor brothers and sisters are provided for; but for the future management nineteen governors are to be chosen; namely, two each to be elected by the four parishes of St. Saviour's, Southwark; St. Giles, Camberwell; St. Luke, Middlesex; and St. Botolph, Bishopsgate, to hold office for seven years; and the remaining eleven to be appointed by the Court of Chancery, without any other restriction than that one must be resident in Dulwich. There is to be an upper and a lower master of the schools, a resident chaplain, and an organist for the chapel, which is to be maintained as a place of worship for Dulwich. The net income of the college is to be divided into four equal parts: three to be devoted to the purposes of education, and the remaining fourth to the support of aged men and women, at present (1858) not to exceed twenty-four, and to be chosen in equal proportions from the four parishes above named.

Provision is also made for the maintenance and preservation of the picture gallery. If a surplus should arise from this fund, it is to be applied in providing instruction in drawing and designing for such of the boys in the two schools as evince an inclination and capability for their acquisition.

DUMB-CANE. [Caladium, *S.* 1.]

DUMBLANE. [Perthshire.]

DUNDAS. [Canada, *S.* 2.]

DUNMANWAY, Cork, Ireland, a market-town and the seat of a Poor-Law Union, is beautifully situated on the river Bandon near its head, in 51° 43′ N. lat., 9° 5′ W. long., distant 33 miles W.S.W. from Cork, 190 miles S.W. from Dublin. The population in 1851 was 2222. Dunmanway Poor-Law Union comprises 15 electoral divisions, with an area of 103,917 acres, and a population in 1851 of 20,517.

The town is situated on level ground almost entirely surrounded by lofty and rugged hills. The greater part of the town was built by Sir Richard Fox, who also obtained for it a charter as a market-town. There are two churches for Episcopalians, a Roman Catholic and a Wesleyan Methodist chapel, and a district Bridewell. A Charter school was endowed by Sir Richard Fox. The market is held weekly; fairs are held in May, July, September, and October.

DUNSE. [Berwickshire.]

DUNSTER. [Somersetshire.]

DUPERRÉ, VICTOR GUY, a baron of the empire and a French admiral, was born at La Rochelle on the 20th of February, 1775. He commenced his maritime career in the merchant navy, and went to India, but returned to France after a voyage of eighteen months; and war having broken out, he entered the republican service in 1795. During the next ten years he took part in many single ship-fights with the English, until he was promoted to the staff on board the Veteran, commanded by Prince Jerome Bonaparte, in 1804. In September, 1806, he became captain, and took the command of the Sirène frigate. In March, 1808, whilst off the coast of Bretagne, in company with the Italienne, Duperré was chased by two ships and three frigates, and whilst making for the port of L'Orient, his passage was intercepted and he had to sustain for an hour and twenty minutes an unequal combat with two of the enemy's ships, keeping up a constant fire at once from both broadsides. Though repeatedly summoned to surrender, he contrived to bring off his frigate; an act of skilful intrepidity which did not escape the notice of Napoleon, who promoted him to the rank of ship captain. He performed several brilliant exploits in the Indian Ocean in 1808 and 1809, after which he became a baron of the empire and contre-amiral, August 20, 1810. In September, 1823, he was appointed to command the French squadron lying before Cadiz, and contributed to the capture of that city. In 1826 he became commander in chief of the combined fleet in the Antilles.

In 1830 he was summoned to Paris in February by the government of Charles X. to be consulted respecting the meditated expedition against Algiers. In his reply, Duperré represented the undertaking as extremely perilous and uncertain, but in spite of his representations it was resolved upon, and the absolute command of the naval forces was confided to him. This fleet set sail on the 25th of May, 1830. It consisted of 103 ships of war, and 572 vessels belonging to the merchant service, and other craft, the whole having on board 37,331 men and 4000 horses. After encountering many difficulties from the nature of the coast and contrary winds, Duperré appeared before the batteries of Algiers on the morning of the 13th of June. The signal share taken by Duperré in the siege and capture of this formidable fort, induced Charles X. to raise him to the peerage, July 14th, 1830, a few days before his own fall. This appointment was revoked by the government of July; but on the 13th of August, 1830, the same government made him an admiral, and restored his peerage. He became minister of the naval department November 22, 1834; and was afterwards recalled twice to the same office under different administrations. He resigned this office on account of declining health, February 7. 1843, and died November 2, 1846.

DUPONT DE L'EURE, JACQUES-CHARLES, was born at Neubourg, department de l'Eure, on the 27th of February 1767. He was an advocate, practising in Normandy, when the revolution began in 1789, and was made a judge in one of the law-courts of Louviers in 1792. In 1798 he was a member of the Council of Five Hundred, and on the 18th Brumaire was driven out by the bayonets of Murat. He belonged to the Corps Legislatif in 1813, and the following year was elected a deputy of the new Chamber. During the governments of Louis XVIII., of Charles X., and of Louis Philippe, he attached himself without deviation to the cause he had at first adopted of constitutional reform, and on more than one critical occasion took the lead of the liberal party. After the revolution of July 1830, Dupont de l'Eure became a commissioner of the law in the provisional government in his own department, and soon after, yielding to the entreaties of Lafitte, he accepted the office of Minister of Justice; but his principles and want of flexibility were suited neither to his colleagues nor to his sovereign, so that he resigned his portfolio on the 27th of December, 1830, and resumed his place in the ranks of the opposition. After the fall of Louis Philippe in February 1848, Dupont de l'Eure became, against his own wish, a member of the provisional government. He died in 1855, at the age of eighty-eight. A firm but by no means a violent republican, he was generally respected as a consistent and honest politician.

DUTENS, JOSEPH-MICHEL, the son of Michel-François, was born at Tours on October 15, 1765. He was entered when eighteen at the École des Ponts et Chaussées, and at twenty-two years of age he left it with the brevet of engineer. In 1800 he printed his first work at Evreux, 'Des Moyens de naturaliser l'Instruction et la Doctrine,' and in the same year published a topographical description of the arrondissement of Louviers, in the department of Eure. In 1804 he gave to the world his first work on political economy, an analytical exposition of its fundamental principles. In 1818 he was commissioned by the government to travel in England in order to obtain a knowledge of the canal system there, and he extended his labours to all the great commercial works of the country, the results of which were published at Paris in 1819 in 'Memoirs on the Public Works of England.' The work is divided into two parts; the first is devoted to engineering, describing the canals, the works of art employed in their construction, the cost of making, the expense of maintaining, and the system of working; the second is principally to develop the mode of concession of public works in England, and its advantages in a country where the energies of association are in almost all cases employed instead of the intervention of the government.

Desirous of enabling his country to profit by his studies in England, Dutens published in 1829 a 'History of the Interior Navigation of France,' in which he gives a detailed description of the geographical features of France, and an account of its rivers and canals; with an analysis of the agricultural and industrial products of France, showing their value if made available by a net-work of canals, sketching a scheme of what should be the principal branches, and discussing the financial condition which would ensure its success. In 1835 Dutens published his greatest work, the 'Philosophy of Political Economy; or a new Exposition of the Principles of this Science,' in 2 vols. 8vo. It was an expansion with considerable modifications of his previous work, and occasioned much opposition from the economists of the school of Adam Smith. Blanqui says, "it is only a new edition of the doctrines of Quesnay, but with less of advancement in respect to commercial freedom and duties." The severe criticisms occasioned M. Dutens to publish in 1837 a defence of his work, and a second in 1839; and the contest was still going on when the Académie des Sciences elected him a member of their body. He then published in 1842 his 'Essai comparitif sur la formation et la distribution du Revenue de la France en 1815 et 1835,' a work which contains the best statistical resumé of the productive riches of France, and has received and deserves high praise. In his last issued work, 'Des pretendues erreurs dans lesquelles, au jugement des modernes economistes, seraient tombés les anciens economistes relativement au principe de la richesse nationale,' in which he defends the theory of Quesnay, Turgot, and their followers, that manufactures and commerce do not constitute the wealth of a country, but that this advantage is only due to agriculture. M. Dutens died in 1848.

(*Nouvelle Biographie Générale.*)

DUTROCHET, RENÉ-JOACHIM-HENRI, a distinguished French botanist and natural philosopher. He was born at the Chateau de Néon, Poitou, on the 14th of November 1776, and died at Paris on the 4th of February 1847. He was the son of a military officer, who emigrated, and whose property was confiscated. Young Dutrochet in 1799 entered as a private the military marine, but afterwards deserted. In 1802 he commenced at Paris the study of medicine. He made a brilliant career as a student, was created doctor in 1806, and in 1808 was appointed physician to Joseph Bonaparte, king of Spain. He became principal physician to the Hospital of Burgos, which was then devastated with typhus. He displayed here great energy and skill. In 1809 he returned to France, and gave himself up to the study of those natural sciences for which his medical education fitted him. The tendency of Dutrochet's mind was to develop the laws which regulated the existence of organic beings, and many of his researches have had a permanent influence on the development of the departments of science to which they relate. His name is best known to physiologists from his researches on the passages of fluids through animal and vegetable membranes. The laws which he observed to regulate these phenomena he applied to the explanation of the functions of absorption and excretion in the animal and vegetable body. The passage of a fluid from without inwards he called 'endosmosis,' and the passage from within outwards 'exosmosis.' His views on this subject were published in a work which appeared both in London and Paris in 1828, with the title 'Nouvelles recherches sur l'Endosmose et l'Exosmose, suivies de l'application expérimentale de ces actions physiques à la solution du problème de l'irritabilité végétale et à la détermination de la cause de l'ascension des tiges, de la descente des racines.' The phenomena comprehended under the terms endosmose and exosmose were rightly described by Dutrochet, but he was hasty in tracing their cause to electricity, and failed to see that they were parts of a much more general set of phenomena than he had described. His other papers are very numerous, and were on a variety of subjects not immediately related. Thus we find his inquiries embraced amongst other things the following subjects: a New Theory of Voice; a New Theory of Harmony; on the Family of Wheel-Animalcules; History of the Egg of the Bird; on the Envelopes of the Fœtus; Researches on the Metamorphosis of the Alimentary Canal in Insects; on the Structure and Regeneration of Feathers; on the Height of the Meteor which projected Aerolites at Charsonville in 1810; on the Growth and Reproduction of Plants; on the Special Directions taken by certain parts of the Plants. The results of all his labours and a connected view of the subjects to which he devoted his attention, he gave in a volume entitled 'Mémoires pour servir à l'Histoire Anatomique et Physiologique des Végétaux et des Animaux.'

DUVERNOY, GEORGES-LOUIS, a distinguished anatomist and zoologist. He was born at Montbelliard, then a dependency of the duchy of Würtemburg, now an arrondissement in the department of Doubs in France, on the 6th of August, 1777, and died at Paris on the 1st of March, 1855. His father practised as a physician at Montbelliard, and he was brought up to the same profession. He commenced his studies at Stuttgart in 1792; but the principality of Montbelliard having been ceded to the French in 1793, he was compelled to finish his studies at Strasbourg. He subsequently went to Paris, where he graduated in 1801. In 1802 he was associated with M. C. Dumeril in reporting the lectures of Georges Cuvier, then in the zenith of his reputation. The 'Leçons d'Anatomie comparées' were concluded and published in 1805. On the completion of this labour he married, and, as natural science afforded him little hope of support for a family, he retired to his native town to practise his profession. In 1809 he was recalled to Paris, and named by De Fontanes joint professor of zoology in the faculty of science. Again, however, he returned to practise his profession in Montbelliard, and for nearly twenty years this distinguished zoologist pursued its harassing and laborious duties. In 1827 the chair of natural history in the faculty of science in Strasbourg was offered him: this he accepted; and from this time to his death we find him pursuing with unwearied industry zoological researches. In 1837 he was offered the chair of natural history in the College of France, vacated by the death of his great master, Cuvier. This chair he accepted, and held till 1850, when the death of De Blainville having created a vacancy in the chair of comparative anatomy he was appointed to it, and held it for four years. Duvernoy's contributions to zoological science are extremely numerous. In his writings and lectures he was more remarkable for the accuracy and extent of his knowledge than for the novelty and originality of his views. He was an industrious compiler, and was an extensive contributor to the 'Dictionnaire des Sciences Naturelles,' and also to the 'Dictionnaire Universelle d'Histoire Naturelle.'

DYNASTES, a genus of Coleopterous Insects belonging to the section *Pentamera*, sub-section *Lamellicornes*, and family *Dynastidæ* of M'Leay. The species have the body very large and thick, the outer edge of the jaws sinuated or toothed, and the lower jaws corneous and toothed. The genus *Dynastes* embraces the largest and most robust forms of the insect kingdom. They are nevertheless quite harmless. None of the species are found in this country, and only one in France. The largest forms are found in the tropical parts of India and South America. The habits of these insects are much the same wherever found. They bury themselves by day in holes in the ground, or in the decaying trunks of trees. At night they are seen flying about the trees. The females are more numerous than the males, and do not possess the horns, which give the males so remarkable an appearance. The more remarkable species of this genus are the Elephant and Hercules Beetles. The latter is of a glossy black colour. In the males the thorax is developed into a thick and curved horn, which is bent downwards at the tip, and a similar horn projects from below which points upwards, so as to come in contact with the former. The entire length of this beetle is 6 inches.

DYSART. [Fifeshire.]

DYSCLASITE, a Mineral consisting of hydrous silicate of lime. It occurs in white fibrous masses, consisting of delicate fibres of a whitish or yellowish or bluish colour. It has a hardness of 4·5, and a specific gravity of from 2·28 to 2·36. It is easily gelatinised in hydrochloric acid. It is found in the trap of the Faroe Islands. A variety called *Okenite* is from Greenland.

DYSDERA, a genus of Spiders. The species have 6 eyes, placed in a curve resembling a horse-shoe open in front; the mouth-claws very large, and produced in front; the maxillæ straight, and dilated at the place of insertion of the palpi. The type of the genus is *D. erythrina*, which is not an uncommon species in Great Britain. It is mostly found under stones.

DYSODIL. [Coal, *S.* 2.]

DYSLUITE. [Mineralogy, *S.* 1.]

E

EARTH-WORM. [ANNELIDA.]

EASINGWOLD. [YORKSHIRE.]

EAST INDIES. [INDIAN EMPIRE, *S.* 2.]

EASTBOURNE. [SUSSEX.]

EBELMEN, JACQUES-JOSEPH, French chemist, was born July 10, 1814, at Beaume-les-Dames, in France. Having passed successively through the colleges Henri IV. and Besançon, he in 1831 entered the École Polytechnique, and in 1833 passed from it to the Ecole des Mines. His ability and attainments early attracted notice; in 1840 he was appointed assistant, and in 1845 chief professor of analysis at the École des Mines; in 1841 he was made one of the secretaries of the 'Annales des Mines,' and experimental chemist at the École Polytechnique. A wider field was however opened before him by the appointment in 1847 of director of the Manufacture-Royale of Sèvres. To the duties of this office he applied all his energies. New and improved modes of operation, and the latest chemical discoveries, were employed with a view to economise the cost and improve the quality of the manufacture, while the most able designers and painters were called in for the purpose of obtaining the best models and the richest ornamentation; and under his direction the porcelain of Sèvres acquired a reputation fully equal to that it had ever held, while the establishment was regarded as a model for the excellence of its arrangements. M. Ebelmen was a member of the commission sent by the French government in 1851 to the Great Exhibition, London. In the beginning of March 1852 M. Ebelmen was named engineer-in-chief of the mines, but he survived the appointment only a few days, dying on the 31st of March, 1852, in his thirty-eighth year.

Ebelmen was regarded with great hope for his combination of sound and minute scientific knowledge with practical administrative ability, and extensive powers of generalisation; and his early death was generally regretted. He contributed a great many papers to the 'Annales des Mines,' the 'Annales de Physique et de Chimie,' and the 'Bulletins de l'Académie des Sciences.' Among the more important were some upon the composition of coal-gas, and its employment in metallic manufactures; and several upon the composition of rocks, the artificial reproduction of minerals, &c., of which we may mention—'Sur les Produits de la Décomposition des espèces Minérales de la famille des Silicates,' 1845; 'Sur une Nouvelle Méthode pour obtenir des Combinaisons Cristallisées par la voie sèche, et sur ses applications à la réproduction des espèces Minerales,' 1847; 'Sur la Décomposition des Roches,' 1848, and particularly 'Sur les Altérations des Roches stratifiées sous l'influence des agents atmospheriques et des eaux d'infiltration,' 1851. The more important of his 'Mémoires' have been collected and published under the care of M. Salvetat with the title of 'Recueil des Travaux Scientifiques de M. Ebelmen,' 2 vols. 8vo, Paris, 1855.

(M. Chevreul, *Notice sur M. Ebelmen; Nouvelle Biographie Générale.*)

ECCLESHALL. [STAFFORDSHIRE.]

ECCLESIASTICAL COMMISSIONERS. The Ecclesiastical Commissioners are a body corporate, created by the statute 6 & 7 Will. IV. c. 77, for certain purposes and with certain powers therein named. The great inequalities in the extent and income of the dioceses of England and Wales, in the duties and receipts of the cathedral and collegiate bodies, and in the extent of parishes and the annual value of the benefices of the Church of England, after long and angry comments gave rise in 1835 to the issue of two commissions, directing the persons named therein to consider the state of the dioceses with reference to the amount of their revenues, and the more equal distribution of episcopal duties; and of the several cathedral and collegiate churches, with a view to the suggestion of such measures as might render them conducive to the efficiency of the Established Church; and further, to devise the best mode of providing for the cure of souls with special reference to the residence of the clergy on their respective benefices. These commissioners made four reports, recommending various alterations, and the appointment of permanent commissioners, for the purpose of preparing and laying before the sovereign in council such schemes as should appear to them to be best adapted for carrying those recommendations into effect; the Crown being empowered to make orders ratifying such schemes, having the full force of law. The statute above mentioned was passed in consequence; and under its provisions a great many beneficial alterations have been and are being effected. The recommendations contained in the four reports of the original commissioners have also been carried out, with certain modifications and amendments, to which the sanction of Parliament was required and obtained (see 1 & 2 Vict. cc. 30, 106, 108; 2 & 3 Vict. cc. 9, 14; 3 & 4 Vict. c. 113; 4 & 5 Vict. c. 39; 6 & 7 Vict. c. 77; 10 & 11 Vict. cc. 98, 108; 13 & 14 Vict. c. 41; 16 & 17 Vict. c. 50). The chief features of the alterations thus effected are the equalisation of the territorial extent of the dioceses, the creation of the new sees of Ripon and Manchester, and the union of the sees of Gloucester and Bristol. The revenues of the sees have also been equalised, by augmenting the income of the smaller out of the revenues of the larger. Cathedral and collegiate bodies have also been regulated. The powers and constitution of the Ecclesiastical Commissioners have been amended by the stat. 3 & 4 Vict. c. 113, s. 78; and by the appointment of Church Estates Commissioners, who are *ex officio* members of the Ecclesiastical Commission (13 & 14 Vict. c. 94; 14 & 15 Vict. c. 104; 19 & 20 Vict. c. 74); and, lastly, by the transfer to them of the powers of the Church-Building Commissioners.

ECCLESIASTICAL COURTS. Until recently the Ecclesiastical Courts, in addition to their merely spiritual functions, had cognisance of three kinds of civil causes, namely, causes *pecuniary*, causes *matrimonial*, and causes *testamentary*.

The first of these heads included matters relating to the non-payment of tithes, and of ecclesiastical dues and fees, and also matters of spoliation, dilapidation, and neglect of repairing the church and things thereto belonging. The statutes under which the tithes have been commuted and replaced by rent-charges, recoverable by distress like ordinary rents, have virtually abolished suits for tithes in the Courts Christian, and their jurisdiction in other causes *pecuniary* has thus been in other ways reduced to a very small compass. The statute 20 & 21 Vict. c. 85 has entirely abolished the jurisdiction of these Courts in causes *matrimonial* [DIVORCE, *S.* 2], the privilege of granting marriage licences being alone preserved to them. And the Act of the same session (20 & 21 Vict. c. 77) has transferred their jurisdiction in causes *testamentary* to a Civil Court, proceeding according to the course of the Common Law. [PROBATE, *S.* 2). Little therefore now remains of the Ecclesiastical Courts except the name, their most important functions having been transferred to other tribunals.

ECHENEI'S, a genus of fishes belonging to the section of Sub-Brachial *Malacopterygii* and the family *Echeneidæ*. The body is elongated, covered with very small scales; a single dorsal fin placed opposite the anal; the head very flat, covered with an oval disc formed by numerous transverse cartilaginous plates, the edges of which are directed backward; the mouth wide, with numerous small recurved teeth on both jaws, the tongue, and the vomer. (Yarrell.)

The species of this genus are not numerous. Cuvier enumerates four, and another has been described from the West Indies. They are all easily recognised by the peculiar adhesive disc on the top of the head, by means of which they attach themselves to other fishes, the bottoms of vessels, or other objects floating in the sea. The object of this contrivance is not very well ascertained.

E. remora, the Common Remora, or Sucking-Fish, is found in the Mediterranean Sea, and was known to the Greeks and Romans. Dr. Turton once took a specimen of this species riding on a cod-fish in Swansea Bay. The following is Mr. Yarrell's description of the sucking apparatus:—

"The disc of the adhesive apparatus in the specimen now described, with seventeen transverse laminæ, was one-third of the whole length of the fish, not including the caudal rays; the breadth one inch and one quarter. The margin is free, flexible, and of considerable breadth, to secure perfect contact with the surface to which it is opposed; the parallel laminæ are represented as only slightly elevated: the degree of adhesion is in proportion to the power used to raise the inner surface of the disc in a direction perpendicular to the plane of contact. * * * * The vertical direction of the moveable laminæ is effected by sets of muscles going off obliquely right and left from two elongated bony processes, one on each half of each of these moveable divisions. The contraction of these muscles acting upon these levers, raises the external edges of the parallel divisions, increasing the area of the vacuum; and it will be observed that the points of the moveable transverse divisions to which the muscles are attached, are nearer the middle line than the outer edge, by which the chance of interfering with the perfect continuity of the free margin, and thereby destroying the vacuum, is diminished. All the bony laminæ, the outer edges of which are furnished with rows of minute tooth-like projections, are moved simultaneously, like the thin vertical divisions of our common window-blinds, by means of the mechanical contrivance on the framework. The longer muscles placed nearer the outer oval edge are probably instrumental in preserving the contact of the more flexible margin, and the serrated external edges of the parallel laminæ help to preserve the degree of elevation obtained: the adhesive power as before observed, is in proportion to the area of the vacuum."

ECHEVERIA, a genus of Plants named after M. Echeveri, author of the drawings in the 'Flora Mexicana.' It belongs to the order *Crassulaceæ*. It has a 5-parted calyx, the sepals erect, united at the base. Petals united at the base, erect, thick, stiffish, thickest at the middle nerve, and nearly trigonal at the base, acute. Stamens 10, shorter than the petals, and adnate to them at the base. Scales 5, short, obtuse. Carpels 5, ending each in a subulate style. The species are succulent shrubs, natives of Mexico. None of the species are used in the arts or medicine, but their handsome leaves and showy flowers give them a place in every collection of plants. The genus is closely allied to *Sedum*, and many of the species resemble that genus.

ECHINODERMATA. [ASTERIAS; STELLERIDIANS.]

ECHIODON, a genus of Apodal Malacopterygious Fishes belonging to the family *Murænidæ*. The head is oval; jaws furnished with large cylindrical teeth in front; other smaller teeth on the palatal bones and on the vomer. Gill-apertures large; branchiostegous membrane with seven rays. Body smooth, without scales, elongated, compressed. Dorsal and anal fins nearly as long as the body; all the rays soft; no ventral fins; anal aperture near the head.

This genus was constituted to receive a very remarkable fish found by Dr. J. L. Drummond on the beach at Camclough, near Glenarm, in the county of Antrim, Ireland. It was described by the late Mr. W. Thompson in part iii. vol. ii. of the 'Transactions of the Zoological Society.' This fish has anomalous characters, and Mr. Thompson had some difficulty in assigning it its proper position. The total length of the fish was 11 inches. As Dr. Drummond's specimen is the only one on record, nothing is known of the habits of the fish.

ECPHYMOTES (Fitzinger), a genus of Saurians belonging to the family of the *Iguanidæ*. It possesses the teeth and pores of the genus *Polychrus*, but with small scales on the body only. The tail, which is large, has great scales, which are rhombic and carinated. The head is 4-sided, and covered with small plates. The form is a little short and flattened, like that of some of the *Agamæ*, rather than like the slender shape of *Polychrus*. There are four species—*E. Fitzingerii* and *E. undulatus*, natives of Brazil; *E. obtusirostris*, native of Mexico; and *E. acutirostris*, a native of Brazil.

ECTOZOA (from ἐκτός, without, and ζωός, living), animals found living upon the external parts of other animals. This term is applied to distinguish the forms of animal life which are parasitic upon the surface of other animals from those which inhabit their interior. [ENTOZOA.] Whilst those which inhabit the interior of animals have so much resemblance to each other that naturalists place them together in an order which is called *Entozoa*, those which are found on the surface are very dissimilar, and belong to distant and dissimilar families. The term *Ectozoa* is therefore not one expressing any affinity between the animals included in it, but simply refers to their habitation.

The *Ectozoa* as well as *Entozoa* are found frequently associated with the diseased states of the animal bodies on which they are found, and much discussion has arisen as to whether they are the true causes of the diseases which they accompany. Thus much is certain, that whether they originate or not the diseased state of the body on which they are found, when allowed to increase they become themselves a source of diseased conditions, which disappear as soon as they are destroyed.

This is a general law equally applicable to parasitic plants as well as to animals. So that it would appear that, although their first attacks may be invited by a diseased condition of the plant or animal on which they are found, they may be productive of destructive effects by an unnatural and unhealthy increase. Every species of plant and animal appears to be subject to the attacks of special forms of parasitic plants and animals; and with regard to the latter they may be either inside or outside, so that we have not only *Ectozoa* and *Entozoa*, but *Ectophyta* and *Entophyta*. [ENTOPHYTA.]

Under the term *Epizoa* a number of animals have been placed together whose claims to be regarded as a section of the great family *Crustacea* are now generally recognised. These are found more especially on the bodies of fish, infesting their skin, eyes, and gills. They are very numerous, and the larger number of them belong to the family *Lerneadæ*. [LERNEADÆ.] They must be regarded as the *Ectozoa* of aquatic animals. The bodies of the *Cetacea* are frequently the chosen residence of many species of *Cirripeda*. [CIRRIPEDA.] These ecto-parasitic habits seem to be partaken of by some of the Vertebrate Animals, as we find the *Remora* [ECHENEIS, *S.* 2.] and other fish attaching themselves to the bodies of animals by an apparatus adapted for the purpose.

Land animals are subject to the attacks of various forms of *Ectozoa*, more especially those belonging to the Articulate tribes of animals. The following is a list of the creatures to which man is subject in various parts of the world:—

Phthirus inguinalis (Leach), the Crab-Louse; *Pediculus Capitis* (Nitzsch), Head-Louse; *Pediculus Vestimenti* (Nitzsch), Body-Louse; *Pediculus Tabescentium*, Burmeister [ANOPLURA, *S.* 2); *Sarcoptes Scabiei* (Latreille), Itch-Insect [ACARIDÆ]; *Dermanyssus Boryi* (Gervais); *Ixodes Americanus* (De Geer), Tick; *Argas Persicus* (Fischer); *Pulex penetrans* (Gmelin), Chigoe; *Pulex irritans* (Linn.), Common Flea [PULEX]; *Cimex lectularius* (Linn.), Bed-Bug [BUG]; *Œstrus Hominis* (Say), Gad-Fly [BOTS].

Other creatures are occasionally found taking possession of the surface of the human body. In diseased conditions the common fly has been known to deposit its ova in various parts of the body, and many of the insects which are parasitic upon the lower animals will take up their abode on the human body. This is the case with the various forms of the *Anoplura*, which are a peculiar species on almost every species of animal on which they are found, so also with the species of the genera *Pulex* and *Cimex*.

(Leidy, in *Flora and Fauna within Living Animals.*)

EDELFORSITE. [MINERALOGY, *S.* 1.]

EDENDERRY. [KING'S COUNTY.]

EDGEWORTH, MARIA, the daughter of Richard Lovell Edgeworth, by his first wife, was born on January 1, 1767, at Hare Hatch, near Reading, in Berkshire. In the year 1782 her father went with his family to reside on his paternal estate at Edgeworthtown, until when, except for a few months in her childhood, his daughter had never been in Ireland. From that time however Edgeworthtown became her abode for the remainder of her long life, with the exception of occasional visits of a few weeks only to England, Scotland, and France, and for about two years at Clifton in attendance on her sick step-mother. The neighbourhood of Edgeworthtown did not afford much congenial society, the family of the Earl of Longford at Pakenham Hall, that of the Earl of Granard at Castle Forbes, and that of a Mr. Brookes, being the only ones whom they visited; and Pakenham Hall, she says, was twelve miles distant, with "a vast Serbonian bog between us, with a bad road, an awkward ferry, and a country so frightful, and so overrun with yellow weeds, that it was aptly called by Mrs. Greville, 'the yellow dwarf's country.'"

Miss Edgeworth was principally educated by her father, as all his other children were. They all lived on the most confidential terms with him, and she was very early selected as his business assistant, copying letters, receiving rents, and welcoming his tenants, while his office of magistrate gave her still further opportunities of observing the manners and habits of the peasantry around her. These occupations soon led to her becoming a co-operator with her father in literary productions. The first was a series of 'Essays on Practical Education,' published in 1798; and 'Early Lessons,' which had been commenced by Mr. Edgeworth and his second wife, was continued by him and his daughter; the 'Parent's Assistant' was also a joint production, as was the 'Essay on Irish Bulls,' published in 1803. But Miss Edgeworth's fame rests upon her novels, which were produced without assistance, though they always had the benefit of her father's revision while he was living. The series commenced with 'Castle Rackrent,' published in 1801, and closed in 1834 with 'Helen.' In the interval there appeared 'Moral Tales,' 'Belinda,' 'Leonora,' 'The Modern Griselda,' 'Popular Tales,' 'Tales of Fashionable Life,' 'Patronage,' 'Frank,' 'Harrington,' and 'Ormond,' with some minor tales. Her last production was 'Orlandino,' a children's tale, published by the Messrs. Chambers in 1847.

The novels of Miss Edgeworth were published some years ago in a collected series. The manners which they describe, especially those of fashionable life, belong in some degree to a past generation. But her delineations of character, more particularly of Irish character, are so true to nature, and there is such a vein of quiet humour and practical good sense running through them all, that amidst the more exciting plots and strong situations of the novels of our own time, the more important may be referred to as worthy of a lasting place in our literature.

Miss Edgeworth passed a quiet but useful life with her family; she maintained an extensive correspondence with many friends and literary acquaintances, and at length died May 21, 1849, at the venerable age of 83.

EDGEWARE. [MIDDLESEX.]

EDMONTON. [MIDDLESEX.]

EEL, SAND. [AMMODYTES, *S.* 1.]

EGG. [REPRODUCTION, *S.* 2.]

EICHHORN, CARL FRIEDRICH, son of Johann Gottfried Eichhorn, obtained considerable celebrity as an able and learned jurisconsulist. He was born at Jena on the 20th of November 1781. After passing through the usual course of academic and legal training, he was named in 1805 Professor of German Law at Frankfurt-on-the-Oder. In 1811 he removed to Berlin, and in 1817 to Göttingen, in each place holding the same chair as at Frankfurt. Ill-health however compelled him in 1828 to resign, and to retire to an estate he possessed near Tübingen. Having somewhat recovered, he was in 1831 again summoned to Berlin, and along with his professorship he received an appointment in the ministry of foreign affairs. At length in 1833 he resigned his professorship, and devoted himself entirely to his official duties and to writing. About this time he was made a member of the Prussian council of state, and of the commission of legislation. He died in July 1854.

Carl Eichhorn was one of the most erudite expounders of the ancient Germanic law, of its origin, its growth, and its various bearings. As the associate and fellow-labourer of Savigny, though taking a somewhat different branch of the subject as the main object of his investigations, and as holding the chair of German law for so many years, Eichhorn exercised an important influence on the study of law in Prussia. His principal writings are—'Deutsche Staats-und Rechts-geschichte,' 4 vols. 8vo, Göttingen, 1808-18, which work has passed through eight editions; 'Grundsätze des Kirchenrechts der Katholischen und Evangelischen Religions-partei in Deutschland,' 2 vols. 8vo, Göttingen, 1831-33; and 'Einleitung in das Deutsche Privatrecht, mit Einschluss des Lehnrechts.' In conjunction with Savigny and Goschen he also carried on the 'Zeitschrift für geschichtliche Rechtswissenschaft,' Berlin, 1815-1843.

EIFEL, a wild highland region in the Prussian Rhein-Provinz, extends along the left bank of the Rhine between Bonn and Coblenz. Its proper geographical boundaries are the Rhine on the east, which divides it from the Westerwald; the deep valley of the Moselle on the south, which separates it from the Hochwald and the Hunsdruck, north-eastern offshoots of the Vosges; the Our or Ourthe, the Ardenne hills, and the Meuse on the west; and the great flat plain of the Lower Rhine on the north. The name however is confined to the region that stretches eastward from the sources of the Our and the Roër to the Rhine. At the head of these rivers lies an extensive highland called *Veen*, or *Fanges* (from the Celtic 'fancq' for bog)—a dreary waste covered with turf-bogs, morasses, and reeds, and rising between 1500 and 2000 feet high, with a length of about 16 miles every way, which connects the Eifel with the Ardenne, and offsets of which stretch nearly to the Meuse below Aix-la-Chapelle.

The Eifel is a rugged, desert, and in parts swampy table-land, with a general elevation of 1400 to 1600 feet above the Rhine. Its slopes are scored in all directions by deep glens and valleys, which are traversed by tributaries of the three great rivers named above. The flat surface of the table-land with the exception of some rather extensive forest-tracts, presents a wild moor covered with a thin barren soil; but here and there rise up abruptly naked crags and basaltic cones of various elevations, some of them richly wooded, with wide-spread layers of ancient lava between. The general components of the region are clay, flint, limestone, and slate; but the hills and rocks that flank the valleys, ravines, and glens of the Eifel are in many instances composed of basalt or capped with it; indeed the Eifel almost everywhere bears traces of violent convulsions and volcanic eruptions at some long-distant period. Extinct volcanoes, cauldron-shaped depressions, tarns of circular shape filling up ancient craters and locally called 'Maare,' mineral-springs, lava-streams, columnar basalt, fossil zoophytes and shells, proving submergence under some ancient waters, are among the natural curiosities of this interesting region.

Amongst the highest points in the Eifel the following may be mentioned:—The Hohen-Acht, above Adenau, 2434 feet above the sea; Nürberg, which is also near Adenau, and is crowned with the ruins of an extensive feudal castle, 2251 feet; Kelberg, near the source of the Elz, 2098 feet; Michaelsberg, near Münstereifel, 1860 feet; and the Schneifel, or Snow-Eifel, in the circle of Prüm, in the wildest part of the region, 2100 feet.

The Eifel has a length from east to west, between the Rhine and the Our, of about 50 miles. Along the left bank of the Rhine, north of Andernach, it extends for about 20 miles; but in the interior the breadth is in some places more, in others less than this. Rivers flow from it in all directions. On the northern slope near Münstereifel (a small town in the government of Cologne with about 1600 inhabitants), rises the Erfft, which flows with rapid course down into the low country, and enters the Rhine at Grimlighausen, a short distance above Düsseldorf. The Röer, or Ruhr, also flows down the northern slope, rising in the mountains between Malmedy and Montjoie; after reaching the low country it runs north-north-west past Düren and Julich, and, entering Belgian Limbourg, joins the Meuse on the right bank at Ruremonde, after a course of above 80 miles. Both of these rivers sweep down stones and gravel from the highlands; they are subject to frequent and sudden swells, and abound in fish. Their water-power is turned to some advantage in driving machinery. Before it leaves the Eifel the Roër receives on its right bank the Urst, which rises near Blankenheim, and passes *Gemünd*, a small town in the government of Aachen with about 1000 inhabitants, who manufacture woollen-cloth and leather. Not far from the source of the Roër rises the Warge, which flows westward past Malmedy, and throws itself into the Ambleve, a feeder of the Ourthe, in the Belgian province of Liège. The Ambleve itself rises a little south of the Warge, which it joins a little below Malmedy. ***Malmedy***, a town in the government of Aachen, stands on the Warge, and has about 4000 inhabitants. It is a quaintly-built place: the houses and gardens are all in the Dutch style. The town is famous for its manufacture of sole-leather: there are above fifty tanyards. It has also mineral springs; manufactures of woollen-cloth, lace, soap, potash, and glue. ***Montjoie*** stands in a marshy country between two high hills on the left bank of the Roër, and has a population of 3000, who manufacture woollen-stuffs, leather, and iron. A large, strong, and gloomy castle above the town is said to occupy the site of a hunting-seat erected here by Charlemagne: it is a fine specimen of a feudal fortress.

On the southern slope flows the Our, which passes Reuland and forms below this small town the boundary between Rhenish Prussia and the Dutch province of Luxemburg to its mouth in the Sure, a feeder of the Moselle. The Sure receives also from the Eifel the Prüm, which rises in the wildest part of the district. Just above its junction with the Sure the Prüm is joined by the Nims. The town of ***Prüm*** is in the government of Trèves. It is situated to the south of the Schneifel at the foot of a beautifully wooded hill, and has 2100 inhabitants. Its name is taken by corruption from that of the Benedictine Abbey of Ad Pratum, founded here in the 8th century, and in which Pepin, natural son of

Charlemagne, and the emperor Lothaire were monks: the latter died here A.D. 853. The abbey buildings were destroyed by fire in 1769, with the exception of a small portion which is now a school; the church near it, which is built in the Italian style, replaces the magnificent church of the abbey, of which no vestige remains. The road from Aix-la-Chapelle to Trèves passes through Prüm, and coincides at some points with the old Roman road from Trèves to Cologne, of which there are many traces south of Prüm. Near *Bitburg*, the ancient Bædæ Vicus, a town of about 2000 inhabitants, midway between Prüm and Trèves, a Roman villa, in excellent preservation, and two Roman milestones, set up in the reign of Hadrian, have been disinterred.

Southwards also, and from near the source of the Roër, flows the Kill directly into the Moselle a little below Trèves. At Gerolstein, a picturesque little town of 600 inhabitants, on its left bank, the river runs between cliffs of limestone and dolomite. Near the town are an old castle, a dry crater, the surface of which is cultivated, several old lava streams, caverns, basaltic rocks, and mineral springs. Fossil shells and corals are found strewed over the fields at Auberg, in the neighbourhood of Gerolstein. Olivine and glassy felspar are found about the dry crater of Dreiser Weiher, about six miles east of Gerolstein.

Further east, but still on the Moselle slope of the Eifel, flow the Lieser, the Ues, and the Elz. The Lieser passes Daun and Witlich (2600 inhabitants), and enters the Moselle at the town of Lieser, which has a population of about 1000. At the village of Daun, which has an old castle (the family residence and birth-place of Marshal Daun, who led the Austrian armies in the Seven Years War), there are three maare, or crater lakes, separated from each other by a narrow partition of slaty rock. To the southward of Daun and on the left bank of the river, is the village of Manderscheid, famous for its old castle and for the beautiful maare in its neighbourhood. On the hill of Mosenberg near it are four volcanic cones of slag, from one of which a lava stream descends to the valley of the Lieser. The Meerfelder maare is about 100 fathoms deep, and the Pulver maare, one of the largest and most beautiful of the crater lakes in the Eifel, is 330 feet deep in the centre. The village of Strötzbusch is built in a dry crater.

The Ues or Iss, which has an old Celtic name, rises near Kelberg, and enters the Moselle at the pretty village of Alf. It flows with many windings and contortions down a valley distinguished for its varied scenery, for the umbrageous foliage of its woods, for its conical hills, and basaltic cliffs. The junction of the clay-slate and lava is distinctly seen at several parts of the valley. In the vale of the Issbach, as the Germans call this small river, are iron-works and the mineral baths of Bertrich.

The Elz rises not far from the source of the Ues, and flows south-east down a wooded gorge, in which it makes innumerable windings, bounding from side to side against the cliffs that screen it on either hand, and enters the Moselle at the little village of Mosel-Kern. The Elz forms some pretty cascades, and passes the castles of Pyrmont and Elz. The Elz-Schloss is one of the most picturesque and best preserved old feudal fortresses in Europe; it begins to yield to decay but is still inhabited. On the opposite rock stands the rival castle of Trutz-Elz, erected by the Bishop of Trèves, against the lords of Elz. The castle of Pyrmont was burnt by the Swedes in 1641. Between the mouths of the Ues and the Elz, on the left bank of the Moselle, stands the town of *Kochem*, prettily situated on a hill, with two old castles frowning from the adjacent heights. Although a pretty object from the Moselle it is a very dirty place. Population about 2500.

On the eastern slope flow the Nette and the Ahr. The Nette rises to the east of Adenau, and runs first to the south-east and then eastward into the Rhine a little above Andernach, which town has been already noticed. [ANDERNACH.] The Ahr (Aar) rises near Blankenheim and running eastward through a valley abounding with wild and most picturesque scenery, past Altenahr and Ahrweiler, enters the Rhine between Remagen and Sinzig. In the upper part of its course the Ahr is joined on the left bank by the Adenau near the small village of Dumpelfeld. On the basalt-capped hill of Landskrone in the Ahrthal, are ruins of a castle built by the emperor Philip of Hohenstaufen in A.D. 1205. The Ahr is celebrated for its minnows, trout, and craw-fish. A fine road runs up the valley and in parts is carried by tunnels through the rocks. *Adenau*, is a small town of 1200 inhabitants, at the foot of the Hope-Acht. *Ahrweiler*, is a pretty walled town entered by four gates, and has about 2500 inhabitants, who are chiefly engaged in the growth of the vine. It is the centre of the wine trade of the valley, and has a beautiful gothic church erected in the 13th century.

The Brohlbach, a small feeder of the Rhine, enters that river at Brohl, a small village, midway between the mouths of the Nette and the Ahr. The stream at Brohl drives a paper-mill and several trass-mills, in which the volcanic tufa, quarried in the neighbourhood, is ground for export to Holland; the tufa, reduced to dust, is used by the Dutch for subaqueous cement (tras or trass), as it hardens under water. In the tufa quarries in the valley of the Brohl, land shells and trunks of trees reduced to the condition of charcoal, are found imbedded. Mineral waters, resembling Seltzer, are got from springs in the valley of the Brohl. A little north of Brohl is the castle of Rheineck, recently purchased and repaired by Professor Bethmann Hollweg, of Bonn. *Sinzig* is a small ill-built walled town of about 1600 inhabitants, with an interesting gothic church, erected in the beginning of the 13th century; an adjoining chapel contains a natural mummy, which was carried away to Paris when the French extended their frontier to the Rhine, but was restored at the peace. Sinzig occupies the site of the ancient *Sentiacum*, near which the cross with the inscription 'In hoc Signo vinces,' upon it, it is said, appeared to Constantine when marching towards Italy against Maxentius. The ancient Roman road along the left bank of the Rhine nearly coincides with the present diligence road between Bonn and Coblenz. *Remagen*, a small place of 1400 inhabitants, occupies the site of the ancient *Rigomagus*. Roman antiquities have been found here.

About 5 miles inland from the mouth of the Brohl, is the large and beautiful crater-lake of Laach, or Laacher-See, which is 666 feet above the Rhine, of nearly elliptic shape, 2 miles long and about a mile and a half broad; its depth increases towards the centre where it is 214 feet deep. The lake is hemmed in on all sides by a ridge of hills covered with wood down to the water's edge. It is supposed to occupy the crater of a volcano. A stream of carbonic acid gas issues from an opening on the north-east side of the lake; and in a neighbouring pit bodies of birds have been found killed by the noxious vapour, which circumstance has given rise to a popular notion similar to that connected with Avernus in Italy, that no bird can fly over the Laacher-See. The lake is fed by numerous springs beneath its surface, which keep its basin always full. Its waters are clear, deep-blue in colour, very cold, but never freeze; and abound in fish. It has no natural outlet, but its superfluous waters are carried off by an underground emissary nearly a mile long, cut in the 12th century by the Benedictine monks of the now ruined abbey of Laach, which is a little south-west of the lake. The shores of the lake are covered with masses of scoriæ, cinders, ashes, pumice, and other volcanic products. Laach abbey, or Kloster-Laach as it is called, was suppressed at the time of the first French revolution. Part of the old buildings that remain is now converted into a farm-house; the church, a beautiful specimen on a small scale of the round-arched gothic, erected in the early part of the 12th century, has been purchased in order to its preservation by the Prussian government. The gardens of the abbey, the lake, and village of Laach, are favourite places of resort with the inhabitants of Coblenz. Between the lake and the Nette are the famous millstone quarries of Nieder-Mendig which have been worked in the hard porous lava for 2000 years. The lava stream in which these quarries lie is 5 miles long and 3 miles broad. The lava separates into gigantic columns, some of which are left by the quarrymen to support the roof; there are vast caverns in it, probably the result of ancient excavations. At *Mayen*, a picturesque old town, on the Nette, with about 3000 inhabitants, defended by a castle and surrounded by walls and gardens, there are several millstone quarries, a paper-mill, tan-yards, and mineral springs. To the geologist, the botanist, and lover of the picturesque, all the southern and eastern part of the Eifel is extremely interesting. Besides the Lacher-See no less than 27 maare, marking as many extinct craters, exist between the Nette and the Ahr.

The climate of the table-land of Eifel is damp, and much colder than that of the plain of the lower Rhine; cold mists very frequently hover over it. In all Prussia there is no district so poor in arable land as the Eifel. The rugged surface of the region is covered with wild heath or swampy bog, the thin coating of the soil not affording nourishment for the roots of the trees. Some parts of it however, as before stated, are clothed with forests. This is especially the case in the districts covered with volanic deposits. The chief species of forest trees are beech, oak, and fir, which are grown for the supply of fuel and timber. The valleys and glens are all inhabited, and in these the population is gathered into small towns, villages, and hamlets, most of which have sprung up under the frowning protection of some feudal castle, and a few in the neighbourhood of ancient monasteries. On the rapid slopes along the Ahr valley and towards the Rhine, vines and fruit trees yield valuable crops; here every piece of cultivated land is covered with walnut, apple, pear, or cherry trees. The wine of the Ahrthal is of excellent quality. The commune of Rübenach draws a revenue of 10,000 francs annually from Coblenz for cherries alone. Walnuts are a favourite crop on the hills but not in the valley bottoms, where it is said, the leaves of the walnut tree injure the soil. The nuts are preserved for oil. Apples and pears are sliced and strung upon pack-thread to serve as vegetables with meat in winter. The fruit of the valleys of the Eifel is good generally; but the apples and pears grown on the Moselle slope are particularly delicious, and not surpassed by those of any region in Europe. The corn crops of the region are necessarily restricted in quantity; the deficiency is supplied from the neighbouring districts.

The region of the Eifel is exposed to a phenomenon called Wolkenbruch, or Cloud-Burst, being a sudden discharge of water, which brings sudden destruction on everything that it may strike; trees are rooted up and hurled down by suddenly formed torrents; cattle, houses, soil, and crops are swept away. A cloud-burst of this description destroyed the greater part of Münstereifel in 1818.

The principal roads through the region of the Eifel are those from Aix-la-Chapelle to Trèves, and from Coblenz to Bonn; the high road up the left bank of the Moselle from Coblenz to Trêves, and the new road up the Ahrthal to Trèves. There are also numerous cross-roads, but most of them are bad. The great Roman road made by Agrippa from Trèves to Cologne traversed the western part of the Eifel. Along it were numerous post houses (mutationes) and six 'mansiones,' serving as military posts and hotels. Bædæ Vicus, now Bitburg, was one of these 'mansiones.' *Zulpich* (population 1200), near the Nassel, a feeder of the Erft in the plain, at the northern base of the Eifel, was another of the mansiones, and was called *Tolbiacum*. The road is still in a perfect state at Zulpich. Remains of an aqueduct, which ran parallel to the road, and along its whole length, to supply the stations with water, are still visible at ten or a dozen different places between the two cities. The road along the left bank of the Rhine, between Remagen and the precipitous projection of Rolandseck, which is composed of prismatic basalt, and is crowned with the ruins of an old castle, is cut in the rock. In making this part of the road several Roman remains were found. Connected with Rolandseck is the circular crater of Rodersberg, which is a quarter of a mile across and 100 feet deep; its sides, which are composed of tufa and scoriæ, are cultivated. The castle of Godsberg, a town of about 1000 inhabitants, a short distance north of Rolandseck, is an interesting object on the road and from the Rhine. Between Godsberg and Bonn, at the north-eastern extremity of the Eifel, are the coal and alum mines of Friesdorf. The coal is of the kind called lignite or fossil wood, and has evidently resulted from the subsidence of some primeval forest; fossil fishes, fresh-water shells, and very fine potters' clay are also found in these beds.

As the Eifel is a popular and not an administrative division of Rhenish Prussia, we have no means of stating its population. The region is divided between the three governments of Aachen, Coblenz, and Trèves. The inhabitants are less polished than their lowland neighbours, in their dress rather slovenly than neat, and their houses are in general rudely constructed. Iron and lead mines are worked near Gemund. The manufactures are unimportant, with the exception of leather. The chief exports are millstones, trass, wine, and fruit. The inhabitants are almost all Roman Catholics. Eifel is said to be an old German name for the Ardenne, of which region the Eifel is in reality a part.

EJECTMENT. The action of ejectment [EJECTMENT] in which *John Doe* was generally the nominal plaintiff, and *Richard Roe* the nominal defendant has been abolished, and a new and simpler mode of proceeding substituted for it. *John Doe's* suit was attended with one great disadvantage: it could only be followed out during term; so that, if a right to lands in Yorkshire accrued on the 1st of June, the person entitled was unable to bring his adversary into court before the following November, or in case of a defence, to proceed to trial before March in the following year. The fictions on which the old action was founded were also considered objectionable, and accordingly, when the procedure of the Superior Courts of Common Law was reconstructed in the year 1852, a new mode of proceeding for the recovery of land was created, which however possesses the one distinguishing peculiarity of the old action, that in it no question can be raised except that of *title*.

This new action is commenced by the issue of a writ, directed to the persons in possession by name, and to all persons entitled to defend the possession of the property claimed; and commands the persons to whom it is directed to appear within sixteen days to defend the possession of the property claimed, a notice being added, that, in default of appearance, they will be turned out of possession. This writ is served on the tenant in possession, or, in case of a vacant possession, by posting a copy thereof upon the door of the dwelling-house, or other conspicuous part of the property. Every tenant served with a writ must give immediate notice thereof to his landlord, under the penalty of forfeiting three years' rack rent of the premises held by him. The object of giving the landlord notice is, that he may be permitted to defend, which he has a right to do, for frequently the tenant has no interest in the premises beyond the temporary possession. A mortgagee, a devisee in trust, or an heir, will also be permitted to defend the possession; for possession has now become the very essence of property, twenty years' uninterrupted possession constituting a title good against all the world.

If no appearance be entered, the claimant obtains judgment to recover possession of the land claimed; to which he by the writ asserts his right. By entering an appearance, the tenant, or the landlord, or any other person admitted to defend, denies that right. The parties are then at issue on the question of *title;* and the next thing to be done is for the claimant to prove his alleged right to a jury on the trial, which must take place, in all ordinary cases, in the county where the property is situated; the proceedings at and after the trial being the same as in ordinary actions.

Such is the modern way of trying the *title* to lands and tenements. It is founded on the same principle as the ancient writs of assize, being calculated to try the mere *possessory* title to an estate; and has succeeded to those real actions, as being infinitely more convenient for attaining the end of justice. It has on the same principle been rendered a very easy and expeditious remedy to landlords whose tenants are in arrear, or who hold over after their term has expired or been determined. The Common Law Procedure Act (re-enacting 4 Geo. II. c. 28) enables a landlord who has a right of re-entry in case of non-payment of rent, when half a year's rent is due and not sufficient distress is to be had, to serve a writ of ejectment on his tenant, or fix the same upon some notorious part of the premises, which shall be valid, without any formal re-entry or previous demand of rent. And a recovery in such ejectment is final and conclusive, both in law and equity, unless the rent and all costs be paid or tendered within six calendar months afterwards. The same statute (re-enacting 1 Geo. IV. c. 87), enables a landlord, on serving a writ of ejectment on a tenant holding over after his term has expired or been determined, to give him notice that he will be required to give bail (if ordered so to do by the court or a judge), conditioned to pay the costs and damages to be recovered in the action. If bail is thereafter ordered to be given, and the tenant fails to do so, the claimant obtains immediate judgment for recovery of possession and for his costs. In ejectments also between landlord and tenant the claimant may go on, after proving his right to recover, to give evidence of the mesne profits, and the jury shall thereupon give their verdict on the whole matter, both as to the title and mesne profits; so that in such cases a second action for mesne profits is unnecessary. Besides these remedies a landlord may, in cases where the rent or value of the premises does not exceed 50*l*., and no fine has been paid, proceed in the County Court (19 & 20 Vict. c. 108, ss. 50-56). And if the rent does not exceed 20*l*., and no fine has been paid, he may proceed summarily before the justices in petty sessions. (1 & 2 Vict. c. 74.)

(Blackstone's 'Commentaries,' Mr. Kerr's edition, vol. iii., p. 210.)

EKEBERGITE. [Mineralogy, *S.* 1.]

ELÆOLITE. [Mineralogy, *S.* 1.]

ELAIDIC ACID. [Chemistry, *S.* 2.]

ELALDEHYDE. [Chemistry, *S.* 2.]

ELANUS. [Falconidæ.]

ELAPHUS. [Deer.]

ELASTIC TISSUE. The elements of Elastic Tissue are cylindrical or band-like fibres with dark contours, very minute, and when present in large numbers they exhibit a yellowish colour. Hence it has been called Yellow Tissue. The fibres acquire sometimes little cavities in particular spots, which give these fibres a striated appearance, as seen in the giraffe. The elastic tissue is rarely found in large masses, but is very frequently mixed with areolar tissue, either in single fibres or in networks of various kinds. The organs into which this tissue enters, and constitutes their special feature, are:—

1. The elastic ligaments, in which the tissue, with only a slight admixture of connective tissues and hardly any vessels and nerves, exists, so to speak, in a pure form. Of these we have examples in the ligamentum subflava of the vertebræ, the ligamentum nuchæ, the ligament of the larynx, and stylo-hyoid ligament.

2. The elastic membranes which appear either in the form of fibrous networks or of fenestrated membranes, and are found in the walls of the vessels, especially in those of the arteries, in the trachea and bronchia, and in the fascia superficialis.

(Kölliker, *Manual of Histology*, translated by Busk and Huxley for the Sydenham Society.)

ELECTION. The proceedings on the election of knights and burgesses to the Commons House of Parliament have formed the subject of several recent statutes; all of them, more or less, directed to obtaining what is called 'purity of election.' With this view, the elections, alike in counties and boroughs, must now be completed in *one* day, so that neither time nor opportunity may be allowed of extensively tampering with the voters. The merely formal proceedings are still taken under the original Reform Acts; but the *bribery oath* can no longer be administered to a voter. In order, however, to restrain bribery, treating, and intimidation, the returning officers are now required annually to appoint *election auditors*, through whom alone can accounts in respect of the election be paid by the candidates. Stringent provisions have been made for inquiring into charges of corrupt practices, by Committees of the House, sworn to the performance of their duties. Bribery, if proved, involves the disqualification of the elector, and the unseating of the member chosen, if the charge is brought home to him. The candidate is required to appoint his own agents, in writing, so that they may be known; and to send all accounts and a note of all his disbursements to the election auditor; which, when audited and paid through the auditor are to be published in the local newspapers. It may be added here, however, that both the method of proceeding at elections, and the principles which ought to guide legislation on that subject are at present quite undetermined, the recent Acts of Parliament being only of temporary operation and of an experimental character. (Blackstone's 'Commentaries,' Mr. Kerr's edition, vol. i. p. 166.)

ELECTRIC TELEGRAPHS. In the previous Supplement a full account of the discovery and of the application of the electric telegraph was given. [Telegraph, Electric.] All that remains now is to complete the account by a statement of its more important improvements, and more especially of the widely-extended transmission of messages by submarine telegraphs, bringing the most distant countries into almost immediate connection.

At the present time almost every important town in Great Britain, with the exception of Inverness in the far north, and Falmouth in the south-west, is furnished with means of telegraphic communication to other towns. As fast as any new railways, whether trunk or branch lines, are opened, so surely is the telegraph now laid down; insomuch that the length of telegraph is nearly coincident with the length of rail. The exceptions to this rule are so few as scarcely to disturb the simplicity of the rule itself. From Cornhill, from Charing Cross, from the government offices, and from numerous other places in the metropolis, messages are every day being quickly flashed to Aberdeen in one direction, to Liverpool in another, to Dover in a third, to Southampton in a fourth, to Plymouth, to Milford Haven, to Holyhead—indeed, to almost all of our outports, and to nearly every inland town of any commercial pretensions. A system is everywhere acted on that the principal railway stations shall at the same time be telegraph stations, some of the wires being for public use, and the others for railway use. The charges have been gradually lowered, to the great advantage of all parties; and the messages now sent are of countless variety—the price of funds, the state of the markets, orders to purchase, the arrival of ships, the receipt of important news, the Queen's speeches, the result of elections, the divisions in a debate, the running of a race, the progress of the Court while travelling, the state of the weather, the verdict of an important trial, the sending for a doctor, the detection of a thief or murderer, inquiries after health, announcements of illness or of death, inquiries after lost luggage—these are only some of the open or confidential communications intrusted to the copper wires.

In most parts of England the wires, as from the commencement of the system in this country, are supported on poles at a height of several feet from the ground; but in a few cases, such as along the mail-coach road from London to Dover, a subterranean arrangement has been adopted: the wires being encased in a wooden trough, and deposited a foot or two beneath the surface of the ground. This arrangement is also adopted in the streets of London, and of other large towns.

An interesting use of the sub-way telegraph may be here noticed. In proportion as the use of Greenwich time has become familiar on all the English railways, so has it become important to ascertain this time with precision, in such a way as to enable all the station-clocks to be regulated thereby. This is one purpose of the new time-ball in the Strand. The Electric Telegraph Company, the South-Eastern Railway Company, and the Astronomer Royal, have acted in conjunction in the establishment of this plan. A subterranean wire has been carried from the Observatory, through Greenwich Park, and across Blackheath to the Lewisham station of the North Kent Railway; thence to the London Bridge station; and thence to the Telegraph office in the Strand. At the top of this office has been erected a hollow shaft, up the interior of which the electric wire is carried, and a large light ball, capable of moving eight or ten feet vertically, slides easily up and down near the top of the shaft. At ten minutes before one o'clock each day the ball is raised nearly to the top of its shaft or spindle; and at five minutes before one it is raised quite to the top. At one o'clock precisely, exact to a single second, the great or master-clock at Greenwich Observatory puts in action a small piece of mechanism which sends an electric shock through the wire to the Strand; the wire at this end is connected with another piece of mechanism, which releases the ball and allows it to fall suddenly. The ball falls upon a kind of piston in an air-cylinder, so as to break the force of the concussion. As this ball is 130 feet above the level of the Thames; as it is six feet in diameter, exhibits bright colours, and falls through a considerable space, its descent can be seen for a great distance on all sides; and all who choose to regulate their clocks and watches by this standard can do so. An electric clock with four dials, illuminated at night, has been put up on a pillar in front of the office; it indicates Greenwich time at all hours. The various railway stations receive their time from the Strand office, which is the medium of communication from the Greenwich Observatory. There can be little doubt that these arrangements will contribute powerfully to the adoption of Greenwich time in church clocks and other public clocks. So useful is this considered to be, that a plan has been under consideration for erecting an electric time-ball on the summit of the South Foreland; the descent of such a time-ball, at one o'clock each day, could be witnessed by the captains of ships many miles out in the Channel, who could regulate their chronometers by this means, as the time-ball would show Greenwich time. It was also proposed that the electric current should fire off a gun at the same time and place, so that the sound might be heard if the descent of the ball could not be seen.

In the English telegraphs, the wires employed are usually about one-sixth of an inch diameter, covered by a galvanic process with a thin coating of zinc, to prevent oxidation. Four miles of such wire weigh about a ton. The supporting posts are about sixty yards apart, with connecting pieces of porcelain or other non-conducting material, so that the wire may not touch the wood itself; the connecting pieces themselves being sheltered from rain by a small overhanging roof. At intervals of a quarter of a mile are winding-posts, with apparatus for screwing up the wires to the proper degree of tightness, and joining the several lengths together. The great number of wires which we see along the chief lines of railway are not all necessary for transmitting one message; a single wire will effect this; but many are required to keep up correspondence of different kinds, and with various stations.

The 'needle telegraph,' as it is called, is still the one generally used in this country; that is, one in which, instead of pressing down the keys of a finger-board, the manipulator works two handles; these handles govern two needles or indices, the relative positions of which indicate letters and words. The action of the machines was sufficiently described in our former article. [TELEGRAPHS, ELECTRIC.] Improvements have been since introduced, but the principle is in its general features such as Messrs. Cooke and Wheatstone made it many years ago. The Electric Company have purchased many patented inventions and machines, to be used subsidiary to the needle-telegraph.

Much as there has been of litigation in England concerning electric telegraphs and their patentees, it bears no comparison with that of the United States, where the system is developed with so much more completeness. The telegraphs principally employed in that country are those of Morse, Bain, and House; and it is chiefly the owners of Morse's patent rights by whom the legal proceedings have been carried on. In one trial in 1851 the evidence extended over a thousand printed pages; and in several other trials it extended to many hundred pages—containing the opinions of a vast number of persons concerning the priority of certain inventions. Between 1837 and 1849, Professor Morse took out seven patents, under the powers of which many thousand miles of telegraphic wire have been laid down.

Bain and Morse both employ a method which, for familiar illustration, may be characterised as nearly the same; and we will therefore briefly describe Bain's. Let us suppose a message to be sent one hundred miles, from one station to another. The letters of the message are separately transmitted, by means of a key-board or a set of handles; or at least a series of impulses, which may be made to represent letters. At the other end of the wire, a small needle or metallic point has slight reciprocating movements given to it by the impulses: and it presses upon a strip of chemically-prepared paper which slowly moves onward by means of clock-work. At the instant of contact, the paper becomes discoloured by a chemical action between it and the iron; these discolorations appear in the forms of dots and short lines, certain combinations of which are understood to represent the letters of the alphabet. A permanent record of the message is thus preserved—in a cypher which requires to be translated into English for the use of all except the telegraph officers.

There are many patented systems in England, Germany, and America, bearing some analogy to those of Bain and Morse. Mr. Rogers, of Baltimore, substitutes a pen for a needle or point, a brass disc for a paper strip, and a kind of ink for the chemical preparation in the paper. The pen is dipped in the ink, which becomes decomposed on contact with the brass; a superficial stain is produced on the metallic surface, which is easily obliterated by friction. In some of the contrivances, a strip of plain paper is bedded upon a cushion of some soft substance; and the dots and lines are effected by indentations with a blunt point on the paper, instead of chemical stains in the paper itself.

House's printing telegraph, in use on many of the American lines, is a beautiful contrivance; for it actually prints the message with ink in the familiar Roman character. When the impulse for each letter has been sent along the wire, it affects the movements of a type-wheel, which is made to press against a slip of blackened paper; beneath this is a strip of white paper; and an impression of the Roman letters becomes transferred to the white paper. Letters can be thus transmitted and printed at the rate of a hundred and fifty or two hundred in a minute. Mr. Bakewell and other inventors in England have put in practice printing telegraphs more or less resembling this by Mr. House.

It is said that House's system is capable of transmitting more words in a minute than either of the other two principal American systems; but to balance it a great deal of time is consumed in adjusting the instrument. There is a fallacy in some of the statements respecting the rapidity of telegraphing which deserves to be borne in mind; Mr. Bain's 'fast method' enables one thousand letters to be transmitted per minute; but the process of preparing the message requires about as much time as the transmission by the ordinary method. It is said, that in the ordinary every-day working, the American rate of transmission averages from seventy-five to a hundred letters per minute. On one particular day in the spring of 1852, Bain's line transmitted 500 messages, besides 5000 words of foreign news, from Boston to New York.

Remarkable and valuable as is the degree of rapidity already attained, there are many reasons to wish for still greater speed in transcribing the messages than that at present attainable. To effect this end, Mr. Bain introduced a method different from those above mentioned. He prepared continuous slips of paper, about a quarter of an inch in width, and perforated them with holes and slits, to represent the dots and lines of his alphabet; the passing of a metal point, alternately over the paper and over the holes in the paper, broke and re-made the galvanised circuit with great rapidity; and in order to aid the work, Mr. Bain invented an ingenious machine for punching the holes in the paper. The actual transmission was very rapid: but by the time the punching and the subsequent translation into English were completed, not much time was gained over the ordinary methods.

In relation to the wires linking Great Britain with other countries, the submarine principle has been brought very remarkably into operation. Beginning at the north, and working half round the island, we first meet with the Portpatrick and Carrickfergus cable (24 miles) dipping between the North Channel of the Irish Sea, and connecting Scotland with Ireland. At one end it joins two land-telegraphs, one from Portpatrick through Stranraer to Ayr and the centre of Scotland; the other through Stranraer to Dumfries and the net-work of British lines. At the other end the cable is connected with wires running along the Irish railways. Without any difficulty a message is sent from London to Ireland *viâ* Dumfries without regard to circuitousness of route; for the electric current recks little of distance. Next comes the Holyhead and Dublin cable (64 miles), joined at one end to the Welsh and English lines of telegraph, at the other end to the Irish lines. In the south is the Hants and Isle of Wight cable, not very important commercially, but establishing electric communication with her Majesty's marine residence at Osborne: it is connected at Hurst Castle with a land-wire running through Lymington to the Brockenhurst station, and at the other end with a land-wire passing through Yarmouth to Osborne. Farther east is the Dover and Calais cable (22 miles), connected at the two ends with the systems of telegraphs belonging to England and France respectively. Another is the Dover and Ostend cable, connecting England with the Belgian and European wires generally. Lastly, there is the Orfordness and Hague cable, joined at one end to a land-wire running to the Ipswich station, and connected at the other with the Dutch telegraphs. All these cables are thicker than that intended for the Atlantic, presently to be described; and all have had occasional mishaps; but taking them collectively, they afford a remarkably complete series of channels through which messages may be exchanged between Great Britain and all the neighbouring countries. The salt-water, the storm-tossed ocean, have been pretty nearly conquered by the ingenious men engaged in these operations; and now the English public hear with as little surprise of messages or *telegrams* (to use a new word concerning which Greek scholars have been carrying on a fierce battle) brought under water as if brought on dry land.

Directing attention next to the continent of Europe, we find telegraphic wires ramifying in all directions. Nations were never more struck with the wonders of the electric telegraph than on the occasion of the death of the Czar Nicolas in 1855. On the 2nd of March the Earl of Clarendon announced in the House of Lords that the Czar had died at St. Petersburg at one o'clock on that same day. Two distinct messages had been received, one *viâ* Berlin and the Hague, the other *viâ* Berlin and Ostend, both communicating a message telegraphed to Berlin from St. Petersburg, and all in four hours after the actual death. Not only have the dreary wastes of Russia been brought within the civilising influence of the bit of copper wire, but lines in all directions have been laid, with or without regard to railways. Nearly all the chief cities in Europe are now linked together. Circuitous as is the route from London to Trieste, going through Belgium, Prussia, several minor German States, Saxony, Bohemia, Austria, and Istria, the connection is nevertheless complete; and telegrams are twice a-month transmitted to us relating to Indian affairs, brought to Trieste from Alexandria. Italy, in railways and in telegraphs, is in arrear of Austria; and Spain is lower on the list than Italy. Turkey, to the great astonishment of many of the Osmanlis, has been made a sharer in the fast-going, high-pressure operations of the age: she possesses an electric telegraph, extending from the Austrian frontier to Constantinople; and messages can now be flashed from London to the seat of the Ottoman empire. During the Russo-Turkish war, an electric cable 300 miles in length was sunk in the Black Sea from Varna in Bulgaria to Kamiesch in the Crimea, there to be available to the allied generals engaged in the operations around Sebastopol: it was one of the many contributions of peaceful industry to dread war. The Czar Alexander and the Sultan Abdu-l-Medjid, now that hostilities have ceased between them, might, if so disposed, exchange friendly telegrams; for there is an uninterrupted copper wire extending all the way from the capital of the one to that of the other, passing in its route through Berlin, Dresden, and Vienna. Nay, if business or pleasure suggested it, a dozen emperors and kings, seated in a dozen capitals, might exchange greetings all in one day, or perhaps in an hour or two, and might make a score of petty princes sharers in the achievement.

We pass now to the routes for traversing the Mediterranean by telegraph. The two islands of Corsica and Sardinia, belonging to two energetic sovereigns, have been connected by telegraph with the French and Sardinian continental dominions: land-wires on the islands themselves, and submerged cables from Sardinia to Corsica and from Corsica to France. This being done, the grand question arose—how to span the broad Mediterranean, so as to connect Europe with regions far beyond. Glancing at a map, we see that the southern end of Sardinia makes a tolerably near approach to the northern coast of Africa, at a point in the pachalic of Tunis. We also see that Sicily, Malta, the Ionian Islands, and Candia, form spots of dry land which might be used as resting places for separate lengths of submarine cable, should commercial and other reasons justify the adoption of such plans. A company, aided by the Sardinian Government, has been formed, which has laid down a submarine cable on the first of these two routes. From Sardinia to Malta, and from Malta to Corfu, it was found that the water is of much less depth than in the line of route from Sardinia to Africa; and as these islands lie in the way towards the Levant and Egypt, an enterprise was commenced to connect the various islands by a chain of telegraphic links. The whole of this line, 450 miles from Sardinia to Malta, and 350 miles from Malta to Corfu, has been completed; and there is a project on the part of the Austrian Government to extend their land-telegraph from Trieste to Ragusa, to lay down a submarine cable from Ragusa to Corfu, there to join the line just described, and thence to extend it to Alexandria, with or without stopping at any intermediate island. The Mediterranean cables, actual or proposed, may thus be classed in four groups: from Spezzia in the Genoese State to Cagliari in Sardinia, promoted and supported by the Sardinian Government; from Cagliari to Africa, by the French Government; from Cagliari to Malta and Corfu, by the English Government; and from Trieste to Corfu and Alexandria, by the Austrian Government.

Next, a few words must be said concerning the rival projects for connecting Asia with Europe by telegraph. Supposing all the attempts in the Mediterranean to succeed (and succeed they probably will after a time), there will be one terminus of electro-communication on the north coast of Africa, another at Corfu, and a third at Constantinople; and the question then arises—how best to apply the system to Asia. Two projects have been competing for public favour during 1857 and 1858—the Red Sea and the Euphrates routes. The first of these comprises a submerged cable along the Red Sea, to be connected at Aden either with a land-wire or a submarine cable to India; while the other starts from Syria or from Asia Minor, and follows the valley of the Euphrates through Mesopotamia to the Persian Gulf and the Indian Ocean, thence to be prolonged, whenever convenient, to India. The promoters of the Red Sea telegraph advocate its merits somewhat in the following way. There would be a land line of 240 miles from Alexandria to Suez; and then a submerged cable of 4200 miles from Suez to Kurrachee in India in two lengths, joined at Aden as a resting-point. Between Suez and Aden there would be three resting-points on land, at Cosseir, Juddah, and Camaran; while there would be three others between Aden and Kurrachee, at Ras Shurmah, the Kooria Mooria Islands (now a British possession), and Ras el Had, in the Imaum of Muscat's territory. The promoters say that 700,000*l.* in money, and one year in time, would complete this great enterprise; but that if the Indian Ocean section, from Aden to Kurrachee, were suspended for the present, and the Red Sea portion only attended to, 300,000*l.* in money, and eight months of time, would suffice to establish a telegraph from Alexandria to Aden. The promoters urge that they have obtained the necessary firmans from the Turkish and Egyptian Governments; that a cable plunged into the sea is freed from the difficulties of territorial politics; that plans are already made by other parties to connect Alexandria with Europe by a cable from Austrian and Sardinian ports; and that, even should these projects fail, the Red Sea Telegraph Company would undertake to lay down a cable of 800 miles from Alexandria to Constantinople—in either case ensuring complete telegraphic communication from London to India. On the other hand, the Euphrates Company propose a land-wire of 1200 miles, starting from Constantinople, stretching south-eastward across Asia Minor, and thence to the Euphrates, or to Baghdad on the Tigris; then a river-cable to the Persian Gulf, and lastly, a submarine cable to Kurrachee at the mouth of the Indus—the two cables together being about 1600 miles, or 2800 miles of electric line from Constantinople to Kurrachee. The estimated coast is 400,000*l.*, and the time of completion six or eight months.

Having thus noticed the various projects for establishing electro-telegraphic lines to India, we must now say a few words concerning what has been effected in India. In 1852 Dr. O'Shaughnessy, after a series of preliminary experiments, was empowered by the East India Company to establish a magnificent series of telegraphs in that country. During the remainder of that year, and the whole of 1853, he was employed in procuring from England the immense quantity of material required, and all the working apparatus. He commenced the actual construction shortly before the end of the year just named, and on the 24th of March, 1854, he sent a message through 800 miles of wire from Calcutta to Agra. Proceeding energetically with his labours, Dr. O'Shaughnessy was able to announce that, on the 1st of February, 1855, only about fourteen months after his commencement, he had finished the whole trunk line from Calcutta through Agra, Delhi, and Lahore, to Attock on the Indus; a branch from Agra to Bombay; and another from Bombay to Madras—the whole extending to 3050 miles, and including 41 offices or telegraph stations. During the remainder of the year 1855 the lines were extended from Attock to Peshawur on the Afghan frontier, from Rangoon to Meeaday on the Burmese frontier, and from Bangalore to Ootacamund—extending the total length to 4000 miles. During 1856, and so much of 1857 as was uninterrupted by war, other lines were executed, raising the length to more than 5000 miles. Throughout Central India the engineer was opposed by enormous difficulties; there was no metalled road; there were few bridges; the jungles are in many places deadly for at least half the year; and there was no police for the protection of the wires. More than seventy principal rivers have been crossed, some by cables, others by wires extended between masts; the Toonbuddra crossing was two miles wide, and that of the Soane more than three miles. Throughout three-fourths of the distance from Calcutta to Madras the telegraph is more substantial than any known in Europe or America; for 174 miles the wire is borne on masonry pillars capped with granite; while for 332 miles it is supported on superb granite slabs, each 16 feet high. The whole expense has, nevertheless, been kept within 50*l.* per mile.

Viewing the state of telegraphy on the other side of the Atlantic, we come to that which almost baffles calculation. In the United States the railways have been ramified in all directions, but the telegraphic wires have far outstripped them in length. The Americans, having millions of acres that belong to no one, or that are of very slight value, set up their telegraphic poles and stretch their wires in spots where no such achievements are dreamed of in England. Across swamps, through forests, over rivers, across prairies, over mountains—nothing stops them, and as the engineers and companies care little about strength or symmetry, the telegraphs are set up with wonderful cheapness. Cheapness of telegraph leads to cheapness of telegram; and the Americans avail themselves much more than the English of this sort of silent converse.

Atlantic Telegraph.—The effort to establish a telegraphic communication between England and the United States so far transcends every previous undertaking of the kind that we deem it advisable to describe the operations in some detail, and for this purpose avail ourselves of a communication with which we have been favoured by a gentleman intimately acquainted with the whole course of the proceedings.

A company having been formed in 1856 for the purpose of connecting the two countries by a line of electric telegraph, under the title of the Atlantic Telegraph Company, and the requisite capital having been subscribed, the Governments of Great Britain and the United States agreed not only to pay each to the Company a subsidy of 10,000*l.* a year, for 25 years, but to assist the undertaking, by furnishing the men and ships which should be required in the laying of the cable. The preparation and perfection of the electrical details of the work were left in the hands of Mr. Wildman Whitehouse. Three gentleman who had practical experience in the work of marine telegraphy, Mr. Canning, who submerged the Newfoundland cable, Mr. Woodhouse, who connected Balaklava and Varna during the Russian war, and Mr. F. C. Webb, who had the charge of the line between Orfordness and the Hague, were associated with Mr. C. Bright, in preparing the engineering appliances for the submergence of the cable, the manufacture of the paying out machinery being intrusted to Mr. Henry Clifford, under the superintendence of Mr. C. Bright. A company which had been incorporated by the legislature of Newfoundland in 1854, under the denomination of the "New York, Newfoundland, and London Telegraph Company," transferred all their rights to the Atlantic Company, securing to them the exclusive privilege of landing a cable upon the Newfoundland shores during fifty years, and upon the coasts of Nova Scotia during twenty-five years. Patent rights in apparatus which would be required in working the line, were also secured to the company by Messrs. Whitehouse and Bright.

Before the actual operations of the undertaking were entered upon it was deemed very important that the capability of transmitting an electrical current through a coated conducting wire as long as the Atlantic is wide, should be put to the test of direct experiments. Mr. Whitehouse had already availed himself of several opportunities furnished by the chance of lengths of cable being under construction, which had separate wires imbedded in the insulating gutta percha mass; the wires being so joined at their extremities upon the occasion of the experiments as to form continuous lines of conduction. In 1855 he was enabled to operate at Greenwich with an extent of 1146 miles. In the following year, with the co-operation of the Magnetic Telegraph Company, arrangements were made for the crowning trial in the persence of Professor Morse, he chancing to be in England at the time. The wires of this company extended under ground, and through the sea, from London through Dumfries to Dublin, along a course of 660 miles. They are also so numerous, and so connected with a wide system of ramifications, that, upon need, a length of some six thousand miles can be formed. Upon a pre-determined night, that of the 9th of October, ten gutta percha-covered insulated wires, each more than 200 miles long, were connected into a continuous circuit of more than 2000 miles. The conclave of experimentalists met at the offices of the company in Old Broad Street, London. A pair of Mr. Whitehouse's induction-coils were used to excite the wires, and the current was made to act through one of Professor Morse's ordinary recording instruments. Signals were distinctly telegraphed through the two thousand miles of wire at the rate of 210, 241, and 270 per minute! This result was deemed eminently successful, and as proving beyond all fair ground of question, that the transmission of an electric signal through a coated wire laid across the bed of the Atlantic was perfectly within the powers of science; for though the greater part of the cable employed in this experiment was subterranean rather than subaqueous, it is now well known to the initiated in these matters, that the two cases are, as nearly as possible, identical in all their essential characteristics and conditions.

During the preparation for the construction of the Atlantic cables, and indeed even more availably during its manufacture, Mr. Whitehouse was engaged in putting several important matters concerning the rationale of electrical action to the rigid questioning of experiment. Many of the results which were elicited through these investigations are of surpassing interest, and require to be alluded to as contributing notable passages to the pages of the history of electrical science. Foremost among the labours of the experimentalist, however, necessarily stood the completion of his instrumental means of research. He very soon found that the instruments which had been previously in use as measures of electrical force and speed were quite inadequate for the examinations he had entered upon. He consequently set himself to work seriously to remedy the defect.

The usual method whereby the force of an electrical current had been estimated hitherto, had been the placing a freely suspended magnetic needle near to, or within, a many-spired coil of the conducting wire. The degree of the magnetic needle's deflection from its position of equilibration, was then held to give the acting force of the current. This answered very well so long as only continuous currents of moderate intensity were under examination. When, however, the experimentalist came to deal with sudden and interrupted currents of high intensity, such as the streams are which the Atlantic telegraphists have to deal with, no steady deflection could be produced. The needle jerked fitfully and violently backwards and forwards with so much caprice that it defied the adroitness of the most skilful observer to get any intelligible indication of force out of its position or movements. This determined Mr. Whitehouse to dispense altogether in his investigations with the fitful and unstable needle, and to call in to his assistance, in its stead, that power which is fixed and stable beyond all other forces that are known to man. He resolved that he would literally *weigh* the available strength of the current; that he would put its strength in the scale, make terrestrial gravity determine the amount, and send in a record of the same in grains. The ingenious piece of apparatus whereby he accomplished this curious feat of *weighing* electrical action, Mr. Whitehouse named, when he had perfected the mechanical details of its construction, his *Magneto-Electrometer*.

Mr. Whitehouse's instrument for measuring the force of electrical currents consists of a delicate steel-yard suspended at each side by springs similar to those which are used for the support of the pendulums of clocks. The short end of the steel-yard is armed with a bar of soft iron, and at a short distance beneath this is placed another bar of soft iron, surrounded by a coil of fine silk-covered copper wire, and therefore capable of being converted into a magnet whenever a current of electricity is flowing through the coil. The strength of the artificially formed magnet depends on the power of the current which flows through the coil, and consequently a greater or less weight can be tilted up on the long arm of the steel-yard accordingly as the short arm is more or less powerfully attracted. By shifting weights along the steel-yard, by changing these weights for others of different mass, and by lifting the steel-yard itself to different distances from the artificially magnetised bar, so wide a range of mechanical adjustment is commanded that degrees of attraction can be accurately estimated from those capable of tilting up but a small fractional part of a grain, to those which can lift many thousands of grains.

Mr. Whitehouse also prepared an instrument which enabled him to compare the velocity of transmission of different currents of electricity through the same wire, or of the same current through different wires. This instrument consists of a pendulum, beating true seconds, connected with a voltaic battery, and of a ribbon of chemically prepared paper unrolled from a drum by a train of clock-work. The pendulum hangs upon a pivot, which is vertically one of the poles of the voltaic battery, and its rod is prolonged upwards into a sort of crest, which comes into contact with a spring right and left, as it swings to and fro. The springs, when not touched by the pendulum, press upon a metallic pillar, which is itself the other pole of the voltaic battery. The crest of the pendulum lifts the spring, which it touches for the time, from the pillar. When it lifts the right spring it sends an electrical current out through it and any conducting wire placed in communication, and back through the left spring to the central pillar and connected pole of the battery. When it lifts the left spring exactly the opposite proceeding occurs. The wire which forms the circuit, and which is supposed to be a lengthened one, is curled into a coil near to either extremity, and into each of these coils a bar of soft iron is inserted. These bars become temporary magnets whenever a current of electricity is passing through the coils, but the precise polarity of either extremity depends on the way the current passes. The extremity, which is a north pole when the current issues from the battery through the right spring of the pendulum apparatus, becomes a south pole when the current issues through the left spring. Near to each temporary magnet is placed a permanent magnet traversing upon a central pivot, in such a way that it can be acted upon and made to traverse backwards and forwards by the reversal of the temporary magnetism. Now when these traversing magnets lie in one position they make a contact, and turn on each a small local voltaic battery in connection with them, causing its current to pass through a style pressed down on the ribbon of paper, so that a visible trace is left upon its surface. When the magnets lie in another direction, they turn the currents of the local batteries off, and cause them to cease to print. As therefore it is the pendulum which reverses the direction of the primary current in the long wire, and so the positions of the temporary magnets, a trace is printed on the temporary ribbon of paper, each alternate second, as the ribbon is drawn along, and an intermediate blank interval is left. But as there are two batteries printing, one at each extremity of the wire, if any appreciable time be occupied by the passage of the current along its extent, and if the two batteries are made to record, side by side, upon the same ribbon, the distance to which the one trace lags back behind the other, *estimated by comparison with the second's-long* trace, will afford a measure of the time. In this way the length of time the electrical current takes to run through the wire from one printing instrument to the other, can be determined with the utmost precision in fractional parts of the printed linear representative of a second. It does not at all matter what the speed is with which the paper ribbon is unwound beneath the printing styles, because the estimate is always a relative one referred at each instant to a particular track made by the beat of the pendulum. When the velocity of transmission in any special wire is to be examined, the apparatus is set to work, and a somewhat lengthened series of observations is printed off. This is then narrowly scrutinised, and any doubtful or suspicious records are rejected, and the mean of all the more trustworthy ones is noted as the result to be adopted.

One of the most important deductions arrived at through the instrumentality of this ingenious apparatus, was the fact that voltaic electricity is capable of producing greater mechanical effects at the extremity of any given wire, than the induced electro-magnetic current, but performs its journey through a long course with inferior speed to its weaker comrade. As is commonly the case in some other matters, the heaviest agent proved to be by no means the most fleet and agile one. Seventy-two pairs of sixteen-inch sand-battery plates lifted 1400 grains on the steelyard of the magneto-electrometer at the end of 600 miles wire, but the current took forty-four hundredths of a second to traverse the distance. Two large electro-magnetic induction coils, excited by a Smee's battery of ten pairs of one hundred square-inch plates, sent forth a current which lifted only 745 grains at the end of the same wire, but which arrived at that end in nineteen hundredths of a second. Simple voltaic electricity is capable of greater mechanical effort, under any given arrangement of conductors, than an induced electro-magnetic current, but the electro-magnetic current travels through lengthened conductors with a considerably superior rate of speed. The electro-magnetic current sent forth from induction-coils possesses a treble velocity of transmission, and realises consequently *a three-fold working speed* as compared with simple voltaic electricity. It was hence obvious that induced, and not voltaic electricity, must be adopted for the wide Atlantic service, where the ultimate commercial success of the enterprise would be mainly dependent upon the number of signals which could be forwarded in any given period.

In the early experiments made to determine the rate of movement of the electrical influence along telegraph-wires, it appeared that it could pass through hundreds of thousands of miles in a single second of time. When however a similar examination was entered upon with telegraph-wires coated with gutta-percha and running beneath the ground and through the sea, instead of being freely suspended in the air, it seemed that scarcely thousands of miles were traversed in a second. Different experimenters, too, arrived at different results for the rate of speed. In a paper read by Mr. Edward Bright, at the meeting of the British Association in 1854, the statement was made that the velocity of currents in ordinary use in subterranean and submarine lines did not exceed one thousand miles per second; this gentleman had also inferred from experiments made in a circuit of 480 miles underground, that the speed of the electric impulse varied with the energy or intensity of the current, and with the nature of the conductor and conditions in which it was placed. When Mr. Whitehouse turned his attention to this question, his investigations amply confirmed the deduction which had been previously drawn. Working with his pendulum-apparatus he found that the mean or average speed of voltaic electricity along a No. 16 gauge copper wire, is about 1400 miles per second. But he also ascertained that that of the induced electro-magnetic current is 4300 miles per second. He determined too that the speed of the voltaic current might be raised under special circumstances to 1800 miles per second, and that that of the induced current might be augmented to 6000 miles per second.

But what could be the cause of these varying rates of speed, and of the retardation in general which the electrical influence was thus proved to suffer when it was constrained to traverse coated underground or sub-marine wires, instead of air-surrounded conductors? Professor Faraday had thoroughly investigated this question so soon as the unexpected fact was disclosed, and was able at once to explain the seeming anomaly. When a conducting wire of metal is stretched as an electrical conductor between posts, and is insulated simply by earthenware holders and the circumambient air, the electrical influence runs along it as a simple stream, and almost without suffering impediment. When, however, the wires are inclosed in a compact sheath of insulating substance, like gutta-percha, and are placed in water or moist earth, the affair is altogether changed. A new agent then comes into play. So soon as the insulated and sheathed wire is electrically excited, the electrical excitement operates upon the near-at-hand outer layer of moisture, and it being a conductor, calls up in it an electrical excitation of an opposite kind. The two electrical forces then pull upon each other through the intervening layer of impenetrable substance, and hold, each the other, fast locked. The inner excited influence keeps the outer reduced force stationary upon the external surface of the insulating sheath. The outer induced force keeps a certain portion of the inner excited one present on the internal surface of the insulating sheath *as a charge*, and so prevents it from moving as freely onward upon its journey as it otherwise would. The submarine telegraph cable is indeed virtually a lengthened out Leyden jar, and is necessarily charged with a certain measure of static electricity whenever a current is passed through it. It is a reservoir or *bottle* for the electricity, which has to be filled and emptied, as well as a channel or *pipe* through which the influence may be poured. When an extent of many miles is concerned, it gets too to be a very capacious bottle in virtue of its length, however narrow its transverse dimensions may be. In the more ordinary practice of artificially induced electricity, the voltaic current is not able to produce a static charge in a Leyden jar. In the case of the coated wire of the electric telegraph it is able to do so, probably in consequence of the comparatively enormous extent of surface which comes to be concerned. Now it is this peculiarity of the action of the coated telegraph-wire which leads to the slower rate at which the electric influence is propagated along its substance. The wire, upon every occasion, must be filled to saturation with the force before any transmission can be effected, and then must be emptied completely before any new transmission can be made. Mr. Whitehouse was able by his delicate instruments to procure a very beautiful illustrative proof that it is as charged Leyden jars, and not simply as conductors, that submarine cables, or subterranean coated wires act. He took fifteen miles of the Atlantic cable, consisting of an internal conducting strand, an external metallic envelope, and an intervening insulating sheath, and he *turned up* the further end into the air, thus leaving the conducting wire entirely insulated that way. He next took 200 miles of the same cable, and arranged it in precisely the same fashion. He now found that he could fill each of these lengths with an electric charge, allow the charges to remain for a few seconds in the wire, and then discharge them back through the nearer end, measuring the force of the discharge, and therefore the amount of influence which had been inductively retained in the wires, by the magneto-electrometer as it flowed out under a constraint which forced it to pass through the coil. The discharge from the 15-mile length of the wire lifted 1075 grains on the steel-yard of the electrometer. The discharge from the 200-miles length lifted 2300 grains. A current which lifted 18,000 grains upon being simply poured through the coil of the electrometer, lifted 60,000 grains when allowed to flow back as a discharge after having saturated a coated wire 498 miles long. Here it was evident that these wires were acting as reservoirs and not as simple channels, because the longer wire had received the most powerful charge, and had produced the most powerful effects. If the wires had been acting as common conductors, the longer wire would necessarily have produced the weaker and not the stronger effect, on account of the electrical influence being attenuated through its greater extent.

Most electricians had held, previously to the period of Mr. Whitehouse's investigations, that the available force of an electric current is diminished by increasing distance, or in other words by the length of the transmitting medium, in the rates of the square of the distance it has traversed. It was very important that this question should receive immediate and full investigation, because, if the received dogma were true, it was obvious that the difficulty must be very great indeed, of getting any efficient current to present itself on the opposite shore of the Atlantic, it having been started from the eastern or western shore. A current which would be strong enough to produce very decided results at the distance of 500 miles, would be rendered at this greater distance almost evanescent. Mr. Whitehouse accordingly proceeded to test the deduction in two ways. First, by examining the diminution of the current power to produce mechanical effects in consequence of its having made certain extended journeys; and then by closely scrutinising its loss of speed at varying distances. The current from a voltaic battery, consisting of 72 pairs of 16-inch plates, was transmitted to the magneto-electrometer through wires of different lengths. Where the wire was only a few feet long, 25,000 grains were lifted on the steelyard. With a wire 200 miles long 10,650 grains were lifted. With 400 miles, 3250 grains, and with 600 miles, 1400 grains. As many as 5000 experiments were made with wires ranging from 80 to 1020 miles long, to determine the rate of transmission. With a length of wire of 83 miles, the transmission was accomplished in eight-hundredths of a second. With 166 miles in fourteen-hundredths of a second. With 249 miles in thirty-six hundredths of a second. With 498 miles in seventy-nine hundredths of a second, and with 1020 miles in a trifle less than a second and a half. Taking 83 miles as the unit in these results, there were a series of distances represented by the numbers 1, 2, 3, 6, 12. Therefore, if the so-called law of the squares of the distances were correct, the transmission through the 1020 miles of wire ought to have required 144 times as long as the transmission through the 83 miles. When the induced electro-magnetic current was employed in the distances represented by the series 1, 2, and 3, the rates of velocity were represented by the fractional series $\frac{1}{4}$ $\frac{1}{9}$ $\frac{1}{16}$. It therefore appears, from experiments, that nature is more auspicious to the cause of wide ocean telegraphy, than the assumption of theory.

During the experimental investigation of this portion of the subject, a very surprising and an altogether unforeseen result was obtained. In the attempt to ascertain how small a quantity-battery would prove sufficient to effect a charge and transmit a current, through some thousand miles of the Atlantic cable, Mr. Whitehouse had a piece of apparatus prepared consisting of twenty-five pairs of zinc and silver plates, each about the twentieth of a square inch large, and the pairs so arranged that they could hold a drop of acidulated water or brine between them. On charging this lilliputian battery, by dipping the plates into salt and water, messages were sent from it through the thousand miles of cable with the utmost ease; and not only so. Pair after pair was dropped out from the series, the messages being still sent on with equal facility, until at last only a single pair, charged by one small drop of liquid was used. Strange to say, with this single pair, and single drop, distinct signals were effected through the thousand miles of the cable! Each signal was registered at the end of the cable, in a trifle less than three seconds of time. This remarkable experiment demonstrated how slight a current might be made to give very good results, when a conductor as perfectly insulated as the copper strand of the Atlantic cable was made the channel of transmission.

In some of Mr. Whitehouse's early experiments it was found that the induced electro-magnetic current took a second and a half to discharge itself, when it moved through a coated wire 1146 miles long, in consequence of the retarding influence of induction in this lengthened channel. This apparently is a very excellent result—a signal conveyed eleven hundred miles in less than two seconds! It is not enough, however, for the exigent service of Atlantic telegraphy. In spelling out messages, most letters require three or four signals each, consequently with this rate of transmission it would be extremely difficult to send enough words across the Atlantic within twenty-four hours, to enable the company to work their telegraph remuneratively at low rates of charge. The experimenter, therefore, set himself to see whether he could not find some means of quickening the pace of his too lagging messenger. He ultimately accomplished his object by means of an arrangement with electro-magnetic coils which enabled the operator, through the simple reversal of the poles of the magnet to send currents of *different kinds* of electricity, one after the other through the conducting wire. Each successive transmission then served to clear away the lagging residue of the antagonistic current which immediately preceded it. The remains of the old current which clung about the wire pertinaciously, were completely and rapidly put to the rout upon the stream of an opposite kind being thrown in. When positive followed negative, and negative followed positive, in exactly equal proportions, the electrical equilibrium of the wire was continually restored as fast as it was disturbed, and its telegraphic capabilities were in this way steadily maintained. By the use of these alternated electrical currents, seven and eight signals were now distinctly recorded through the 1146 miles of wire in a second, instead of one signal in a second and a half.

When the idea was first entertained that electrical currents would run along coated telegraph-wires with a velocity that was inversely proportional to the squares of the distances traversed, it was also thought that the difficulty might be partially overcome by providing them a wider road to travel along. It was conceived, that if one of two wires of equal length, was six times as large as the other, that wire ought to transmit any given electrical current with a six times greater facility and rate of speed. Hence it was proposed that long wires should always be made larger than short ones. But this proposal became a matter of very great consequence when a cable of sufficient length to span the Atlantic was concerned. A cable possessing only the dimensions of the Dover and Calais one, if extended enough for the Atlantic service would weigh not less than 20,000 tons. But if the Dover and Calais cable were only duly proportioned to its work, the Atlantic cable would be required, by theory, to be considerably larger and heavier, so that not even such a vessel as the Leviathan would be capacious enough to carry more than a small part of it. The weight, too, that would be dependent upon itself and upon the stern of the vessel from which it was being payed out, would in Atlantic depths amount to a considerable number of tons. Mr. Whitehouse, consequently, applied himself with considerable anxiety to determine how far this view was based in fact. He worked with a 300 miles' length of cable which had three insulated wires running along parallel to each other, but distinct, through one mass of gutta-percha, so that he could use a single wire, or a double, or a treble one, at will, combined as one. Some 3000 separate observations were made, and to the experimenter's great relief it proved, that the wire of increased capacity *did not* transmit electrical signals with greater facility or speed than the smaller one. With a length of 166 miles the velocity of the induced electro-magnetic current was eight-hundredths of a second in a single wire. With the double wire it was nine hundredths; and with the trebled wire it was nine and a half hundredths. Increasing the size of the conductor actually *augmented the retardation* of the electrical transmission through it. All Mr. Whitehouse's experiments taken together seemed to warrant the conclusion, that a treble-sized conductor gives nearly a doubled rate of retardation.

When the actual construction of the Atlantic telegraph-cable was commenced, certain important facts had therefore been determined which served as very excellent indications of the principles upon which the manufacture of the apparatus would have to be carried on. It was manifest that gutta percha covered submarine wires transmit the agent entrusted to their conveyance as induction-incumbered Leyden jars, and that consequently the transmission is effected with a velocity which is modified and influenced by external conditions. Also that induced electro-magnetic currents of a certain determinate intensity, travel more quickly than simple voltaic currents, and that the rapidity with which signals are transmitted by the agency of electro-magnetic currents, can be greatly increased by using opposite electricities following each other alternately. It was also clear that the diminution of the speed of movement along induction-embarrassed wires was not in so high a ratio as the squares of the distances traversed; that several distinct waves of transmission might be made to run along the same wire, one after the other, at the same time; that large coated wires transmitted with less facility and freedom than small ones, in consequence of requiring a larger charge to saturate their inductive capacities before they were in a fit state to transmit; and that therefore the small ones were better suited than large ones for employment in wide ocean telegraphy; and that by the use of small wires, very perfectly insulated, and of electro-magnetic induction-coils of powers carefully apportioned to the dimensions of the wires, signals might be transmitted through a distance of 2000 miles with a rapidity amply sufficient for all purposes of revenue to the Company and of utility to commerce.

It was necessary, then, that an Atlantic cable, which was to furnish a fair promise of success, should have a well insulated conductor, of dimensions of a very moderate size; that it should be so light as to be easily conveyed across the Atlantic, and easily handled during paying out, and yet be so dense as to be able to sink with facility to the depths of the Atlantic, and so strong that it could resist any strain to which it might be exposed during deposition. It was also essential that it should be so flexible that it could be readily coiled up in the store-spaces of the factories, and of the vessels employed in paying out, and rolled over the sheaves of the paying-out apparatus, and yet possessing sufficient inertia and rigidity to allow of its lying in a tolerably straight line when once *in situ* at the bottom of the sea.

The following is the plan which, in accordance with the indications of these multiplied experiments, was finally adopted in preparing a cable for the Atlantic. A strand of seven wires of the purest copper of the No. 22 gauge, was first prepared, it being the sixteenth of an inch in diameter when twisted. The strand of seven wires was adopted in preference to a single wire of the same practical capacity, because the probability of a destruction of continuity was in this way greatly diminished. In case of any accident occurring it was very unlikely that all the seven wires would be broken in exactly the same place, and so long as only one of them remained sound, the electrical transmission could be carried on. The strand itself was subject to a strain which stretched it twenty per cent., without any appreciable injury to its conducting power being discovered. To show that no amount of attenuation, which could possibly be produced by accident, could interfere to any important extent with its utility as a telegraphic conductor, one mile of wire eleven times smaller than the strand, was introduced into a gap made in a 600-miles length of the cable, and the effect produced on the transmitting power of the cable by the interpolation was tested. It proved that the transmitting capacity of the cable was only diminished by one thirty-seventh part.

As the copper strand was prepared, it was rolled upon drums, and then taken from the drums to have three separate coatings of gutta percha applied, until the aggregate diameter was thus brought up to about three-eighths of an inch. The gutta percha used for these coatings was prepared with the utmost possible care. It was first rasped into shreds, and washed, and next pressed through several layers of fine wire gauze, and kneaded for hours in the interior of iron cylinders by steam machinery. It was then squeezed by powerful screws, through dyes, as the strand of copper was gradually drawn along between them, and so made to adapt itself as a compact sheath to the strand. Three several and successive coatings were given to the strand in order that any imperfection left in the first might be compensated and remedied by the next coat applied. The completed core was subjected to a pressure of five tons upon the square inch, by the use of hydraulic power, without the insulating material being at all injured by the force applied.

During the process of the manufacture of this core it was submitted to constant examination to prove both that the continuity of the copper strand continued unimpaired, and also that the insulating power of the gutta percha sheath was as complete as it was required to be. The continuity was proved by passing a voltaic current of *low intensity* from a battery of a single pair of plates, through the strand, and then causing it to record a signal after issuing from the wire. A battery of low intensity was employed for this purpose, because it made the test so much the more severe. A strong battery might have thrown the current through a slight imperfection, which a weak battery might not be able to overcome. The due perfection of the insulation was tried by turning up into the air the end of the length of core about to be examined, and by then connecting one pole of a voltaic battery of five hundred pairs of plates with the nearer end of the length of wire, and the other pole with the earth, a magnetic galvanometer being suspended within a coil continuous with the strand. So long as the insulation of the strand was fairly perfect, the copper wires became charged with the electricity of which but very little could escape, and so no current was produced through the strand, and no defection of any consequence appeared in the magnetic needle. When the insulating sheath, on the other hand, was imperfect, the electrical charge *leaked* through the imperfections to the earth, and so got back to the opposite pole of the battery. In this way a current was set up in the wire to supply the leakage, and the magnetic needle was deflected from its position of equilibrium, the deflection being in proportion to the amount of the current. A strong battery of five hundred pairs of plates was employed in detecting imperfect insulation, in preference to a weak one, because a strong current would force a passage through an imperfection which might be too slight to allow a weak current to make its way. During the progress of the work, a plan was devised which enabled the testing for both continuity of the strand and insulation of the sheath to be carried on simultaneously. A voltaic current can pass through a charged Leyden jar without either the current or the charge being in any practical way interfered with. Therefore the entire length of cable under examination was joined up into a loop or endless ring, and a voltaic battery of five hundred pairs of plates had one of its poles connected with the conducting strand of this ring, and the other pole placed in communication with the earth. A small *insulated* battery of low tension was also introduced into the circuit of the ring, so that its current flowed round continually, from pole to pole, through the strand. An insulated bell was also so placed in the circuit, that any break of continuity dropped a needle, before held magnetically fast, and caused the bell to sound. Another bell instrument was so arranged that it was rung whenever the current from the five hundred cell battery began to run, in consequence of electrical leakage, with undesirable speed. The feeble battery in the circuit rung its bell whenever the circuit was broken. The strong battery out of the circuit rung its bell whenever an outflowing current was set up through the strand, in consequence of the insulating sheath being unable to retain the charge.

During the prosecution of these experiments the very remarkable discovery was made, that the insulating power of gutta percha is very materially affected by temperature. A high temperature seems greatly to impair its insulating capacity, and the recurrence of a low temperature speedily restores it to its original excellence. An opportunity was taken, when a single flake or tier of the completed cable was lying at the bottom of the receptacle in the yard of the manufactory at Greenwich, to watch the changes which the natural variation of temperature during forty-eight hours produced in its conducting capability. When the thermometer stood at 42°, the deflection of the galvanometer needle was barely 3°; but when the thermometer rose to 59°, the deflection of the magnetic needle became 64°. Even passing sunshine and cloud made the tell-tale needle traverse out and in with surprising rapidity. There is fortunately reason to conclude that the bottom of the Atlantic *will* supply the low temperature essential to the good performance of the insulating material. The last soundings taken by Lieutenant Dayman of the Cyclops, have enabled him to determine the deep-sea temperature over a very considerable range, and are abundantly confirmatory of this fact.

The separate lengths of manufactured core were joined into longer extents in a very ingenious way. The gutta percha was scraped from the ends for a short distance, and these were placed in contact. A piece of copper wire was then attached by firm brazing to one side of the joint, and *wound* round the strand until it reached as far on the other side, being there brazed again. A second binding was then effected outside the first in precisely the same way, and several layers of gutta percha placed over the whole by the aid of hot irons. In case of the core on each side of the joint being at any time so dragged that the ends of the strand were broken asunder, this outer investment of wire would unroll spirally without being detached from the strand. Thus the electric continuity of the strand would be preserved even when the strand itself was severed.

Every two miles of the completed core were wound upon channelled drums with deep flanges, iron shod at the rim, so that they could be rolled about and made to perform their own locomotion. When the contents of these drums were used in supplying the cable with more core, one of the ends was attached to the outgoing core of the compressed cable, and so the contents were unrolled from the drum as the external metallic wires were spun round the core. During the unrolling a serving of hemp, saturated with a mixture of pitch and tar, was compactly wound round the core to act as a bed for the external metallic sheath. Then eighteen strands, each of seven wires of charcoal iron, were twisted firmly round the core. The strands and the cable were made by precisely analogous machinery. A large horizontal table, containing seven bobbins on the circumference in the case of the strand machine, and eighteen in the case of the closing or finishing machine, was whirled round by steam power with great rapidity. A central wire, or the core, was drawn up through a hole in the middle of the table, and so invested with a twisted whorl of wires or strands, given off from the bobbins as the table revolved. The strands were used, in completing the cable, instead of solid wires, because by this means greater flexibility and strength, for the material used, were obtained. The external investment of iron was solely designed to protect the coated core from mechanical violence during the act of submergence, and to confer upon it a convenient amount of weight for effecting its sinking in the sea.

Each strand-machine, during the manufacture of the cable, was worked day and night, and in twenty-four hours spun ninety-eight miles of wire into fourteen miles of strand. The several strand-machines at work simultaneously every twenty-four hours transformed 2058 miles of wire into 294 miles of strand. As much as thirty miles of cable have been made within twenty-four hours. At one time all the wire-drawers in England proved to be unable to supply the exacting demands of the machinery, and the works had to pause for a short space. The entire length of wire, iron and copper, spun into this wonderful structure, amounts to 332,500 miles; a length sufficient to engirdle the earth thirteen times! The completed cable weighed from nineteen hundredweight to one ton per mile, and proved to be able to bear with impunity a direct strain of five tons. In the salt water the weight of the cable would, however, not exceed fourteen hundredweight per mile; and as the greatest depth of the Atlantic in which it would have to be laid is only a little more than two miles, and a certain portion of the weight would necessarily be borne by friction against the particles of the water as the rope sunk, it was anticipated that the cable would never, under any circumstances, be required to meet a strain of more than one ton and a half.

The Atlantic cable is to be worked at the bottom of the sea by means of electro-magnetic currents called forth by an instrumental agency of a somewhat complicated kind. First and foremost in this agency, as the primary source of the working influence, stands Mr. Whitehouse's "Perpetual Maintenance Battery." This battery consists of large plates of platinated silver, and amalgamated zinc, mounted in cells of gutta percha. There are several plates, both of silver and zinc, in each cell; but all the zinc plates rest upon a longitudinal bar of metal at the bottom of the cell, and all the silver plates hang upon a similar bar at the top of the cell, so that thus there is virtually but a single stretch of silver, and a single stretch of zinc in operation. This arrangement is made because it enables any portion of either silver or zinc to be removed for repair or renewal without stopping for a moment the operation of the battery. As any one lamina becomes imperfect, it can be taken out from its groove, and replaced. Each cell contains two thousand square inches of acting surface, and is charged with the usual mixture of acid and water, and there are ten such cells combined to constitute the battery that is employed. This combination is so powerful that when the broad strips of copper plate which form the polar extensions are brought into contact or separated, brilliant flashes are produced, accompanied by a loud crackling sound. The points of large pliers are made red-hot in five seconds when placed between them, and iron screws burn with vivid scintillation. These brilliant effects are, however, inconvenient in one particular. They are produced at the expense of the apparatus. The metallic surfaces from which they are emitted, are rapidly burned away during their continuance. In order, as far as possible, to alleviate this injurious effect, contact is made and broken, during the transmission of electrical signals, by means of a key presenting a very large surface of metal. A horizontal bar, flattened at the top, turns backwards and forwards pivot-ways, and tilts its edges against twenty flat brass springs resembling in form the keys of a piano-forte, ten being on each side. A constant slight leak of the current is also continuously maintained through a curl of platinum wire placed in water. By this contrivance the injurious force of the spark is pretty well absorbed and destroyed. The cost of maintaining this magnificent ten-celled Titan battery at work does not exceed a shilling per hour.

But it has been stated that the voltaic current is by no means a fleet messenger compared with other agents which are at the command of the electrician. Consequently it is not the electric stream generated in this mighty battery which is designed to be actually sent across the Atlantic on the performance of telegraphic service. This primary power is only used to call up and stimulate the energy of a more speedy traveller. The voltaic current, generated in the battery, is transmitted to a piece of complicated apparatus known as Mr. Whitehouse's "Double Induction Coils." These coils are arranged in pairs, and each coil consists, first, of a thick bar of soft iron about five feet long; then of a sheath of gutta percha enveloping the bar; next of several miles of comparatively fine silk-covered copper wire, coiled round the gutta percha sheath and bar; and finally of a mile and a half of silk-covered coarser copper wire coiled round outside the inner coil, but without the two coils having any metallic communication or connection. Now the inside iron bars, here, are intended to be made into temporary magnets by the action of electrical currents circulating through the coils. The outer coil of coarse wire carries the battery-current round the iron to make it a temporary magnet. This coil therefore is the primary or *generating* coil. The inner coil of finer wire has a new independent current set up in it by the instrumentality of the temporary magnet; as the primary current makes a magnet, so the magnet makes a secondary current in the previously quiescent coil, and this secondary and magnetically induced current it is which is sent off brisk enough to perform the work of rushing across the Atlantic. This independent secondary current is therefore the *transmission current*, and the coil in which it is produced is properly the transmission coil. To Mr. Whitehouse the merit is due of winding the secondary transmission coil round the magnet directly, and inside of the generating coil. By this means the magnet has additional inducing power given to it on account of the greater propinquity. The coils are used in pairs, because each one inductively increases the power of its neighbour, and in return has its own energy inductively increased as well. The great heating power of the battery-current is rendered harmless by the size and extent of the primary coil through which it is passed. If at any time, by accident, the current find a short course for itself in consequence of the silk covering of the wire being injured, the accident is immediately indicated by the rapid rise of the temperature of the coil.

The transmission-current generated in the inner wire of the double induction-coil necessarily gets considerably weakened when it has passed through a distance of 1800 or 1900 miles. Consequently it does not form a part of the electrician's plan to set this weakened current immediately to work to print or record the signals transmitted. The weakened transmission-current is merely caused to open and close the outlet of a fresh battery destined to do the printing or recording labour. The strand of the cable is continued into a coil of fine wire, wound about a bar of soft iron. When the transmission-current flows through the coil, the bar becomes a temporary magnet, which has the direction of its polarity determined by the nature of the current (positive or negative) that is sent through the coil. The pole which is north when the transmission-current is positive, becomes south when the transmission-current is negative. Near to the temporary magnet a permanent magnet is so placed that it can traverse backwards and forwards upon a pivot as it is actuated by the temporary magnet. The north pole of the permanent magnet is attracted by the south pole of the temporary one, and *vice versâ;* so that as the polarity of the temporary magnet is reversed, the permanent magnet is caused to traverse. When it traverses one way, it opens the outlet of the local battery by effecting a contact and causes it to print; when it traverses the other way it shuts off the current of the local battery, so that it is constrained to cease to print.

It is the peculiar advantage of this relay-instrument (as it is called) that the temporary magnet has no other work to do than to turn the permanent magnet upon its almost frictionless pivot. It has no spring to overcome, such as is more commonly employed in this class of instruments. The arrangement is so sensitive that the apparatus may be put in action by a fragment of zinc and a sixpence pressed against the tongue. These relays may indeed be ordinarily heard clicking backwards and forwards, and working automatically when the large induction-coils are in operation within a few feet of them, actually doing a little business on their own account, although not in communication with any current, and transmitting the same signals and messages as those which are being forwarded through the agency of the induction-coils. As the poles of the induction-coil magnets are reversed, the poles of the relay-magnets are actuated different ways. Mr. Whitehouse has made the instruments even more exquisitely delicate by applying a second permanent magnet, so that it can be made by a screw-adjustment to increase or diminish the attraction acting on the working magnet, either way.

When the printing battery is brought into operation by the relay, already described, it records by the agency of one of Professor Morse's instruments. In this instrument a ribbon of paper is unrolled from a hollow cylinder by a train of clock-work, and as it is unrolled, a sharp style, magnetically actuated, indents a series of dots or lines upon the paper. When the style is pricked down but for an instant, it is a *dot* that is impressed. When it is kept down for more than an instant a lengthened line or *dash* is left, because the paper ribbon is being drawn along beneath the style. In order that the style may be magnetically controlled to inscribe the dash or the dot, it is held up by a strong spring when not in action, and drawn down by a temporary magnet formed by the printing battery current, when in operation. A soft iron bar, enveloped by a coil of the printing battery wire, is stronger than the spring when it becomes a magnet, and drags it down.

The dot and dash-code of Professor Morse is adopted for the Atlantic service, because there is but one wire in the cable, which must be made to express, at least, all the letters of the alphabet, and all the numerals; different combinations of the dot and dash can be readily caused to effect this; thus dot and dash, . — is taken to signify a; — . . . to signify b; — . — . for c; — . . d; . for e, and so on. Mr. C. Bright has patented a very ingenious piece of apparatus in which the same elementary symbols are given by sounds issuing from a free and a muffled bell. It is possible that this apparatus will some day be adopted by the Atlantic Company for their service.

Her Britannic Majesty's Government granted to the Company the use of the fine 91-gun ship Agamemnon for paying out one half of the cable into the Atlantic, and commissioned the paddle-wheel frigate Leopard to act as its tender. The United States Government sent over the magnificent new heavy frigate Niagara to carry the other half, with the paddle-wheel steamer Susquehanna for a tender. The Agamemnon proved to be singularly adapted for its work in consequence of having one square space as a hold, 49 feet across and 20 feet deep. In this space the 1260 miles of the cable were able to be deposited in a single circular coil. The Niagara was not by any means so well adapted for the service, and had to be considerably altered in her internal arrangements after she came over to England, the cable even then being distributed into three or four distinct coils. The arrangements made by the engineer for the paying out, planned that the cable should come up from the hold of the ship, sweeping round a central block occupying the width of the coil, and then wound out and in over four grooved sheaves, geared together by cogs, finally passing along a short distance above the poop-deck, and plunging over a fifth sheave, resting over the stern, into the sea. A friction drum, also geared to the sheaves, was embraced by blocks worked by powerful screws, so that it could be gripped more or less tightly whenever occasion arose. Provision was also made to register electrically the speed with which the paying-out vessels moved through the water, the rate at which the cable was payed out every instant, and the strain which was thrown upon it. Electrical signals, too, were to be made through the cable, from end to end, every second, to prove the maintenance of its continuity. The engineer's calculations fixed from four to five miles an hour as the rate of speed at which it was deemed advisable the paying-out of the cable should be effected. An external guard was placed over the screws of the vessels engaged in the work, to prevent the cable being injured in case any need should arise for returning upon the course to pick up some portion of it that had been already submerged. A small journeyman engine was prepared for accomplishing this picking-up labour. Provision was also made for dropping the portion of the cable in the act of being submerged to the bottom of the sea on the occurrence of a severe storm, and for buoying the end until the storm was past, the dropping being accomplished by means of very strong supernumerary ropes kept ready for the purpose.

The end of the month of July was selected for the accomplishment of this wonderful enterprise, because Lieutenant Manry had ascertained, by the accumulation of a large series of observations, that the Northern Atlantic is in the most favourable condition for any work of the kind in this season of the year. There is then the least likelihood of trouble from the presence of either fogs or icebergs, and gales of wind are almost unknown at the period, excepting just off the western coast of Ireland. Lieutenant Maury also marked out the track the vessels ought to endeavour to take. Theoretically, the best course lay in the arc of a great circle running directly from Trinity Bay in Newfoundland to Valentia Harbour in Ireland. But all practical navigators are aware that it is altogether impossible to direct a ship along a true great circle track. Such a track would require that the course of the vessel should be altered to an almost infinitely small amount at every successive instant. Whereas in steering by the compass no alteration, of course, to any thing less than half a point of the compass is actually trustworthy. Bad steering, unascertainable sets of the current, and unavoidable compass deviations, introduce continually errors nearly approaching to this amount. Lieutenant Maury consequently planned a *polygonal* route from Valentia Harbour to Trinity Bay, in which there were only six changes of course, each one restricted to a quarter of a point of the compass, and in which the departure from a true great circle-path was no more than eight-tenths of a nautical mile. If one ship had sailed in the great circle route, and the other in the polygonal route, each moving at the same rate of speed, the one vessel would not have been out of hail of the other the whole way. The telegraph cable being laid in the polygonal route, and then hauled in by windlasses at each end, until it was reduced to a true great circle curve, each windlass would only have to wind in 350 fathoms of the cable. The entire length of the cable that would be required to connect Valentia Harbour with Trinity Bay would be 1834 statute miles. The liberal allowance of a superfluous length of 600 miles was therefore made to provide against unforeseen accidents.

In recent years very great improvements have been made in the process of deep sea sounding, chiefly in the first instance through American ingenuity and skill. Mr. Brooke, of the United States navy, has contrived a sounding apparatus, which proves very successful and manageable. The apparatus consists of a cannon-ball threaded upon an iron rod in such a way that when the rod strikes the bottom of the sea the cannon ball is detached from a pair of triggers and dropped, the rod being then drawn up with specimens of the bottom adhering to a hollow cup indented into its inferior surface. Allowance is made for the extent to which transverse currents draw out the line during the descent of the plummet, based upon the known rate at which the plummet ought to descend in deep water. It appears from a large series of deep soundings which have now been taken, that the actual bed of the Atlantic is very much, and very abruptly broken up; jagged peaks alternating with precipitous submarine vallies. The greatest depth of the Atlantic seems to lie to the south of the banks of Newfoundland, the sounding there indicating a descent of something more than five miles. In the more northern regions the depth is considerably less, especially between the parallels of 48° and 55° north latitude. There is one great zone of the earth, extending from east to west, in which the surface appears to be raised comparatively high. This zone marks the line in which the northern and southern water-sheds meet, alike in the continents of America, Europe, and Asia. It is continued in the Northern Pacific through the Aleutian Isles, and it stretches at the bottom of the Atlantic, as a sort of submarine shelf from Cape Race, in Newfoundland to Cape Clear in Ireland, Newfoundland and the British Islands being really projecting extremities of the higher portion of the shelf. This plateau rests precisely in the course along which the telegraphic cable requires to be stretched, and nowhere sinks to more than a trifle beyond two miles. Besides this, it is covered through a great portion of its course by microscopically minute calcareous and siliceous shields or shells of foraminated and diatom races of creatures, which have been produced in the warm waters of the tropics, and then drifted along by the Gulf stream, until they were finally dropped in this region as a kind of perpetual snow storm, in consequence of passing from water in rapid onward movement, into fluid that is comparatively at rest. These delicate remains of organised existence when brought up by the deep sea plummet prove to be so perfect notwithstanding their fragility, that there can be no doubt the depths where they lie are free from all kinds of mechanical disturbance, and so in the precise condition which must be the most conducive to the safe preservation of an electrical cable once deposited in their recesses. Lieutenant Berryman, of the United States navy, carefully sounded through the extent of this submarine plateau, and described it as being smooth and slightly inclined from end to end. Lieutenant Dayman of H.M.S. Cyclops, revised these soundings shortly before the sailing of the expedition for the submergence of the cable, going over the same track again, and fully confirmed the general facts of the relatively slight depth of the plateau, and the abundant presence of the diatomaceous and foraminated deposits, but he reported a greater degree of density in the depths of different positions than Lieutenant Berryman had conceived.

On the 5th of August, 1857, operations commenced. There were present the 'Agamemnon,' 'Niagara,' 'Leopard,' 'Susquehanna,' 'Willing Mind,' and 'Advice,' six steamers intended to assist in various parts of the operations. The shore-end of the cable was taken on shore from the 'Niagara,' by a number of boats. And then took place a ceremonial inauguration of the enterprise: the Lord-Lieutenant of Ireland receiving the extreme end of the cable, and drawing it into a tent where electrical batteries had been placed, on the beach of Valentia Harbour. The engineer was doomed, however, to a mortifying disappointment. A slight accident happened to the cable on the 6th, but this was repaired, and the ships proceeded. By the morning of the 10th they had got out 200 miles to sea, and the cable conveyed messages to and from the land and the ships with the utmost facility: the persons on shore following the history of the voyage hour by hour. On the 11th, however, the engineer found that 335 nautical miles, or 380 statute miles, of cable had been submerged; and, knowing that that was far too much in proportion to the straight line distance, he concluded there was too much 'slack' or zigzag in the cable's course. A modification in the grip of the machinery was therefore made; and this modification appears to have been unskilfully attended to by one of the subordinates. The cable was stretched too tightly; it snapped, and went to the bottom, at a depth of twelve thousand feet, equal to forty times the height of St. Paul's. Preparations are being made at this time, March 1858, for immediately resuming the attempt. The lost portion of the cable has been replaced; and government ships of Great Britain and of the United States are under orders again to assist in this national enterprise.

Electrical Telegraphs now render useful service in several cities of America. In New York eight bell-towers are connected with each other, and with the central tower over the City Hall by telegraphic wires; this system is used to signalise an alarm of fire. At Boston a comprehensive plan is acted on. A central station has been selected, in which the principal instruments are placed. Two wires take a very circuitous route from this station; one, ingeniously supported on house-tops by insulated standards, extends to all the fire-bell towers in the city, where it acts upon machinery which strikes on a large bell whenever an impulse is transmitted through the wire; the other, much more extensive, proceeds to all the street or ward signal-stations in the city. At each of these signal-stations is a box containing a magnetic apparatus, under the care of a keeper. If a fire break out in any part of the city, a message is sent to the nearest signal-station; the man transmits a signal to the central station, whence an electric impulse is sent to all the bell-towers in the city, the ringing of which conveys the required information. It is obvious that other public information, besides that relating to fires, may be disseminated throughout the city by similar means. There are about fifty miles of wire in this telegraph at Boston. There seems every reason to believe that, now the telegraphic wires follow so many sub-way routes in London, local news will gradually be brought within the scope of the system.

ELECTRICITY OF ORGANIC BEINGS. Plants and animals, under certain circumstances, exhibit electrical phenomena. These however are not so constant or frequent as is sometimes imagined. Considering the connection that is now known to exist between the great forces of nature, as Light, Heat, Chemical Action, and Electricity, it is perhaps matter of surprise that so few electrical phenomena are exhibited by organised bodies.

In Plants it appears that during growth electricity is developed. Pouillet filled several pots with earth, and placed in them different kinds of seeds, and then insulated them. During the process of germination no electric disturbance was discovered, but when the seeds began to sprout a gold-leaf electrometer had its leaves separated at least half an inch from each other. Pouillet concludes that the vegetation on the surface of the earth must produce a vast amount of electricity, and be an active cause of its phenomena in the atmosphere. Other observers have found that, by placing wires in the bark and pith of a growing tree, they have obtained decided indications of the presence of a galvanic current. These exhibitions of electric disturbance are undoubtedly dependent on the chemical changes going on in the plant, and this is one of the many instances in which we find one force in nature representing another. Under the influence of heat and light the chemical and attractive forces are brought into play, and the motile force of the growth of the plant as well as electrical phenomena are the result.

In the Animal Kingdom the same indications of the presence of electricity is afforded during the activity of the vital functions. Matteucci has observed a considerable deflection of the galvanometer when wires were connected with it passing from the liver and stomach of a rabbit. Other experimenters have obtained similar results. It has been supposed that these phenomena were due to the chemical changes going on in the body of the animal, but they cease on the death of the animal. Free electricity is excited by the movements of the human body. This is made evident by rubbing the feet on a woollen rug, when, on applying the hand to a gold-leaf electrometer, the presence of electric disturbance is indicated. Some persons are more liable to this development than others; and Dr. Carpenter says there are persons "who scarcely ever pull off articles of dress which have been worn next the skin without sparks and a crackling noise being produced, especially in dry weather."

Recent experiments of Matteucci and Du Bois-Raymond have shown not only that free electricity is developed in animal bodies, but that there is a true galvanic current both in the muscles and nerves. Galvani attributed the movements, first observed by his wife, induced in a frog's leg by plates of copper and zinc, to a purely animal action. Volta showed that the movements observed by Galvani were dependent on the chemical action developed in the metals. Matteucci observed the peculiar sensibility of the nerves and muscles of the frog to galvanic action, and made use of the leg, prepared as a galvanometer, in many of his experiments. The mode of using it was simply to take the leg of a recently-killed frog with the crural nerve dissected out of the body, but remaining in connection with it. The leg was then inclosed in a glass tube, covered with an insulating varnish, and the nerve allowed to hang freely at its open end. When two points of the nerve thus prepared are brought in contact with any two substances in a different electrical state, the muscles of the frog's leg are thrown into contraction. By this 'galvanoscopic frog' Matteucci was able to detect currents of electricity in the muscles of animals, by cutting into them, and placing one extremity of the nerve deep in the wound and the other at its lips. The experiments of Matteucci were followed up by Du Bois-Raymond, who has arrived at the following conclusions:—1. That galvanic currents may be observed in any limb of any animal whether cold or warm-blooded. These currents in some limbs are directed downwards, in others upwards. They are of different intensity in different limbs; but their intensity and direction are always the same in the same limb of different individuals of the same species. 2. The electro-motive action on which these currents depend does not arise from the contact of heterogeneous tissues, as Volta supposed; for the different tissues, the nerves, muscles, and tendons, in an electric point of view, are quite homogeneous. 3. These currents are produced by the muscles. If any undissected muscle of any animal be brought into the circuit longitudinally, it generally exhibits an electro-motive action, the direction of which depends on the position of the muscle. The current of the whole limb is nothing but the resultant of the partial currents which are engendered by each muscle of the limb. It is therefore a 'muscular current.' 4. The law of the muscular current may be expressed as follows: "Any point of the natural or artificial longitudinal section of the muscle is positive in relation to any point of the natural or artificial transverse section." 5. By means of the above-mentioned law an explanation is afforded of the muscular current appearing in one instance an upward one, in another a downward one, which occurs according as the upper or the under of the two transverse sections is made to touch one of the ends of the galvanometer wire, whilst the other end is applied to the longitudinal section of the muscle. This is true even as regards shreds of muscle consisting of only a few primary fibres, and such as only admit of observation by the microscope. 6. The nerves are possessed of an electromotive power which acts according to the same law as the muscles. Whilst still in organic connection with the muscles, and forming part of a circuit in which the muscles give rise to a current, the nerves simply play the part of an inactive conducting body, provided their own current be prevented from entering the circuit.

There are certain animals which possess the power of accumulating electric force within their bodies, and of discharging it at will in a violent form, and with the exception of some insects and *Mollusca* which have been said (though this is doubtful) to communicate sensible shocks, these animals are all included in the class of Fishes. About seven species of this class, belonging to five genera, are known to possess electric properties, and it is curious that these genera belong to tribes very dissimilar from one another, and that, though each has a limited geographical range, one species or other is found in almost every part of the world. Thus, the three species of *Torpedo*, belonging to the Ray tribe, are found on most of the coasts of the Atlantic and Mediterranean, and sometimes so abundantly as to be a staple article of food. The *Gymnotus*, or Electric Eel, is confined to the rivers of South America. The *Silurus* (more correctly the *Malapterurus*), which approaches more nearly to the Salmon tribe, occurs in the Niger, the Senegal, and the Nile. The *Trichiurus*, or Indian Sword-Fish, is an inhabitant of the Indian Seas; and the *Tetraodon* (one of the genus allied to the *Diodon*, or Globe-Fish) has only been met with on the coral banks of Johanna, one of the Comoro Islands. These fishes have not all been examined with the same degree of attention, but it seems probable that the phenomena which they exhibit, and the structural peculiarities with which these are connected, are essentially the same throughout.

The peculiar characteristic of all is the power of giving to any living body which touches them a shock resembling in its effects that produced by the discharge of a Leyden jar. This is of very variable intensity in different species and individuals, and at different times. The *Gymnotus* will attack and paralyse horses, as well as kill small animals; and the discharges of large fish (which are 20 feet long) sometimes prove sufficient to deprive men of sense and motion. The effects of the contact of the *Torpedo* are less severe, and soon pass off; but the shock is attended with considerable pain when the fish is vigorous. The electrical organs appear to be charged and discharged to a certain extent at the will of the animals. Their power is generally exerted by the approach of some other animal, or by some external irritation; but it is not always possible to call it into action, even in vigorous individuals. It usually diminishes with the general feebleness of the system, though sometimes a dying fish exerts considerable power. All electrical fishes have their energy exhausted by a continued series of discharges; hence it is a common practice with convoys in South America to collect a number of wild horses and drive them into the rivers, in order to save themselves, when they pass, from being injured by the fish. If excessively exhausted, the animals may even die; but they usually recover their electrical energy after a few hours' rest.

The *Torpedo*, from its proximity to European shores, has been most frequently made the subject of observation and experiment; and the following are the most important results of the investigations which have been made upon it by various inquirers:—That the shock received by the organs of sensation in man is really the result of an electric discharge, has now been fully established. Although no one has ever seen a spark emitted from the body of one of the fish, it may be easily manifested by causing the *Torpedo* or *Gymnotus* to send its discharge through a slightly interrupted circuit. The galvanometer is influenced by the discharge of the *Torpedo*, and chemical decomposition may be effected by it, as well as magnetic properties communicated to needles. It seems essential to the proper reception of the shock, that two parts of the body should be touched at the same time, and that these two should be in different electrical states. The most energetic discharge is procured from the *Torpedo* by touching the back and belly simultaneously, the electricity of the dorsal surface being positive, and that of the ventral negative; and by this means the galvanometer may be strongly affected, every part of the back being positive with respect to every part of the opposite surface. When the two wires of the galvanometer are applied to the corresponding parts of the two sides of the same surface, no influence is manifested; but, if the two points do not correspond in situation, whether they be both on the back or both on the belly, the index of the galvanometer is made to deviate. The degree of proximity to the electric organ appears to be the source of the difference in the relative state of different parts of the body; those which are near to it being always positive in respect to those more distant. Dr. Davy found that, however much Torpedoes were irritated through a single point, no discharge took place; and he states that, when one surface only is touched and irritated, the fish themselves appear to make an effort to bring the border of the other surface, by muscular contraction, into contact with the offending body; and that this is even done by fœtal fish. If a fish be placed between two plates of metal, the edges of which are in contact, no shock is perceived by the hands placed upon them, since the metal is a better conductor than the human body; but if the plates be separated, and while still in contact with the opposite sides of the body, the hands be applied to them, the discharge is at once rendered perceptible, and it may be passed through a line formed by the moistened hands of two or more persons, the extremities being brought into relation with the opposite plates. The electrical phenomena of the *Gymnotus* are essentially the same with those of the *Torpedo;* but the opposite electrical states are found to exist, not between the dorsal and ventral surfaces, but between the head and tail; so that the shock is most powerful when the connection is formed between these two extreme points.

It has been ascertained by experiment, that the manifestation of this peculiar power depends upon the integrity of the connection between the nervous centres and certain organs peculiar to electrical fishes. In the *Torpedo* the electrical organs are of a flattened shape, and occupy the front and sides of the body, forming two large masses, which extend backwards and outwards from each side of the head. They are composed of two layers of membrane, between which is a whitish soft pulp, divided into columns by processes of the membrane sent off so as to form partitions like the cells of a honeycomb; the ends of these columns being directed towards the two surfaces of the body. The columns are again subdivided horizontally by more delicate partitions, which form each into a number of distinct cells; the partitions are extremely vascular, and are profusely supplied with nerves, the fibres of which seem to break up into minuter fibrillæ to form plexuses upon these membranes. The fluid contained in the electrical organs forms so large a portion of them, that the specific gravity of the mass is only 1·026, whilst that of the body in general is about 1·060; and from a chemical examination of its constituents, it seems to be little else than water, holding one-tenth part of albumen in solution, with a little chloride of sodium. The electrical organs of *Gymnotus* are essentially the same in structure, though differing in shape, in accordance with the conformation of the animal; they occupy one-third of its whole bulk, and run along nearly its entire length; there are however two distinct pairs, one much larger than the other. The prisms are here less numerous, but are much longer; for they run in the direction of the length of the body, a difference which is productive of a considerable modification of the character of the discharge. In the *Silurus* there is not any electrical organ so definite as those just described; but the thick layer of dense cellular tissue, which completely surrounds the body, appears to be subservient to this function; it is composed of tendinous fibres interwoven together, and of an albuminous substance contained in their interstices, so as to bear a close analogy with the cellular partitions in the special organs of the *Torpedo* and *Gymnotus*. The organs of the other known electrical fishes have not yet come under the notice of any anatomist.

In all these instances the electrical organs are supplied with nerves of very great size, larger than any others in the same animals, and larger than any nerve in other animals of like bulk. They all arise in the *Torpedo* from a ganglionic mass situated behind the cerebellum, and connected with the medulla oblongata, to which the name of 'electric lobe' has been given; the first two of them issue from the cranium in close proximity with the fifth pair, and have been regarded as belonging to it, although their real origin is different; whilst, from the distribution of the third electrical nerve to the stomach, after sending its principal portion to the electrical organ, it would seem analogous to the eighth pair or pneumogastric.

The electrical nerves in the *Gymnotus* are believed to arise from the spinal marrow alone; and those of the *Silurus* are partly intercostals and partly belong to the fifth pair. The integrity of the nerves is essential to the full action of the electrical organs. If all the trunks be cut on one side, the power of that organ will be destroyed, but that of the other may remain uninjured. If the nerves be partially destroyed on either or both sides, the power is retained by the portion of the organs still in connection with the centres. The same effects are produced by tying the nerves as by cutting them. Even slices of the organ entirely separated from the body, except by a nervous fibre, may exhibit electrical properties. Discharges may be excited by irritation of the brain when the nerves are entire, or of the part of the divided trunk distributed on the organ; but on destroying the electric lobe of the brain the electric power of the animal ceases entirely, although all the other ganglionic centres may be removed without impairing it. It is remarkable, however, that after the section of the electrical nerves Torpedoes appear more lively than before the operation, and actually live longer than others not so injured, which are excited to discharge frequently. Poisons which act violently on the nervous system have a striking effect upon the electrical manifestations of these fish; thus, two grains of muriate of morphia were found by Matteucci to produce death after about ten minutes, during which time the discharges were very numerous and powerful; and strychnia also excited powerful discharges at first, succeeded by weaker ones, the animals dying in violent convulsions. When the animals were under the influence of strychnia it was observed that the slightest irritation occasioned discharges; a blow given to the table on which the animal was placed being sufficient to produce this effect. If the spinal cord were divided, however, no irritation of the parts situated below the section called forth a shock. It has also been ascertained by Matteucci that the electric power is suspended when the *Torpedo* is plunged into water at 32°, and is recovered again when it is immersed in water of a temperature from 58° to 68°; and that this alternation may be repeated several times upon the same fish. But if the temperature be raised to 86° the *Torpedo* soon ceases to live, and dies while giving a great number of violent discharges. (Carpenter.)

From these facts it is evident that the electric force is developed as the result of nervous agency. From this it has been sometimes hastily inferred that the electric and nervous forces are identical. This, however, is not more probable than that the contractile force of the muscles is identical with the nervous force. The best explanation of the phenomena appears to be the correlation of these forces. They are convertible forces, the one being capable of generating the other; the force generated being always the representative of the force generating it. The uses of these electric organs it is somewhat difficult to explain. The *Gymnotus* eats very few of the fishes which it kills by its shocks, and this is the case with the Torpedoes. Dr. John Davy conjectures that the electric discharges decompose the water, and supplying oxygen assist in respiration. Dr. Carpenter suggests that this peculiar action may assist the digestion of the fish, as animals killed by electricity are more digestible. The electrical condition of the animal itself he also thinks may conduce to the easy digestion of its food.

(Carpenter, ***Principles of Physiology, General and Comparative***; Professor Matteucci, ***Electro-Physiological Researches; Philosophical Transactions***, 1850; Matteucci, ***Lectures upon the Physical Phenomena of Living Beings***, translated by Pereira; Du Bois-Raymond, ***On Matteucci's Letter to Dr. Bence Jones***, editor of Dr. Du Bois-Raymond's ***Researches in Animal Electricity***; H. Bence Jones, ***Abstract of Du Bois-Raymond's Researches in Animal Electricity***.)

ELEOTRIS, a genus of Acanthopterygious Fishes belonging to the family *Gobiodæ*. Like the Gobies the species have flexible spines in the first dorsal fin, and an appendage behind the vent, but they have the ventral fins separate and six gill-rays. The species are inhabitants of the fresh waters of warm countries, and conceal themselves in the mud.

E. dormatrix, the Sleeper, is a large fish. It is found in the West Indian marshes. Other species have been found in Africa, India, and the Mediterranean.

ELIDONE. [SEPIADÆ.]

ELLENBOROUGH. [CUMBERLAND.]

ELLENBOROUGH, LORD. Edward Law was born November 16, 1750, at Great Salkeld, in the county of Cumberland. He was the fourth son of Dr. Edmund Law, bishop of Carlisle. He received his rudimentary education at the residence of his maternal uncle, the Rev. Humphrey Christian, who then resided at Docking in Norfolk. He was removed thence in 1762 to the Charter-house School, London, and placed on the foundation. In 1768 he was entered of St. Peter's College, Cambridge. After taking his degree of B.A. he removed to London, and became a student of law at the Inner Temple. Having been called to the bar, and acquired by a short preparatory practice the needful technical knowledge, he soon took his place among the chief members of the profession. He was engaged as the leading counsel in the defence of Warren Hastings, 1788 to 1795, and in this famous trial acquired great distinction both as a lawyer and a speaker. In Westminster Hall he had Erskine and other able rivals to contend with, and never rose to the first lead as a pleader, but he became the admitted leader of the Northern Circuit. His rise in the profession was remarkably rapid. In 1801 he was appointed attorney-general and knighted, and in the same year he was elected a member of the House of Commons. In April 1802 Sir Edward Law succeeded Lord Kenyon as lord chief justice of the court of King's Bench, and was created a peer by the title of Baron Ellenborough, of Ellenborough in Cumberland, by patent dated April 10th, 1802. He was afterwards made a privy councillor. In the House of Lords in 1805 he strenuously opposed any concession to the Roman Catholics. On the trial of Lord Melville in 1806 Lord Ellenborough voted against him. In 1813 he was nominated one of the commissioners to inquire into the conduct of the Princess of Wales. In 1814 he was one of the judges who presided at the trial of Lord Cochrane, and in 1818 on the trial of Hone. [HONE, WILLIAM, *S.* 1.] In November of the same year he retired from the bench. He died December 13, 1818, at his residence in London. He married in 1782, and was succeeded in the title by his eldest son, who is now Earl of Ellenborough. Lord Brougham, in his 'Historical Sketches of Statesmen,' makes the following remarks on his character as a judge:—"The Term Reports bear ample testimony to the vigour of this eminent individual's capacity during the eighteen years that he filled the first place among the English common-law judges. . . . . He was somewhat irascible, and sometimes even violent. But no one could accuse him of the least partiality. His honest and manly nature ever disdained as much to trample overbearingly on the humble as to crouch meanly before the powerful. . . . . He despatched business with great celerity, and for the most part with success. But causes were not sifted before him with that closeness of scrutiny, and parties were not suffered to bring forward all they had to state with that fulness and freedom, which alone can prevent misdecision, and ensure the due administration of justice."

ELLESMERE, EARL OF. LORD FRANCIS LEVESON GOWER was born in London, January 1, 1800. He was the second son of the first Duke of Sutherland, and brother of the present Duke. He was educated at Eton College, and afterwards at Christ Church, Oxford. He left the university in 1820, in which year he was returned as M.P. for Bletchingly in Surrey, since disfranchised by the Reform Act. At a time when the German language was little studied in England he distinguished himself by a translation of the 'Faust' of Göthe, in two volumes, which was more than once reprinted before the author resolved to withdraw it from circulation. It has now been several years out of print. The 'Faust' was followed by 'Translations from the German, and Original Poems, by Lord Francis Leveson Gower,' 8vo, London, 1824. This small volume consists of translations of seven lyrical poems by Schiller, one by Göthe, one by Salis, and three by Körner, and of thirteen original poems. He was M.P. for Sutherlandshire from 1826 to 1830. In 1827 he was made a lord of the treasury. From January 1828 to July 1830 he was chief secretary for Ireland, and from July to November 1830 he was secretary at war. After the death of his father in 1833, having received as his inheritance the Bridgewater estates, which his father had inherited from the last Duke of Bridgewater, he assumed the name of EGERTON. From 1835 to 1846 Lord Francis Egerton was M.P. for South Lancashire. In the autumn of 1839 he commenced a voyage in his own yacht up the Mediterranean Sea. He wintered at Rome, whence he sailed for Malta in April 1840, and having landed on the coast of Syria, made a tour in Palestine. In 1841 he was elected rector of the university of Aberdeen. In 1843 he published 'Mediterranean Sketches, by Lord Francis Egerton,' 12mo. In this volume the poem called 'The Pilgrimage' records some of the most interesting impressions of his tour in Palestine. It is followed by extracts from his journal and by a few poems. A new edition of these poems, with several additions, was published in 1856, 'The Pilgrimage, and other Poems,' 4to. In 1846 he was created Earl of Ellesmere and Viscount Brackley, titles nearly corresponding to those held by Lord Chancellor Egerton, who, at the time of his death, held the title of Viscount Brackley, and had previously held that of Baron Ellesmere. The Earl of Ellesmere was elected President of the Asiatic Society in 1849. In 1855 he was created a knight of the Garter, and in the same year became colonel-commandant of the Lancashire yeomanry cavalry. He was also deputy-lieutenant of Sutherlandshire. He died Feb. 21, 1857.

Besides the works before mentioned, the Earl of Ellesmere published the 'Camp of Wallenstein, and other Poems;' the tragedies of 'Catherine of Cleves and Hernani;' 'The Sieges of Vienna by the Turks, from the German of K. A. Schimmer, and other sources,' 16mo, 1847; 'Military Events in Italy, transcribed from the German,' 12mo, 1851; 'Life and Character of the Duke of Wellington,' 12mo, 1852; 'History of the Two Tartar Conquerors of China, from the French of J. P. D'Orleans,' 8vo, 1854.

The Earl of Ellesmere, at his residence, Bridgewater House, Cleveland Square, London, had one of the very finest galleries of paintings possessed by any individual in the kingdom. He inherited the chief portion of it as a part of the property of the Duke of Bridgewater, but he made some additions to it himself, and in a very handsome manner he made it accessible to the public. We ought to mention that his lordship presented to the nation his celebrated portrait of Shakspere, known as the Chandos Shakspere, with a view to its forming a portion of the projected National Gallery of Portraits.

ELLIOTT, EBENEZER, the Corn-law Rhymer, was born March 17th, 1781, at the New Foundry, Masbro', near Rotherham, Yorkshire. His father, a clerk at the foundry, was an ardent politician, and a stern ultra-calvinistic dissenter of the Berean sect; and he employed his "brother Berean, Tommy Wright, the Barnesley tinker" to baptise his son—as the poet relates in his 'Autobiography,' published soon after his death in the 'Athenæum' (January 12, 1850). The elder Elliott (also an Ebenezer) was accustomed to preach in his own room every fourth Sunday, to persons of a similar persuasion, who used to come twelve or fourteen miles to hear him; and on the week-days he "delighted to declaim on the virtues of slandered Cromwell and of Washington, the rebel," as he pointed to prints of them which hung on the walls; and here, as Elliott wrote, "is the key which will unlock all the future politics" of the Corn-law Rhymer. The young Ebenezer was regarded as a dull child, loved to be alone, made little progress at school, where he could never master grammar, or attain to vulgar fractions, was a frequent truant, and seemed to be a confirmed dunce; and eventually, out of sheer hopelessness, was sent by his father to work in the foundry. At the foundry work, however, he was thought to be even clever, but with the workmen's skill he acquired also the workmen's evil habits, and for a while gave way to intemperance. But from sinking into thoroughly vicious courses his early love of nature saved him. A copy of Sowerby's 'English Botany,' lent him by an aunt, led him to collect botanical specimens, and after a while he became interested in poetry that treated of his favourite flowers, and of country scenes. He soon became a diligent reader, studying "after Milton, Shakspere—then Ossian, then Junius," and so on, while "of Barrow," he says, "I was never weary; he and Young taught me to condense." In time too he began to write verses himself, though his early efforts, he confesses, were very unsuccessful; and he set himself doggedly to learn in his own way grammar and even French, but could master neither. Meanwhile he was not neglecting his ordinary duties. His father had been induced to purchase the foundry business on credit, and from his sixteenth to his twenty-third year Elliott "worked for his father as laboriously as any servant he had, and without wages, except an occasional shilling or two for pocket-money." It was while thus engaged that he composed (in his seventeenth year) his first published poem, the 'Vernal Walk;' this was followed soon after by 'Night,' 'Wharncliffe,' and others: and Elliott, between his rhymes and politics, began to be a local celebrity. He had the good fortune to form the acquaintance of Southey, who was earnest in giving him the full benefit of his own wide experience in poetical studies, and Elliott was in after years proud of proclaiming that Southey taught him poetry. Happily for his lasting fame, he did not let his respect for the genius or his gratitude for the kindness of the laureate lead him to become an imitator, or to tame down his wild notes to the orthodox tunes. Between 'Wharncliffe' and the 'Corn-law Rhymes,' he published in 1823 'Love,' and another poem, accompanying them with a 'Letter to Lord Byron.'

Elliott's father was too much hampered by the liabilities he had incurred, and his want of capital, to carry on the foundry with success. After a time young Elliott commenced business at Rotherham on his own account; but failing there he removed to Sheffield, where in 1821 he, at the age of forty, recommenced the battle of life as a bar-iron merchant, with a borrowed capital of 100*l*. Here he had a series of commercial successes, built himself a handsome residence in the suburb of Upper Thorpe, and carried on a flourishing business till the great panic of 1837, when heavy losses caused him to contract the scale of his dealings. He finally withdrew from business in 1841, and retired to a pretty country residence he had built for himself on an estate of his own at Great Houghton, near Barnesley, and there he resided at ease in his circumstances, the centre and oracle of a circle of admiring friends, till his death, which occurred on the 1st of December, 1849, having lived to see the great change effected in the commercial policy of the country which he had laboured so earnestly to bring about.

Elliott says of himself, in the 'Autobiography' already quoted: "There is not in my poetry one good idea that has not been suggested to me by some real occurrence, or by some object actually before my eyes, or by some remembered object or occurrence, or by the thoughts of other men, heard or read." And this is evidently true. All his poetry—all the true and living part of it at least—was suggested by some passing event, or was written to serve some temporary purpose. None of it is the result of a long meditated design, or the completely formed issue of a vivid and vigorous imagination; or, on the other hand, the unpremeditated melody of a heart imbued with happy thoughts and fancies—singing as the wild-bird sings. Nevertheless it is true poetry, albeit often very harsh and rugged. It is the passionate protest against wrong—the fiery remonstrance with the wrong-doer—spurning the cold incumbrance of prose, and finding its only sufficient utterance in the unrestrained flow of poetry. The great public evil that came nearest home to his own hearth, that, as it seemed to him, which was inflicting dire mischief on the labouring classes of his own neighbourhood, and which was undermining the prosperity of the manufactures of his native place, and as he believed, of the country generally, was the Corn-Laws; and he resolved to set forth the mischiefs those laws were producing, and the greater dangers they were threatening. He had not been long settled at Sheffield when his 'Corn-Law Rhymes' began to appear in a local paper, and their effect on the hard Yorkshire artisans was immediate and lasting. And their influence was assuredly well-earned. Rude and rugged in language, intensely bitter, even savage in their indignation, often, as might be expected, inconsiderate and sometimes unjust in their denunciations, they yet showed everywhere a thoroughly honest hatred of oppression, and fellow-feeling with the oppressed and suffering. With quite a Crabbe-like familiarity with the poverty of the poor, they displayed a far warmer, deeper, and more genial sympathy. The wrath and the pathos, too, uttered in the most impassioned and the most direct words, were yet conveyed in genuine music, which made its way at once to the heart.' When from a local they appealed to the general public they were equally successful.

The 'Corn-law Rhymes,' published in a single volume with 'The Ranter,' at once made Elliott's name famous. Men of all shades of opinion joined in the admiration. The language was occasionally objected to, but it was generally felt that the language was really a part of the man. Noticing the objection in the preface to a new edition of the Rhymes, Elliott asked, "Is it strange that my language is fervent as a welding heat, when my thoughts are passions that rush burning from my mind like white-hot bolts of steel?" But this, while a sufficient explanation of what reads so like excessive vehemence, serves really to take off the edge of his poetic declamation, while it destroys the impression of his prose, as placing within the category of passion what ought to be the result of reason. Elliott followed his 'Corn-Law Rhymes' by publishing in 1829 the 'Village Patriarch,' another but longer corn-law rhyme, much the best of his longer pieces, and one which, with many faults, shows that he was capable of producing a great work, could he have subjected his mind to the necessary discipline. 'Love,' 'They Met Again,' 'Withered Wild Flowers,' 'Kerhonah,' a dramatic fragment, and numerous beautiful little pieces, in which descriptions of the scenery of his much-loved Yorkshire formed the most attractive part, followed; and in 1834 he published his collected works in three volumes. Three or four more editions of his poetry were called for during his life, and to the last he continued to write rhymes, epigrams, songs, and short snatches of verse, which usually appeared from time to time in the corner of a local newspaper, or the pages of 'Tait's Magazine.' Since his death two volumes of his inedited remains have appeared under the title of 'More Prose and Verse, by the Corn-law Rhymer,' but they contain nothing that can materially add to his reputation.

Two memoirs of Ebenezer Elliot have been published, written by Sheffield friends: but his biography remains to be written; and it is greatly to be desired that a fitting biography should be written of one who is emphatically the poet of Yorkshire—of its moors and streams, its towns and townsmen—the poet of the corn-law struggle, and the poet of the poor.

ELMES, HARVEY LONSDALE, son of James Elmes, was born near Chichester, about the year 1814. He was sent to school at Mortlake, in Surrey, and subsequently was taken into the office of his father, who had removed to London. At the age of twenty-one he joined his father in partnership, and together they designed and superintended buildings in Park-street and the South Mall, St. James's Park. His independent fame dates from his success in the competition for the building of St. George's Hall, Liverpool; his design having been chosen from the drawings of eighty-six competitors. He was then aged twenty-three. The building was at first intended for a music-hall only, and a foundation-stone was laid on the 28th of June 1838, though not quite on the present site. A competition for the Assize Courts shortly succeeded the other; and in this also Elmes was successful, there being seventy-five competitors. It was however decided to erect one grand edifice, and for this a fresh design by Elmes was approved of in 1841, when the work at length commenced. It was carried on under the architect's direction till the year 1847, when he was obliged to succumb to the encroachments of a fatal malady, and, after a brief sojourn at the Isle of Wight, he quitted England for Jamaica, with the hope of restoration in a warm climate, but died at Spanish Town, November 26, 1847, in the 33d year of his age. He had delegated the superintendence of his great work during his expected absence to his friend Mr. R. Rawlinson, Mr. Cockerell having agreed to attend to architectural detail. Under the first of these gentlemen the hall was arched over, contrary to many predictions which the architect had borne the brunt of—feeling probably that what had been accomplished in the works of the Romans should be allowed to present no insurmountable difficulty in the present century. The present decorative character of the interior, and some of the external accessories, are due to Mr. Cockerell, who also designed the sculpture of the pediment.

To understand the importance of Elmes's great work, it would be necessary to review the history of architecture, and especially the adaptation of Greek models, during the course of some years preceding the date of the St. George's Hall design. The proper use of ancient models had been completely lost sight of, and especially as to Greek architecture. In many parts of the kingdom buildings were erected, supposed to be classical, but which realised neither art nor the lower quality, the very imitation. Thus an idea had begun to prevail that the Greek system was so limited in its scope, whilst at variance with modern requirements, as to be in itself the cause of the failure in certain ambitious productions. Elmes however repeated the proof how that it is possible to use the works of preceding minds, and yet to realise the grandest new conception. Considered as to the attributes of art, Elmes's work is more Greek than many modern buildings which may exhibit even accurate reproduction. The design may well be claimed by this country as amongst the noblest efforts of architecture in Europe.

After years spent most worthily in the pursuit of art, Elmes had not realised anything commensurate with the extent and merit of his exertions. An average of 450*l*. a-year, subject to deductions for travelling, clerks, office and other heavy expenses, was all that one who had the highest gifts, received from that work which forms the chief adornment of a rich provincial town; and after his death a subscription was raised to provide a moderate income for his wife and child.

ELODIANS. [TORTOISES.]

EMBERIZIDÆ, a family of birds belonging to the order *Insessores* and the tribe *Conirostres*. The most distinguishing genus of the family is *Emberiza*. It comprises however other genera. The general relations of this family are given under FRINGILLIDÆ. We shall confine ourselves here to the British genera of this family known under the name of Buntings.

Plectrophanes.—Beak short, thick, conical, the edges of both mandibles slightly curved inwards; upper mandible smaller than the lower, with a small palatal knot. Nostrils basal, oval, partly hidden by small feathers. Wings long and pointed; the first and second quill feathers of nearly equal length, and the longest in the wing. Legs with the tarsi of moderate length; anterior toes divided; lateral toes equal in length; hind toe strong; claw elongated, and nearly straight.

P. Lapponica (Gould), the Lapland Bunting. It is the *Emberiza Lapponica* and *E. calcarata* of other writers. Though a native of the arctic regions, Mr. Yarrell records five instances of its being taken in Great Britain. It is found in Siberia and near the Uralian chain. Towards winter a few migrate as far as Switzerland. It inhabits the Faroe Islands, Spitzbergen, Greenland, and Iceland in summer, and thence westward to Hudson's Bay. Sir John Richardson says, that about the middle of May, 1827, they appeared in very large flocks at Carlton House, and a few days later made their appearance at Cumberland House. The eggs are usually seven, and of a pale ochre-yellow spotted with brown.

P. nivalis, the Snow-Bunting. It is the *Emberiza glacialis*, *E. montana*, *E. nivalis*, and *E. mustelina* of authors; and the Tawny-Mountain- and Snow-Bunting of English writers. It was at one time supposed they were different species, but this arose from the great variety of plumage to which these birds are subject. The predominant colour of their plumage is white, hence the name Snow-Bunting. This bird arrives in this country in the end of September and the beginning of October, and extends from the north of Scotland to the south of England. This bird is rather larger than the last.

Emberiza.—Beak conical, strong, hard, and sharp-pointed; the edges of both mandibles curving inwards; the upper mandible narrower and smaller than the under one, and its roof furnished with a hard bony and projecting palatal knob. Nostrils basal and round, partly hidden by small feathers at the base of the bill. Wings of moderate size; the first quill shorter than the third, which is the longest in the wing. Feet with three toes before and one behind, divided to their origin; claws rather long, curved, and strong.

E. miliaria, the Common Bunting, is the most common species of this genus. It remains in the British Islands throughout the year; and on account of its very familiar presence in corn-fields, is frequently called the Corn-Bunting. It builds its nest in April, and lays four or five eggs of a reddish-white or pale purple-red ground, streaked and spotted with dark purple-brown. It feeds on the seeds of the grasses, of the *Polygona*, of sorrels, and of cereal plants; also on Coleopterous Insects.

In both sexes of this species the upper parts are of a light yellowish-brown streaked with blackish-brown, each feather being of that colour along the shaft; lower parts pale yellowish-gray, each feather of the fore neck tipped with a triangular spot of brownish-black, the fore part of the breast and the sides with more elongated and fainter spots.

E. schœniclus, the Reed-Bunting. It is also called, according to MacGillivray, Black-Headed Bunting, Reed-Sparrow, Water-Sparrow, Ring-Bunting, Ring-Bird, Ring-Fowl, and Chuck. It frequents marshy places, where it is seen perching on willows, reeds, sedge, and other aquatic plants. It feeds on insects, seeds, and small *Mollusca*. The nest is placed among aquatic plants, and is composed of stalks and blades of grasses, bits of rushes, and the like. The eggs are four or five in number, of a yellowish-gray, with tortuous or angular lines, and irregular spots of black. This bird is easily distinguished from the other species by its black head and white throat.

E. citrinella, the Yellow Bunting, or Yellow Ammer. It is also called in English Yellow Yelding or Yolding, Yellow Yowley, Yellow Yite, Yeldrock Skute, and Devil's Bird. It is a permanent resident in Great Britain, in cultivated and wooded districts, where it is well known. The back and wings are bright red, the central part of each feather brownish-black. The nest is composed of coarse grasses and twigs, neatly lined with fine grass, fibrous roots, and hairs: it is placed on the ground or in the lower part of a bush. It lays four or five eggs purplish-white, marked with linear and angular streaks and a few irregular dots of black.

E. Cirlus, the Cirl-Bunting. This bird is not so common in this country as the last, which it greatly resembles. It was first distinguished as a British bird by Colonel Montagu. It is a native also of the south of Europe, and is more frequent in the south of England than in the north.

E. hortulana, the Ortolan Bunting. A very few specimens only of this bird have been taken in England. It is common in the southern countries of Europe, and migrates as far northward as the Baltic.

(MacGillivray, *Manual of British Birds;* Yarrell, *History of British Birds*.)

EMIGRATION. One of the most remarkable facts in the history of Great Britain is the rapid increase of the population. The positive increase in our own kingdom has been pointed out in the article CENSUS. While the population of France and Germany has increased within the last fifty years in a very small degree; while in Spain, Portugal, and Italy it has probably decreased; Great Britain has increased from 10,800,000, as given in the census of 1801, to 20,900,000 in that of 1851; and in the middle of 1856, the Registrar-General estimated the population of England and Wales alone at 19,044,000: Ireland is omitted, as there was no census of 1801. In addition to this increase, swarms have been thrown off to which the ancient migrations from the North are insignificant in their total amount, though the emigration has been less striking from its being not an irruption but a gradual progress. In forty-two years, from 1815 to 1846 inclusive, during which an account of avowed emigrants has been taken, 4,470,319 persons, male and female, have left the shores of the United Kingdom; and these have been enabled to form what may now be termed three mighty empires, subordinate to our own, in Australia, North America, and South Africa; independent of the branch streams which have flown off to Ceylon, the West and East Indies, Guiana, and other British possessions. The United States of America is the only dominion that can afford anything like a parallel, and even that is indebted to us for 2,703,782 persons, who have proceeded thither, the greater proportion of whom have been from Ireland, and chiefly from the years beginning with 1847. The annual average of emigration from 1815 to 1846, was 52,255; from 1847 to 1856, it was 279,816. It should be added, however, that from 1815 to 1824 no records were kept of the emigration to South Australia and New Zealand; but it was certainly under 1000 a year. In the 'Penny Cyclopædia' (vol. ix. p. 377; article EMIGRATION) we gave a table of emigration to 1836, which we now complete to 1856:—

Years.	North American Colonies.	United States.	Australia and New Zealand.	Other Places.	Total.
1837	29,884	36,770	5,054	326	72,034
1838	4,577	14,332	14,021	292	33,222
1839	12,658	33,536	15,786	227	62,207
1840	32,293	40,642	15,850	1,958	90,743
1841	38,164	45,017	32,625	2,786	118,592
1842	54,123	63,852	8,534	1,835	128,344
1843	23,518	28,335	3,478	1,881	57,212
1844	22,924	43,660	2,229	1,873	70,686
1845	31,803	58,538	830	2,330	93,501
1846	43,439	82,239	2,347	1,826	129,851
1847	109,680	142,154	4,949	1,487	258,270
1848	31,065	188,233	23,904	4,887	248,089
1849	41,367	219,450	32,191	6,490	299,498
1850	32,961	223,078	16,037	8,773	280,849
1851	42,605	267,357	21,532	4,472	335,966
1852	32,873	244,261	87,881	3,749	368,764
1853	34,522	230,885	61,401	3,129	329,937
1854	43,761	193,065	83,237	3,366	323,429
1855	17,966	103,414	52,309	3,118	176,807
1856	16,378	111,837	44,584	3,755	176,554
Total.	696,561	2,370,655	529,279	58,560	3,655,055

In 1857 the total number of emigrants from the port of Liverpool only, was 155,652; of these 9788 were for the North American colonies; 106,918 for the United States; 32,631 for Australia and New Zealand, and 324 for other places. Of these emigrants England supplied 50,289; Scotland, 8161; Ireland, 71,195; and various foreign countries, chiefly Germany, 6414. The emigration to Australia was principally English; that to the United States principally Irish.

Many emigrants, however, proceed to the North American colonies by New York, and no account is taken of the passage either way on the borders between them and the United States. The population thus exported seems scarcely less fertile than at home. We give the latest returns of the population of these colonies which are mainly occupied by a British population, our youngest and most vigorous:—

IN NORTH AMERICA:		Males.	Females.	Total.
Canada	Western	499,067	452,937	952,004
	Eastern	449,967	440,294	890,261
New Brunswick		99,526	94,274	193,800
Nova Scotia		137,677	138,440	276,117
Prince Edward's Island and Cape Breton		36,137	35,365	71,502
Newfoundland		52,274	44,232	96,506
Bermuda		4,797	6,295	11,092

The numbers given for Canada are from the Census of 1851 for Western, and the official return of 1852 for Eastern Canada; the estimated numbers of both in January 1857, were 2,500,000. For New Brunswick they are taken from the Census of 1851, and the official returns of 1853. For Nova Scotia, from the Census of 1851. For Prince Edward's Island, the Census of 1854; estimated in 1857 at 117,000. All have increased since the returns. For Newfoundland the numbers are taken from the Census of 1845, and in 1857 the increase was estimated at 10,000. For Bermuda the authority is the official return of 1853.

IN AUSTRALIA:	Males.	Females.	Total.
New South Wales	147,091	119,098	266,189
Victoria (late Port Phillip)	201,422	104,742	306,164
South Australia	48,843	48,544	97,387
Western Australia	8,536	4,282	12,818
Tasmania	38,505	32,460	70,965
New Zealand	15,035	11,672	26,707

These returns all come down to a recent date, 1855-56, except New Zealand, for which the numbers are from the Census of 1851, and is exclusive of military and aborigines. In Tasmania are included 7740 convicts, 989 troops, and 19 aborigines. The population of Victoria on Dec. 31, 1855, only three months later than the above return, was estimated at 319,379; and on Dec. 31, 1857, at 457,000.

IN AFRICA:		Males.	Females.	Total.
Cape of Good Hope	Western Division	71,021	69,957	140,978
	Eastern Division	48,973	48,147	97,120
Natal		4,142	3,487	7,629

The returns of these colonies are for 1853 and 1854; and in Natal the numbers given are exclusive of 112,988 settled natives.

In these three divisions of the British colonies, there are now representative governments, the privilege of self taxation, and the right of a free press; in short, a complete reproduction of the British Constitution. To other colonies, especially to British Guiana and some of the West India islands, the emigration has been considerable; but as the emigrants become mixed with an older and in some cases a coloured or foreign population, we cannot trace the British element so clearly. The effect has been so far good, that the inhabitants of the North American and Australian colonies are, with the exception of the United States, among our best customers. It is not remarkable, therefore, that so much attention has been paid of late years to the subject of the transmission of emigrants thither, and of means for enabling them to settle there in comfort. Government, accordingly, has undertaken to a considerable extent the business of regulating emigration. First, an agent-general for emigration was appointed. This officer introduced many judicious plans for rendering the passage of emigrants across the ocean as free as possible from discomfort, and a code of rules was framed to secure this and other objects. The functions of the agent-general for emigration are now exercised by the Land and Emigration Commissioners. Emigrants are also protected by the Passengers' Act. The Act 5 & 6 William IV. c. 5, passed in 1835, having proved insufficient for the purpose, several amended acts were passed, of which the latest is the 18 and 19 Vict. cap. 119, passed in 1855. Its objects are to regulate the number of passengers in each ship, and to provide for their proper accommodation on board; to ensure a proper supply of provisions and water for their use; to provide for the sea-worthiness of the vessels; to secure a sufficient number of boats in case of accidents; and to protect emigrants from the numerous frauds to which at various stages of their undertaking their helplessness and inexperience expose them. If the ship does not sail on the day mentioned in the agreement, the Passengers' Act compels the captain to victual the emigrants just the same as if the voyage had commenced; and they are entitled to remain on board forty-eight hours after the ship reaches her destination.

As a further protection to emigrants, and to enforce the provisions of the Passengers' Act, government emigration agents are appointed for the ports of London, Liverpool, Plymouth, Southampton, Glasgow and Greenock, Dublin, Cork, Belfast, Tralee, Donegal, Ballina, Limerick, Sligo, Waterford, Londonderry, and Galway. These officers act under the immediate directions of the Colonial Land and Emigration Commissioners. They procure and give gratuitously information as to the sailing of ships, and means of accommodation for emigrants; and whenever applied to for that purpose, they see that all agreements between ship-owners, agents, or masters, and intending emigrants, are duly performed. They also see that the provisions of the Passengers' Act are strictly complied with, viz., that passenger-vessels are sea-worthy, that they have on board a sufficient supply of provisions, water, medicines, &c., and that they sail with proper punctuality. They attend personally at their offices on every week-day, and afford gratuitously all the assistance in their power to protect intending emigrants against fraud and imposition, and to obtain redress where oppression or injury has been practised on them.

In the colonies there are Government Emigration Agents at the following places:—

Canada.—Quebec, Montreal, Toronto, and Hamilton.

New Brunswick.—St. John's, St. Andrew's, Chatham (Miramichi), Bathurst, Dalhousie, and Richibucto.

Australian Colonies.—Sydney, Moreton Bay, Melbourne, Geelong, Portland Bay, Hobart Town, Launceston, Perth, Fremantle, Adelaide, and Auckland.

Cape of Good Hope.—Cape Town, Port Elizabeth, and Simon's Town.

The duty of these officers is to afford gratuitously to emigrants every assistance in their power by way of advice and information as to the districts where employment can be obtained most readily, and upon the most advantageous terms, and also as to the best modes of reaching such districts.

The Emigration Commissioners, while they have funds for the purpose, grant passages to New South Wales, Victoria, and South Australia, to persons strictly of the labouring class who may be considered eligible emigrants. The funds are supplied entirely from colonial revenues, and in the administration of them the Commissioners act as trustees for the colonies, and are therefore bound to look exclusively to colonial interests. They do not consider therefore how distress in this country may be best relieved, but how the largest number of emigrants most suited for the wants of the colony may be procured and sent out. In deciding what classes are most suited to the wants of the colonies, the Commissioners are guided by reports and instructions received from time to time from the governments of the respective colonies, either direct or through the Secretary of State. The Commissioners are occasionally also able to grant passages to Western Australia; but they have no funds for assisting persons wishing to emigrate to the North American colonies.

In British Guiana, the Governor, under Ordinance No. 7, of 1854, sect. 4, is authorised by proclamation to name the places from which emigration on bounties is permitted, and to fix the rates of bounty for the introduction of emigrants, under the age of forty, competent and willing to engage in agricultural labour.

Emigration is one of the 'modes of relief' contemplated by the Poor Law Amendment Acts (4 & 5 Wm. IV. c. 76; 11 & 12 Vict. c. 110; 12 & 13 Vict. c. 103; and 13 & 14 Vict. c. 101). In some years a large number of persons have emigrated with the assistance of funds obtained under the Act 4 & 5 Wm. IV. By sect. 62 of that Act owners and rate-payers are empowered to raise money on security of the rates for the purposes of emigration, under the authority of the Poor Law Commissioners. The sum so raised must not exceed half the average yearly rate of the preceding three years, and it must be repaid within five years. The money is advanced to emigrants by way of loan, and is recoverable against persons above the age of twenty-one, who, having consented to emigrate, refuse to do so after the expenses of emigration have been incurred; and the loan is also recoverable if persons who emigrate shall return to this country. By the 12 & 13 Vict. cap. 103, the guardians of any parish or Union are empowered to expend money to the amount of 10*l.* upon the emigration of any poor person belonging to the parish or to any parish in the Union, without the necessity of a parochial meeting to give their consent. But the gross amount expended must not exceed the limit fixed above, and a majority of the Guardians of the parish of the settlement must express their concurrence in writing in the resolution of the Board of Guardians for such expenditure. This written concurrence must be transmitted, together with a list describing the proposed emigrants, to the Poor Law Board, who are to issue their order to confirm the resolution. The 13 & 14 Vict. c. 101, s. 4, enables Boards of Guardians, under similar restrictions, to expend money in and about the emigration of orphan or deserted children under sixteen having no settlement, or whose settlement is unknown. But it requires that no emigration of any such orphan or deserted child shall take place without the consent of such child given in petty session, and unless a certificate thereof under the hands of two justices shall have been transmitted to the Poor Law Board. Certain conditions are inserted by the Poor Law Board in all orders sanctioning the emigration of poor persons, of which the most material is, that the party emigrating shall go to some British colony not lying within the tropics; and the guardians are empowered to expend certain specified sums in the conveyance of the emigrant to the port of embarkation, and on the outfit, including bed, bedding, and clothing.

Under the Irish Poor Law Act, money may be raised for enabling poor persons to emigrate to British colonies; but the money so raised must not exceed one shilling in the pound on the net annual value of rateable property.

The Bounty System derives its name from the mode in which the proceeds of land-sales are applied in obtaining immigrants. In this case persons who introduce persons into the colony receive so much per head, according to the terms of agreement. The contractors engage to find persons willing to emigrate, and undertake to land them in the colony. This system is in force only in some of the Australian colonies. In New South Wales 51,736 persons were introduced from 1831 to 1842 under bounties.

The mode in which unoccupied land is disposed of in the colonies has a most important influence on the condition and welfare of immigrants. By the application of a general principle of law, the waste lands in the British colonies were considered to be vested in the Crown, and that every private title must rest upon a royal grant as its basis. But since 1831 another principle has been acknowledged and observed: that the Crown holds the lands in question for the purposes of the public good, not merely for the existing colonists, but for the people of the British empire collectively. It must be appropriated to public uses and for the public benefit. The Land Sale Act for the Australian Colonies (5 & 6 Vict. c. 36) prohibits land being alienated by her Majesty, or by any one acting under her authority, except by sale, and in the manner directed by the Act.

Down to the year 1831 no regular or uniform system of selling land appears to have been adopted in the British colonies. In place of such system, conditions were attached to the occupation of land under the name of quit-rents, money payments, or the cultivation of the soil; but these conditions were not effectually enforced, and in fact it was generally found impossible to enforce them. Land was profusely granted to individuals in large tracts, and as cultivation was not enforced, and no roads were made through these tracts, they interrupted the course of improvement. Under the old system, lands in the colony of the Cape of Good Hope, amounting to upwards of thirty-one million acres, have been disposed of for less than 46,000*l.* In Prince Edward's Island the whole of the land was granted in one day to absentee proprietors upon terms which have never been fulfilled. The influence of these proprietors with the Home Government prevented such measures being adopted as were calculated to enforce the settlement of the grants, and consequently the greater part of them remained chiefly in a wild state. ('Report of Mr. C. Buller, M.P., to the Earl of Durham, on Public Lands in British North America,' 1838.) This Report contains an account of the system of granting lands in each of the provinces of British North America; and in all of them it appears to have been injurious to the public interests.

In January, 1840, commissioners were appointed under the royal sign manual to act as a Land and Emigration Board. The sale of the waste lands of the Crown throughout the British colonies was regulated by the commissioners, and they applied the proceeds of such sales towards the removal thither of emigrants from this country, when the land-fund was appropriated to this object. This board was a subordinate department of the Colonial Office. But the disposal of the waste lands is now, by various Acts of the imperial and provincial parliaments, vested in the local governments. The regulations vary considerably in their details, but we give a summary of the conditions and prices of the waste lands in the North American, Australian, and Cape of Good Hope Colonies.

Colony.	Mode of Sale.	Price per acre.
NORTH AMERICAN COLONIES:		
Canada (West)	Fixed Price	4*s.* to 20*s.* currency.
Canada (East)	Ditto	2*s.* to 4*s.* ditto, according to situation.
Nova Scotia	Ditto	1*s.* 9*d.* sterling.
New Brunswick	Auction and private sales	2*s.* 5*d.* sterling upset price, and 2*s.* 1*d.* at private sale.
Newfoundland	Ditto	2*s.* currency upset price.
Prince Edward Island	Private contract	5*s.* or upwards, according to situation
AUSTRALIAN COLONIES:		
New South Wales	By Auction. Country lands not sold at the public sales may afterwards be bought at the upset price as a fixed price.	Lowest upset price, 1*l.* sterling.
Victoria		
Western Australia		
South Australia		
Tasmania		
New Zealand [Crown lands]	Auction, for town, suburban and rural lands. Fixed price for country lands.	Highest fixed price, 10*s.* an acre.
Cape of Good Hope	Auction, subject to a quit-rent	No fixed upset price.
Natal	Ditto	Lowest upset price, 4*s.* sterling.

In Canada there are detached Clergy Reserves for sale in most of the townships surveyed prior to 1841. These reserves are now vested in the Colonial Government by the 16 Vict. c. 21 (1853), subject to the rights of the clergy. They are now thrown open for public sale. The lands reported by the chief agent for emigration at Quebec to be most worthy the attention of emigrants, are the townships Peel, Wellesley, Maryborough, and Mornington, covering an area of 250,000 acres, in the county of Waterloo. The prices of land in these townships (as of all Clergy Reserves), are regulated by the quality of soil and situation, and average from 8*s.* to 20*s.* currency per acre, one-tenth of the purchase-money being required at the time of sale, and the remainder to be paid in nine annual instalments, with interest. One million acres of land were also appropriated for school purposes by the legislature in 1849, and the school lands in the counties of Bruce, Grey, and Huron are now open for sale to actual settlers upon the following terms:—The price to be 10*s.* per acre, payable in ten equal annual instalments, with interest. The first instalment to be paid upon receiving authority to enter upon the land. Actual occupation to be immediate and continuous. The land to be cleared at the rate of 5 acres annually for every 100 acres during the first 5 years. A dwelling-house at least 18 feet by 26 to be erected. The timber to be reserved until the land has been paid for in full and patented, and to be subject to any general timber duty thereafter. A license of occupation, not assignable without permission, to be granted. The sale and the license of occupation to become null and void in case of neglect or violation of any of the conditions. The settler to be entitled to obtain a patent upon complying with all the conditions. Not more than 200 acres to be sold to any one person on these terms.

In Canada West, the provincial government have recently opened three great lines of road, and laid out for settlement the lands through which they pass; they are styled, 1st, The Ottawa and Opeongo Road, which runs east and west; it will eventually be 171 miles in length, and connect the Ottawa River with Lake Huron. 2nd, The Addington Road, which runs north and south, is 60 miles long, and starts from the settlements in the county of Addington until it intersects the Opeongo Road. 3rd, The Hastings Road, which runs nearly parallel to the Addington Road, is 74 miles long, and connects the county of Hastings with the Ottawa and Opeongo Road. In order to facilitate the settlement of this part of Canada, and to provide for keeping the roads in repair, the provincial government have authorised free grants of land along these three roads, not to exceed in each case 100 acres, upon the following conditions:—That the settler be eighteen years of age. That he take possession of the land allotted to him within one month, and put in a state of cultivation at least twelve acres of the land in the course of four years,—build a house (at least 20 by 18 feet) and reside on the lot until the conditions of settlement are duly performed. Families comprising several settlers entitled to lands, preferring to reside on a single lot, will be exempted from the obligation of building and of residence (except upon the lot on which they live) provided that the required clearing of the land be made on each lot. No title is given to the settler until after these conditions have been performed, and the non-performance of them entails the immediate loss of the assigned lot of land, which will be sold or given to another.

The road having been opened by the Government the settlers are required to keep it in repair. The log house required by the Government to be built is of such a description as can be put up in four days by five men. The neighbours generally help to build the log cabin for newly-arrived settlers without charge, and when this is done the cost of erection is small; the roof can be covered with bark, and the spaces between the logs plastered with clay, and whitewashed; it then becomes a neat dwelling, and warm as a stone house.

The lands in Canada West thus opened up for settlement are capable, both as to soil and climate, of producing abundant crops of winter wheat, of excellent quality and full weight, and also of every other description of farm produce grown in the best-cultivated districts of that province.

In Australia and New Zealand licenses and leases are granted for large tracts of land for pasturage purposes, at very low rents, as to which the holders have certain restricted rights of pre-emption if required for purposes of cultivation; and subject to the right of being taken by the Government if wanted for public purposes.

In all the colonies the rights of the Crown in regard to minerals are preserved; but in most cases leases are granted on payment of a certain rate per cent. on the produce. In Australia licenses to mine and dig for gold on Crown lands are granted at the rate of 10*s.* per month for each individual license, payable in advance; or in case of a lease being granted of a certain portion of land, at a rate of three per cent. on the gross value of the gold procured from Crown lands, and of half that amount on gold obtained from private lands. A 'miner's right' license to search and dig for gold is obtainable on payment in advance of 1*l.* per annum. 'Storekeepers' licenses' at the 'Diggings' are also paid for at the rate of 2*l.* 10*s.* for three months, 5*l.* for six months, and 10*l.* for twelve months.

The Land and Emigration Commissioners are required by their official instructions to prepare and issue "a distinct and compendious account of whatever relates to the agriculture, the commerce, the natural products, the physical structure, and the ecclesiastical and political institutions of each of the colonies in which they offer land for sale." The Commissioners in pursuance of this object issue occasionally a 'Colonisation Circular,' which contains matter calculated to be of essential use to emigrants or persons who intend at some time to settle in the colonies.

EMMET, a name used by early English writers for the Ant. [ANT.]

ENAMEL (*of Teeth*). [TISSUES, ORGANIC, *S.* 1.]

ENCEPHALARTOS, a genus of Plants belonging to the natural order *Cycadaceæ.* The species are found in Africa. Like many of the other forms of Cycadaceous plants they yield starch in their stems, which are prepared by the natives and eaten; hence these plants are known by the name of Caffer-Bread or Kaffir-Bread.

ENCHELIS, a genus of infusorial animalcules. The species *E. sanguinea* and *E. pulvisculus*, according to Meyen, form the Red and Green Snow-Plants which have been described as *Confervæ*, and referred to *Protococcus.* [SNOW, RED.]

ENDOSMOSIS, a name given by Dutrochet to the process by which fluids pass from the exterior to the interior of a cell. This process seems to result from two distinct agencies, which are always brought into operation where fluids pass through a membrane. The one is the imbibition of the fluid by the porous cell-membrane, and the other is the mutual diffusion of miscible fluids. From the researches of Matteucci and others there can be little doubt that the passage of a gas or liquid through an animal or vegetable membrane is but the modification of the process of attraction by which fluids are absorbed by solid bodies. This process is carried on with various degrees of force in different materials, and seems to depend on the degree of attraction subsisting between the particles of the solid and those of the fluid. Matteucci found that when glass tubes of about three-quarters of an inch diameter were filled with fine sand previously dried, and introduced without pressure, and were immersed at their lower ends into the following liquids, the action of imbibition raised the liquids in the tubes to the following height:—

Solution of Carbonate of Potash .	85	millimetres.
Solution of Sulphate of Copper . .	75	"
Serum of Blood	70	"
Solution of Carbonate of Ammonia .	62	"
Distilled Water	60	"
Solution of Common Salt . . .	58	"
Milk	55	"
White of Egg, diluted with its own volume of water	35	"

In these cases the imbibition took place at first rapidly, then more slowly, and ceased entirely at the end of ten hours. When thick solutions of gum, or starch, or fixed oils were employed, scarcely any imbibition took place, and it was but little more when strong saline solutions were used. The degree in which different fluids pass into different solids will be seen in the following table:—

	Sand.	Pounded Glass.	Saw-dust.
Alcohol	85 mill.	175 mill.	125 mill.
Water	175 "	182 "	60 "

Thus showing that water passed more freely than alcohol into sand, but less freely into saw-dust, and both fluids passed with equal facility into pounded glass. The size of the tubes employed in these experiments and the temperature affected considerably the results. The fluids rose higher in proportion as the temperature increased. This enables us to understand the influence of heat on life by the physical effects it produces.

Not only is the passage of fluids from the exterior to the interior of a cell facilitated by the attraction between the cell-wall and the fluids, but the fluids on either side of the membrane have a tendency to mix with each other, which cannot but assist in this process. Professor Graham has shown that not only have gases an inherent tendency to mix with each other, independent of the laws of gravity, but that this law also applies to the miscibility of liquids. In a Memoir on this subject in the 'Philosophical Transactions' for 1850, he has shown the laws which this diffusion of liquids obeys. Different substances possess this property in different degrees. Thus, when solutions of the following substances were used, of the strength of 20 parts to 100 parts of water, the relative quantities diffused in a given time were as follows:—

Chloride of Sodium	58·68
Sulphate of Magnesia . . .	27·42
Nitrate of Soda	51·56
Sulphate of Water	69·32
Crystallised Cane-Sugar . . .	26·74
Starch-Sugar (Glucose) . . .	26·94
Gum Arabic	13·24

The experiments from which these results were obtained, were performed by inverting a phial containing the solution to be diffused in a large jar of pure water. The diffusion was stopped after seven or eight days, and the amount of diffusion was determined by evaporating the water of the jar to dryness. There can be little doubt that the relative diffusibility of the juices of plants and animals must have an important influence on the changes which go on in the cells during the performance of the functions of the vegetable or animal body. "Thus," observes Dr. Carpenter, "the low diffusibility of albumen obviously tends to the retention of the serous fluids within the tissues; whilst the high diffusibity of urea will favour its escape from them." The following is an account of the process of Endosmosis, and some of the conclusions at which we may arrive, from Dr. Carpenter's 'Principles of Physiology:'—

"If into a tube, closed at one end with a piece of bladder or other membrane, be put a solution of gum or sugar, and the closed end be immersed in water, a passage of fluid will take place from the exterior to the interior of the tube, through the membranous septum; so that the quantity of the combined solution will be greatly increased, its strength being proportionably diminished. At the same time, there will be a counter-current in the opposite direction; a portion of the gummy or saccharine solution passing through the membrane to mingle with the exterior fluid, but in much less quantity.

"The first current is termed Endosmose, and the counter-current Exosmose. The increase on either side will of course be due to the relative velocity of the currents; and the changes will continue until the densities of the two fluids are so nearly alike as to be incapable of maintaining it. The greater the original difference (provided that the denser be not actually viscid, but be capable of mixing with the other), the more rapidly and powerfully will the process be performed. The best means of experimenting upon the phenomena is afforded by a tube, narrow above, but widely dilated below, so as to afford a large surface to the membrane, compared with that of the superincumbent column, which will then increase in height with great rapidity. By bending this tube in the form of a syphon, and introducing into its curve a quantity of mercury, the force as well as the rapidity of the Endosmose between different fluids may be estimated with precision. In this way it was ascertained by Dutrochet, in some of his experiments, that fluid might be raised against a pressure of no less than 4½ atmospheres, or nearly 70 lbs. to the square inch. Although it is not universally true that the activity of the process depends upon the difference in density of the two fluids (for in one or two cases the stronger current passes from the denser to the lighter), it seems to be so with regard to particular solutions, as those of gummy or saccharine matter. No endosmose takes place between fluids which will not mingle, such as oil and water; and very little between such as act chemically on each other. Although an organic membrane forms the best septum, yet it has been found that thin laminæ of baked pipe-clay will suffice for the evident production of the phenomenon; and that porous limestones possess the same property in an inferior degree. Although it may not yet be possible to explain all the phenomena of Endosmose upon physical principles, yet these will go so far towards it that the general conditions of the process may be considered as well understood. Supposing that two mutually diffusible liquids are on the opposite sides of a porous septum, which is not equally penetrable by them, then the one which is most readily imbibed will tend to occupy the capillary passages of the septum, and will thus be brought into contact with the liquid on the opposite side. This contact will permit the diffusion of that which has passed through the pores of the septum; and as fast as that which occupies these pores is removed by diffusion, so fast will it be renewed on the other side,—just as oil continues to ascend through the capillary channels in the wick of a lamp, so long as it is being dissipated by the combustive process at its summit. In this way then an endosmotic current is produced, the force of which will depend upon the diffusion-powers of the two liquids, and upon the difference of the attractive power which the capillary tubes of the septum have for the two respectively.

Thus when a solution of sugar or gum is on one side of the septum, and water on the other, the water is the most readily imbibed; and consequently the chief mixture and diffusion of the liquids, the one through the other, takes place at the surface of the septum in contact with the more viscid liquid. But at the same time this liquid is tending to diffuse itself through the water which occupies the capillary channels of the septum; and as it is not repelled by the septum, but is only attracted by it in a less degree than the water, a portion of it finds its way in a direction opposed to the principal current, and diffuses itself through the water on the other side, thus constituting Exosmose. Thus it happens that the direction of the principal current, or Endosmose, will be determined by the attractive power of the septum for one or the other of the liquids; though the diffusion-power of the liquids through each other will help to determine its force. When alcohol and water, for example, are separated by a septum composed of animal membrane, the endosmotic current will be from the water towards the alcohol, because the former liquid more readily 'wets' the membrane, and consequently tends most strongly to occupy its capillary passages; but on the other hand, when the separation is made by a thin lamina of caoutchouc, the endosmotic current is from the alcohol towards the water, because the former is most readily imbibed by the septum. It has further been ascertained by the experiments of Matteucci, that when an organic membrane is employed as a septum, the rapidity of transmission is considerably affected by the direction in which the endosmotic current traverses the membrane. Thus, when the skin of the Torpedo was employed, with a solution of sugar on one side of it and water on the other, although there was always an endosmotic current from the water to the sugar, yet this current was strong enough to raise the interior liquid to 80° when the water was in contact with the internal surface of the membrane, in the same time that was occupied by its rise to 20° when the external surface of the membrane was turned towards the water. Again, when the mucous membrane of the stomach of a dog was used as the septum, and its external (or muscular) surface was placed in contact with alcohol, the passage of water from the other side took place with such rapidity as to raise the liquid in the tube to 130°; whilst if the internal (or mucous) surface of the membrane were placed in contact with the alcohol, and the muscular surface with water, the current was only sufficient to raise the liquid 6 degrees in the same time; so that it is evident that the transudation of water takes place much more readily from the mucous lining of the stomach towards the outer side of the viscus than in an opposite direction, in virtue simply of the physical properties of the membrane. In fact, according to Professor Matteucci, the cases are very rare in which, with fresh membranes, Endosmose takes place with equal readiness, whichever of the two sides is exposed to the water.

"The direction which is most favourable to Endosmose through skins is usually from the internal to the external surface, with the exception of the skin of the frog, in which the endosmotic current, in the single case of water and alcohol, takes place most readily from the external to the internal surface. But when stomachs and urinary bladders are employed, the direction varies much more, according to the nature of the liquids employed. This variation appears to have some relation to the physiological conditions in which these membranes are placed in the living animal: thus, the direction most favourable to Endosmose between water and a saccharine solution, is not the same for the stomach of a ruminant as for that of a carnivorous animal: as yet however no positive statement can be made on this subject. When membranes are employed that have been dried or altered by putrefaction, we either do not observe the usual difference arising from the position of the surfaces, or Endosmose no longer takes place; thus affording another indication that it is to the physical condition of the perfectly-organised membrane that we are to look for many of the peculiarities which are noticeable in the transudation of fluids through them. The exosmotic current does not bear any constant relation to the endosmotic, as may be easily comprehended from the preceding explanation; for if the liquids have a strong tendency to mutual diffusion, and the difference in attractive power which the septum has for them respectively is not great, each may find its way towards the other, and a considerable exosmose may ensue, with very little change of level. The amount of the exosmotic as of the endosmotic current, varies with the direction in which it traverses the membrane; thus, when sugar, albumen, or gum, was employed in solution, its transudation towards water took place most readily from the internal towards the external surface of all the skins examined by Matteucci, a fact which is not without its significance, when it is remembered that it is in this direction that the secretion of mucus takes place on the skins of fishes, frogs, &c.

"Applying these considerations to the phenomena of imbibition of liquids into the tissues and canals of the living body, we shall have to inquire how far they are capable of being accounted for on physical principles which have been now brought forward. It has been maintained by some that absorption is a purely vital operation, because it does not occur save during the continuance of life. But this is not true, since imbibition will take place into dead tissues, though more slowly than into some parts when living; and the difference of rate seems to be fully accounted for by the difference of the condition between a mass of tissue, all whose fluids are stagnant, and another in which an active circulation is taking place. Thus, as Matteucci has shown, if the hind legs of a frog recently killed be immersed for some hours in a solution of ferrocyanide of potassium, it will be found that every part of the viscera is so penetrated with the salt, that by touching it with a glass rod moistened with a solution of chloride of iron, a more or less deep blue stain is the result. Now, the same effect is produced much more speedily in a living frog; and it is easily proved that the imbibition takes place in the latter case into the blood-vessels, and that the salt is conveyed to the remoter parts of the body by the circulation, instead of having slowly to make its way by transudation through the tissues, as in the dead animal. But further, not only does the movement of blood in the vessels promote the diffusion of liquid, which has been already observed, it also increases the rapidity of the absorption itself in a very extraordinary degree. Thus, if a membranous tube, such as a piece of small intestine, or of a large vein of an animal, be fixed by one extremity to an opening at the bottom of a vessel filled with water, and have a stop-cock attached at the other extremity, and be then immersed in water acidulated with sulphuric or hydrochloric acid, it will be some time before the acid will penetrate to the interior of the tube, which is distended with water; but if the stop-cock be opened, and the water be allowed to discharge itself, the presence of the acid will be immediately discovered (by tincture of litmus) in the liquid which flows out, showing that the acid has been assisted in its penetration of the walls of the tube by the current traversing its interior. Thus, the continuance of circulation is obviously one of the most patent of all the conditions of absorption, and the difference in the rate of the process in the dead and living organisms, placed under the same circumstances, may be accounted for in great part, if not entirely, by the stoppage of the circulation in the former. All the circumstances which are laid down by physiologists as favouring absorption are in strict accordance with the physical principles which have been now explained. These circumstances are—1. The ready miscibility of the liquids to be absorbed with the juices of the body. 2. The penetrability of the tissue through which the absorption takes place. 3. The absence of previous distention in the tissues or canals towards which the flow takes place. 4. The elevation of the temperature within certain limits. 5. The vascularity of the tissues, and the rate of movement of the blood through the vessels. And the results of experiments upon recently-dead membranes which retain almost exactly the same physical conditions as those which they possessed during life, but have entirely lost their vital properties, seem most decidedly to indicate that the relative facility with which different substances are absorbed, and the direction most favourable to their passage through the tissues, are determined in great part by the physical relations of those tissues (and of the vessels which traverse them) to the liquid which is seeking to enter them. In this way, then, many of the phenomena of selective absorption are probably to be explained, especially in plants and the lower animals. The special absorbent vessels, however, of *Vertebrata* seem to possess properties which can scarcely be thus accounted for." ('Principles of Physiology.') [ABSORPTION.]

ENDYMION, a genus of plants belonging to the class of Endogens, the order *Liliaceæ*, and the tribe *Hemerocallideæ*. It has a tubular bell-shaped perianth, composed of six connivent leaves, with reflexed points combined below. The stamens are inserted below the middle of the perianth; the filaments decurrent.

E. nutans, the English Blue-Bell. It is also the *Scilla nutans*, the *Hyacinthus non-scriptus*, and *Agraphis nutans* of various botanical writers. It has linear leaves, with nodding racemes, the flowers bell-shaped, cylindrical; the apex of the sepals revolute; the bracts 2. This is a very common plant, flowering in May in the woods and thickets of England. It is also common in France and Belgium. The flower-stalk is about a foot high. The leaves are shorter than the flower-stalk. The flowers are generally blue. A white variety is however occasionally seen.

ENFRANCHISEMENT. The enfranchisement of copyholds, to facilitate which a great many acts of parliament have been passed, has at length, by the statute 15 & 16 Vict. c. 51, been rendered compulsory alike on the lord as on the tenant, on terms which are to be determined in case of difference by the Copyhold Commissioners nominated by the statutes. From the annual reports of these commissioners, which are laid before parliament, it would seem that the holders of copyhold property are gradually availing themselves of the facilities afforded by the statutes; so that in course of time the old tenure by copy of court-roll will become rare, and perhaps unknown. This is one of the many instances showing the tendency of modern legislature to simplify and cheapen the transfer of real property. (Blackstone's 'Commentaries,' Mr. Kerr's edition, vol. vii. p. 146.)

ENGRAULUS. [Anchovy.]

ENNISTYMOND. [Clare.]

ENTOPHYTA (from ἔντον and φυτόν), a term applied to plants found living within animal bodies. The term *Epiphyta* has been applied to those forms of plants which live upon the external parts of organised beings whether plants or animals. It is however difficult to draw the line between these two classes, because it frequently happens that a plant whose spores are deposited in the interior of an animal body, in the course of growth finds its way to the surface. The term Epiphyte has also been employed to designate those higher forms of plants, more especially the *Orchidaceæ* which are found growing on other plants, so that the term Entophyte is more especially used to designate those cryptogamic plants which grow on the skin or mucous membranes of animals. These will be more particularly referred to here. At the same time it should be observed that a large number of cryptogamic plants are found in the living tissues of other plants, and claim to be regarded as Entophytes in relation to the vegetable kingdom.

The study of *Entophyta* has been invested with considerable interest, since by the aid of the microscope so many of these plants have been detected accompanying various diseased conditions of the animal body. Although they have been perhaps more carefully investigated in the human body, it has been for a long time a familiar fact that many of the lower animals are attacked by these plants in states of disease. Thus the cultivators of the silk-worm have observed the growth of a species of *Botrytis* in the organs of that animal, producing great destruction amongst them, and the occurrence of this fungus is known by the name of Muscardine. [Muscardine, *S.* 2.] Caterpillars have been brought to this country from New Zealand, Australia, and China, as curiosities, from the bodies of which a species of *Clavaria* or *Sphæria* of considerable size is found to project. A species of *Polistes*, a kind of wasp, has been observed in the West Indies to be subject to the attacks of a fungus which appeared on the surface of its body in the form of a growth as large as itself. The common house-fly is often seen in the autumn of the year adhering helplessly to a pane of window-glass from the growth of a fungus on its body, which has not been free from the suspicion of producing even so formidable a disease as cholera. Gold-fish, when kept in confinement, as well as water-salamanders and sticklebacks, have been observed to be covered with a fungus (*Achlya prolifera*) before death.

These facts, and many others, have from time to time attracted attention, which, having been followed up by diligent observations with the microscope, have led to the discovery of a very large class of vegetable bodies taking up their ordinary residence within or upon animal surfaces.

A question has been raised as to whether these plants are the natural products of the bodies on which they are found, as other plants are of the soil in which they grow, or are introduced from some foreign and extraneous source. From the observations that have been made up to the present time, it appears that these plants are truly in their natural positions in the localities in which they are found, and that they only multiply or become sources of disease when the bodies on which they grow get into a disordered state. In the same manner the ova of animalcules seem constantly present in the air and water, only awaiting the proper combination of circumstances to be developed in prodigious numbers. The circumstances which predispose to the growth of these Entophytes upon the body, are not better known than those which predispose the body to receive certain contagions. A failure of the ordinary vital powers to carry on the healthy processes of life seems ordinarily to be the inviting cause of such a development of these plants as would constitute a disease.

All the observations that have been made on this important subject have been brought together by M. Robin in his work on the 'Natural History of the Parasitic Vegetables which grow on Man and on Living Animals' (Paris, 1853). The following is a classification of these plants:—

I. Algæ.

Class *Isocarpeæ*.
Sub-Class I. *Diatomeæ*.
Genus *Psorospermia*, 11 species.
Sub-Class II. *Malacophyceæ*.
Tribe *Gymnospermeæ*.
Order I. *Eremospermeæ*:
Sub-Order I. *Mycophyceæ*.
Family *Cryptococceæ*.
Genus *Cryptococcus*, 2 species.
Tribe *Palmelleæ*.
Genus *Merismopædia ventriculi*.
Family *Leptothriceæ*.
Genus *Leptothrix*, 2 species.
Genus *Cladophytum comatum*.
Genus *Arthromitus*, 2 species.
Tribe *Leptomiteæ*.
Genus *Leptomitus*, 6 species.
Genus *Moulinica*, 3 species.
Tribe *Laprolegnieæ*.
Genus *Saprolegnia ferax*.
Genus *Enterobryus*, 4 species.
Genus *Eccrina*, 2 species.
Sub-Order III. *Tiloblasteæ*.
Family *Oscillarieæ*.
Genus *Oscillaria*.
Genus *Zygnæma cruciatum*.
Order II. *Cryptospermeæ*.
Family *Chætophoreæ*.
Genus *Chætophora meteorica*.

II. Fungi.

Division I. *Arthrosporci*.
Tribe *Torulacei*.
Genus *Trichophyton*, 3 species.
Genus *Microsporon*, 3 species.
Genus *Sporendonema musca*.
Tribe *Oidiei*.
Genus *Achorion Schœnleinii*.
Genus *Oidium*, 3 species.
Tribe *Aspergillei*.
Genus *Aspergillus*, 8 species.
Division II. *Trichosporei*.
Tribe *Oxycladei*.
Genus *Dactylium oogenum*.
Genus *Botrytis Bassiana*.
Tribe *Sporotrichei*.
Genus *Sporotrichum*.
Tribe *Isariei*.
Genus *Isaria*, 12 species.
Division III. *Cystoporei*.
Tribe *Columellati*.
Section *Ascophorei*.
Genus *Mucor Mucedo*.
Division IV. *Chirosporei*.
Tribe *Coniopsidei*.
Section *Phragmidiei*.
Genus *Puccinia favi*.
Sub-Division *Endoclivei*.
Section *Spheronomei*.
Genus *Laboulbenia*, 2 species.

Tribe *Sarcopsidei.*
Genus *Stilbum Buquetii.*
Division V. *Thecasporei.*
Tribe *Sphæriacei.*
Genus *Sphæria*, 8 species.
Genus *Kentrosporium*, 2 species.

The following is a list of the distribution of the species of the above genera in the various localities of the animal body.

I. Man and the *Mammalia.*
A. The Skin.
Trichophyton tonsurans. Malmsten. (On Hairs.)
T. sporuloides. Ch. Robin.
T. ulcerum. Ch. Robin. (On Ulcerated Skin.)
Microsporon Audouini. Gruby. (Hair Follicles.)
M. mentagrophytes. Ch. Robin. (Roots of the Hair.)
M. furfur. Ch. Robin. (Skin.)
Mucor mucedo. Linnæus.
Achorion Schœnleinii. Remak. (The Hair and the Hair Follicles.)
Aspergilli species. Pacini et Meyer. (Auditory Passage.)
Puccinia favi. Ardsten.
B. On the Mucous Membrane.
Cryptococcus cerevisiæ. Kützing. (Intestines.)
C. guttulatus. Ch. Robin. (Rabbit.)
Merismopædia ventriculi. Ch. Robin.
Leptothrix buccalis. Ch. Robin.
Oscillaire (?) of the Intestines. Farre.
Leptomitus urophilus. Mont. (Bladder.)
Leptomitus of Hannover. Ch. Robin. (Pharynx and Œsophagus.)
Leptomitus of the Epidermis.
Leptomitus of the Uterus.
Leptomitus of Uterine Mucus.
Leptomitus of the Eye.
Oidium albicans. Ch. Robin. (In Thrush.)
Fungus of the Lungs. Bennett.
Fungus of the Nasal Mucus.

II. Birds.
A. Of the Respiratory Organs.
Aspergillus candidus. Michele. (The Air-Cells and the Lungs.)
A. glaucus. Fries.
A. nigrescens. Ch. Robin.
A. strix nyctea. J. Müller and Retzius.
Mouldiness of the Lungs of the Jackdaw. Meyer.
B. The Eggs.
Dactylium oogenum. Montague.
Sporotrichum (*Nematogonum*) *brunneum.* Schenk.

III. Reptiles.
A. The Eggs.

IV. Batrachians.
A. The skin. *Saprolegnia ferax.* Kützing (*Achlya*, Nees von Esenbeck).

V. Fishes.
A. The Skin.
Zygnema cruciatum. Agardh.
Chætophora (*Tremella*) *meteorica.* Ehrenberg.
Saprolegnia ferax. Kützing.
Trichotraunia dermale. E. Germain of St. Pierre.
Confervæ of Gold-Fish. Bennett.
Algæ of the Stickleback. Manicus.
B. The Gills and the Cellular Tissue.
Psorospermia of the Pike. J. Müller.
P. of the *Synodontis Schal.* J. Müller.
P. of the Sandre. (*Lucioperca sandra.*) J. Müller.
P. of the Roach. (*Cyprinus rutilus.*) J. Müller.
P. of the *Labeo niloticus.* J. Müller.
P. of the *Pimelodus Blochii.* J. Müller.
P. of the *Pimelodus Sebæ*, and of *Platystoma fasciatum.* J. Müller.
P. of the *Catastomus tuberculatus.* J. Müller.
P. of the *Gadus callarias.* J. Müller.
P. of the *Acerina vulgaris* of Grenville. Creplin.
P. of the *Sciæna umbra.* Ch. Robin.
C. The Eggs. *Saprolegnia ferax.* Kützing.

VI. Insects.
A. On the Elytra, and on the Articulations.
Botrytis Bassiana. Balsamo. Montagne.
Laboulbenia Rougelii. Ch. Robin. Montagne.
L. Guerinii. Ch. Robin.
Stilbum Buquetii. J. Müller and Ch. Robin.
B. On the Caterpillars and Chrysalises in the Tissues.
Botrytis Bassiana. Balsamo. Montagne.
Genus *Sphæria.* Haller.
Section *Cordyceps.* Fries.
Sphæria militaris. Ehrenberg.
S. sphærocephala. Klein.
S. entomorhiza. Dickson.
S. sobolifera. Hill.
S. Sinensis. Berkeley.
S. Robertsii. Hooker.
S. Taylori. Berkeley.
S. Gunnii. Berkeley.
Kentrosporium microcephalum. Wallroth.
K. mitratum. Wallroth.
Isaria eleuteratorum. Nees.
I. floccosa. Fries.
I. strigosa. Fries.
I. arachnophila. Dittmar.
I. leprosa. Fries.
I. Tartarica. Wallroth.
I. crassa. Persoon.
I. sphecophila. Dittmar.
I. exotela. Fries.
I. aranearum. Schweinitz.
I. sphyngum. Schweinitz.
I. gigantea. Montagne.
C. In the Intestines.
Moulinia chrysomelæ. Ch. Robin.
M. cetoniæ. Ch. Robin.
M. gyrini. Ch. Robin.
Leptothrix insectorum. Ch. Robin.
Genus *Eccrina.* Leidy.
E. longa. Leidy.
E. moniliformia.
Cladophytum comatum. Leidy.
Anthromitus cristatus. Leidy.
A. nitidus. Leidy.

VII. The Myriapoda.
A. In the Intestines.
Enterobryus elegans. Leidy.
E. spiralis. Leidy.
E. attenuatus. Leidy.
E. Juli-terrestris. Ch. Robin.

VIII. The Mollusca.
A. On the Vesicle of Slugs. (Algue indéterminée, Lebert.)
B. The Eggs. *Saprolegnia ferax.* Kützing.

The most interesting of these species are undoubtedly those which attack man or the animals which he domesticates and employs. With the exception of the *Botrytis* of the silk-worm, the latter have not been much investigated. Those which attack man, and accompany diseased conditions of his body, are better known. They may be divided into those which are found on the skin, and those which are attached to or found in the secretions of the mucous membrane.

I. *Entophyta* of the Skin.—Ten species have been noted in this locality. We shall enumerate them in the order in which they are given by M. Robin.

1. *Trichophyton tonsurans* (Malmsten); *Trichomyces tonsurans; Mycoderma* of the *Plica Polonica;* fungus of the hairs in *Herpes tonsurans*, fungus of *Porrigo scutulata, Achorion Lebertii;* fungus of the *Teigne tondante*, Bazin; *Rhizophyte*, Gruby. This fungus was discovered and described in 1844 by Gruby in the disease called by the brothers Mahon *Teigne tondante*, by Cazenave *Herpes tonsurans*, by Erasmus Wilson *Trichoses furfuracea* (one of the diseases called Ringworm and *Porrigo scutulata* in this country). It exists also, as pointed out by Gunsberg, in the *Plica Polonica*, although the two plants were formerly described as different. The *Tricophyton* is formed by oval transparent spores, which give rise to articulated filaments. Its anatomical seat is in the interior of the roots of the hairs. The hairs and fungi simultaneously increase. The former seem larger than usual, are paler in colour, lose their elas-

ticity, soften, and break off when they have risen some one or two lines above the surface of the scalp. In the short cylinder then left the fungus grows still more rapidly, so that the normal structure of the small stump of hair soon becomes indistinguishable. Sometimes the hair breaks off before emerging from the skin, and the fungus, epidermis, and sebaceous matter, fill the ends of the piliferous conduits, and form the little prominences which can be seen by the naked eye in this disease, and give the skin a rough anserine appearance. The sporules and mycelium of the plants can sometimes be seen, in the form of a white powder, on the roots of the broken hairs. Sometimes the cutis becomes congested and thickened, and then the plant is mixed up with scales of epidermis, with fatty and albumenoid granules, with pus, &c., and crusts are formed of greater or less thickness in which the growth of the fungus can go on. Messrs. Robin and Bazin adopt unreservedly the opinion that the *Trichophyton* is the cause of the disease known under the various names above given, and each has given examples of the contagion of the disease by the transmission of the spores. Bazin has made the very important observation that the same disease will attack horses, and can be communicated from them to men. Both Robin and Bazin however admit that there is some condition of the hairs (dependent no doubt on constitutional causes) which is essential for the growth of the plant, as sometimes the disease disappears, that is, the fungus dies, without treatment. With respect to the name of the most common disease in which the *Trichophyton tonsurans* appears, the term used by Cazenave (*Herpes tondens*) is extremely unfortunate. No doubt vesicles are sometimes seen, and sometimes the cryptogamic disease succeeds to true *Herpes circinata* of the scalp, but in many cases there are no vesicles at all throughout the whole course of the disease. The term used in this country *Porrigo scutulata* is inconvenient as it is applied with greater justice to *Favus*. The old term of *Tinea* is after all by far the best, and the specific affix *tondens* expresses well one feature of the disease, the baldness arising from the brittleness of the hairs.

2. *Tricophyton* (?) *sporuloides* (Robin), (*Mycoderme* of the *Plica Polonica*). In addition to the former species, Walther describes in the *Plica Polonica* oval or circular flattened sporules, which have been too little studied at present to permit their exact characters to be stated.

3. *Trichophyton* (?) *ulcerum* (Robin). Lebert has described a fungus in the crusts covering an atonic ulcer of the leg.

4. *Microsporon Audouini* (Gruby). This plant has been studied by Gruby, and its existence, though denied by Cazenave, has been confirmed by Robin. It is present in the disease commonly called after Willan *Porrigo decalvans* or *Alopecia circumscripta*, or by Bazin, *Tinea achromatosa*. It differs from the *Trichophyton* of *Tinea tondens*, by its numerous waved filaments, and by the extremely small size of its sporules. It is not found, like the *Trichophyton*, in the interior of the root, but forms round each hair a little tube; the hair then becomes opaque, softens, and breaks off. The Alopecia is rapid, with or without vitiligo of the skin. The dermis is not congested, and the epidermis is thin and smooth. There is an affection which should probably be distinguished from the *Porrigo decalvans*, or *Alopecia circumscripta*, and which is characterised by a rapid disappearance of pigment from both skin and hair, with or without Alopecia. M. Bazin includes it in his *Tinea achromatosa*, but does not mention the fact that Alopecia is not constant. He states that a parasitic plant is present, but does not describe it. There must however be something more than a fungus to cause the total disappearance of pigment from a considerable portion of dermis. Besides, when the hairs return they are at first white, and only gradually regain colour; but if the vitiligo were owing to a plant, it is probable they would not grow at all. The disease appears to be allied to those obscure pigmentary changes which have a much deeper seat than the surface of the body.

5. *Microsporon mentagrophyta* (Robin), (*Mentagrophyte*, Gruby). This is a plant resembling the preceding, but possessing larger spores and filaments. It was discovered by Gruby in a case of mentagra, and has been since described by Bazin. Its seat differs from that of the preceding, and from that of the *Trichophyton*. It is between the bulb of the hair and the follicle in which the bulb is seated, and never extends beyond the surface of the skin.

6. *Microsporon furfur* (Robin). In 1846 Eichstedt discovered a cryptogamic plant in the disease called by Willan *Pityriasis versicolor*, and more lately *Chloasma*. Soon afterwards Sluyter described the same fungus, and lately Sprengler has described and figured it. It forms with the epidermic scales the yellowish-brown scurf seen in *Pityriasis*.

7. *Achorion Schœnleinii* (Remak), (*Oidium Schœnleinii*; *Mycoderma* of *Tinea favosa*; *Porrigophyte* (Gruby); Fungus of *Favus*. Schœnlein was the first to suggest that the honeycomb, or yellow favous crusts in the so-called *Porrigo lupinosa* (Willan) and *P. scutulata*, were constituted by a vegetable growth. This has been repeatedly confirmed, and many excellent descriptions have been given of the disease now called indifferently *Favus, Tinea favosa*, or *Porrigo scutulata*.

M. Robin believes he has discovered that the primary seat of the *Achorion* is in the depth of the hair follicle, against the hair, and, as well as we can understand the description, outside the layer of epithelium which covers the root of the hair, and which forms the 'inner root-sheath' of Kölliker. In this observation however he has been anticipated by Wedl, who has pointed out that by using a concentrated solution of liquor potassæ to make the parts transparent, the fungus is found in the follicle round the hair at the place where it passes through the epidermis. In addition to this, the plant is found in depressions on the surface of the skin, forming the yellow honeycomb-like masses which give the specific name *Favus* to the disease, and which from their frequent buckler-like shape suggested the term *scutulata*. The development of the *Achorion* in this situation is described by Robin after Remak and Lebert. A cuticular elevation is seen, beneath which is a small favus. When the cuticle is raised, a drop of pus sometimes issues: hence the error of those who have considered this disease always pustular. Generally however there is no pus or liquid of any kind. The plant grows, and the cuticle over it (supposing it has not been forcibly detached) finally separates, leaving the favus exposed to the air.

M. Bazin describes the *Favus* under three heads, which are fundamentally identical, and different only in respect of form:—

1. *Favus urceolaria dissemina:* this corresponds to the *Porrigo favosa*, *Favus dispersus*, and *Teigne alveolaire* of other authors.
2. *F. scutiformis:* this is the *Porrigo scutulata*, or *F. confertus*.
3. *F. squamosa*, a form usually called *scutulata*, but distinguished chiefly by the irregular distribution of the achorion, and by the furrowed masses formed by the fungus, the hairs, epidermis, and exudation.

8. *Puccinia Favi.* The achorion constitutes, with epithelium and a little exudation, the mass of the *Favus;* but it has been lately (1850) observed by Ardsten, of Christiania, that a different fungus, a species of *Puccinia*, is occasionally also present. Robin considers it to be only an epiphenomenon, and that it is certainly not present in all cases. The *Puccinia* is easily recognised. It has one extremity (the body) rounded, and composed of two cells of unequal size, a superior and an inferior. The other extremity is prolonged into a pointed stem or trunk.

There are still three other plants found upon the skin, which need merely be enumerated.

9. *Mucor.* In senile gangrene, an ill-described fungus, supposed to be the *Mucor mucedo* of Linnæus, has been seen on the sloughing mass.

10. *Aspergillus.* In the wax in the external meatus of the ear, Mayer many years ago described a fungus, and Paccini has lately made a similar observation—*Leptomitus*(?) of the epidermis. An *Alga* has been seen by M. Gubler in the epidermis of an arm which was irrigated for a long time to keep down inflammation after a gunshot wound. No one else has noticed it. Not only Messrs. Robin and Bazin, but Simon and others of the best dermatologists of Europe, have adopted the opinion that the plants are the actual causes of the diseases in which they are found. The contrary opinion is generally held in this country, on the grounds that fungi are generally the proofs and consequences of decay, but not its causes; that in the various forms of *Tinea* a special condition of the skin and hairs appears necessary for the growth of the plant; and that in *Tinea favosa* (*Favus*) in particular, a marked feature of the disease occasionally is an hyper-secretion of epithelium and exudation, owing to an hyperæmic cutis, before any trace of fungus can be found.

Nevertheless, these arguments, strong as they are, seem to be overborne by the two grand facts that *Tinea tondens* and

Tinea favosa can be communicated by transfer of the plant, and that the disease can be cured with the greatest readiness by the chemical agents which are most destructive to vegetable life. That a special nidus is necessary may very well be admitted by the partisans of this view, since even in the case of epidemic agents a predisposition is necessary; yet no one dreams of confounding the co-operating cause with the special and peculiar poison.

It may be desirable to recapitulate the diseases of the skin in which parasitic plants are found:—

1. *Tinea tondens*, in which the *Trichophyton tonsurans* is present.
2. *Tinea favosa*, in which are present the *Achorion Schœnleinii*, and the *Puccinia Favi* in some cases.
3. *Mentagra*, or *Tinea mentagra*, which exhibits the *Microsporon mentagrophyta*.
4. *Pityriasis versicolor* (*Chloasma*), in which the *Microsporon furfur* occurs.
5. *Porrigo decalvans* (*Tinea achromatosa*), in which the *Microsporon Audouini* is found.
6. *Plica Polonica*, in which the *Trichophyton tonsurans* and *Trichophyton sporuloides* are present.

II. *Entophyta* on the Mucous Membrane.—The plants forming on mucous membranes, or in the contents of cavities lined by mucous membrane, are of less interest than those which grow on the skin, as in most cases they are decidedly only secondary. We shall merely enumerate them:—

1. *Cryptococcus Cerevisiæ*, Kützing (*Torula Cerevisiæ*), the Yeast-Plant in the bladder, stomach, intestines, &c.
2. *Merismopœdia ventriculi*, Robin (*Sarcina*), in the stomach, intestines, &c.
3. *Leptothrix buccalis*, Robin (*Alga*), of the mouth.
4. *Oscillaria* of the intestines. (Farre.)
5. *Leptomitus urophilus*, Montague; an *Alga* described as forming in the urine. It has as yet been scarcely studied.
6. *Leptomitus* (?), Hannover, Robin; *Alga* found by Hannover in the pharynx and œsophagus.
7. *Leptomitus* of the uterus.
8. *Leptomitus* of the uterine mucus.
9. *Leptomitus* of the eye.
10. *Oidium albicans*, Robin (*Cryptogamiæ*) of diptheritis and aptha; Aptophyte. (Gruby.)
11. Fungus of the lungs. (Bennett.)
12. Fungus in the discharge of glanders.

To this list from M. Robin may be added the so-called Cholera Fungus of Brittan and Budd. It should however be added that no confirmation of the view originally taken by the discoverers, that the fungus discovered in the dejections of those affected with cholera was the cause of the disease, has been afforded. The only explanation that can be given of the occasional occurrence of the spores of fungi or spore-like bodies on the mucous membrane of the stomach and intestines, is their introduction with the food. It has been stated above that the spores of certain species of fungi are found naturally on grains of wheat, and only await favourable conditions for development. Such fungi may be constantly introduced into the stomach with the flour of wheat in the form of bread or other kinds of food.

"In the study of the vegetable parasites of animals, particularly those of the intestinal canals, it is necessary to be careful not to confound the tissues of certain well-known cryptogamic plants, which may serve as food or adhere to the ordinary food of such animals, with true *Entophyta*. Thus fragments of fungi, confervæ, lichens, and the spores of these, used as food, or adhering as foreign matter to food of an ordinary kind, are liable within the intestine to be mistaken for parasites.

"In mid-winter I found beneath an old fence-rail an individual of *Achela nigra*, or large black cricket, within the proventriculus of which were large quantities of what I supposed at the time to be a free floating Entophyte, resembling in general appearance the ordinary Yeast Fungus, *Torula*, but which I now suspect to be an ergot upon which the animal had fed. The plant consisted of oblong or oval vesicular bodies, apparently thickened at the poles, and filled with a colourless liquid; but this appearance more probably arose from the cells being distended with a single large, transparent, colourless, amorphous globule, which pressed a small existing amount of protoplasma to each end of the cavity. The cells were single, or in rows, to eighteen in number. Frequently a single cell of comparatively large size had an attached pair of cells, or rows of cells, at one or both ends. Occasionally they are met with containing one or two small round hyaline amorphous nuclei. The isolated cellules, measured from the $\frac{1}{3500}$th to the $\frac{1}{1666}$th of an inch in length by the $\frac{1}{5000}$th to $\frac{1}{6000}$th of an inch in breadth. The rows measured up to the $\frac{1}{300}$th of an inch in length." (Leidy.)

(Leidy, *A Flora and Fauna within Animals*; Robin, *Histoire Naturelle des Végétaux Parasites*; Bazin, *Recherches sur la Nature des Teignes, &c.*; Parkes, *Epiphytes and Entophytes*; *Brit. and For. Medico-Chirurgical Review*, 1853; *Journal of Microscopical Science*, vol. ii.)

ENTRE RIOS, one of the Riverine provinces of the Argentine Confederation, South America, owes its name to its situation between the rivers Paraná and Uruguay. It comprehends however only the southern part of the peninsula formed by those rivers, the northern portion forming the province of Corrientes. The boundary between the provinces is formed by the Rio Guayquirare, which falls into the Paraná, and the Mocoreta, which falls into the Uruguay, between 30° and 30° 30′ S. lat. The area is about 32,000 square miles. The population is about 25,000.

The surface is gently undulating; it is only broken by hills along the middle portion or interior of the country. This part is covered with forests of low stunted trees. The southern part of the province is low, and especially along the banks of the Paraná subject to inundations. The northern part is occupied by a low swampy tract, known as the Forest of Monteil. Besides the rivers Paraná and Uruguay, the province is abundantly watered by numerous small streams. The soil of Entre Rios is in general fertile, and covered with luxuriant herbage. The climate is mild and dry. Frost never occurs. Rain seldom falls more than fifty days in the year. The highest range of the thermometer at the town of Paraná during the year 1844-47 was 96° in January 1844; the lowest, 50°, occurred in the month of June in 1844 and 1846. (M'Cann.) Cultivation is limited to a comparatively few spots. The principal grain crops are wheat, barley, and maize. Tobacco and cotton of excellent quality are also raised, but the crops are precarious in consequence of frequent droughts. Great damage is also done to all kinds of crops by the immense swarms of locusts and ants, which sometimes devastate an entire district. The forest-trees are chiefly mimosas, nandubay, black and white espinello, guebracho, and guayiabo, but they are generally small, though in much request for carpenter's work and firewood. Vast herds of cattle are reared, but heavy losses frequently occur owing to the severe droughts to which the province is so often subject. In 1846 so great a drought occurred that the grass was everywhere burnt up; and Mr. M'Cann states that the whole of the cattle in the province went off from the feeding grounds in search of food and water: many estancias (cattle farms) lost from 5000 to 50,000 head of cattle, and one farm 150,000. Horses are bred in great numbers. Owing to the long-continued state of anarchy in the province there are, in the unsettled parts, numerous herds of wild cattle and horses. The rearing of cattle and horses is the chief occupation of the inhabitants. Mechanical employments are almost entirely neglected. The geographical position of the province admirably adapts it for commercial pursuits; but owing to the closure of the navigation of the two great rivers, and the disturbed state in which the country has so long been kept, comparatively little commercial progress has yet been made. Now however that the rivers are declared open to vessels of all nations, under the guarantee of the principal maritime powers, there seems to be required only internal peace for the development of the great capabilities of the country. The exports are principally of hides, horns, tallow, and jerked beef.

Like the other provinces of the Argentine Confederation, Entre Rios is a feudal state, owning but little dependence upon the central government. The government is almost entirely in the hands of a governor, elected for the term of two years. The Congress consists of deputies chosen from the several towns or districts. The revenue is derived chiefly from customs duties.

Except a few families of Guarini origin, the country is almost entirely inhabited by the descendants of Spaniards. In the towns however a few foreigners are settled, mostly Italians, who mainly conduct the river navigation, with some French and English traders. Some of the large estancias (cattle farms) and saladeros (tallow-melting establishments) are the property of and conducted by Englishmen.

Entre Rios took a leading part in the revolt against the supremacy of Buenos Ayres, joining with Corrientes in the engagements with foreign powers, which led to the fall of Rosas, and in all the subsequent proceedings which have had for their main object the opening of the rivers Paraná and Uruguay.

Paraná, or *Villa del Paraná*, the capital of the province, is about a mile from the left bank of the Paraná, in 31° 45′ S. lat., 60° 47′ W. long., and contains about 6000 inhabitants. It is built on the summit of a lofty cliff, which slopes gently towards Santa Fé, which stands on the opposite side of the river, and hence the town derived its original name, Bajada de Santa Fé, or the 'Descent to Santa Fé.' The only public building of any consequence in Paraná is the recently erected government house. A large church which was commenced some years back remains unfinished. The climate is mild and dry, but not healthy. The houses have no fire-places; and all classes live much in the open air. The supply of water is very bad; all that is consumed is brought to the town in carts drawn by oxen. The town at present has a quiet listless appearance. Only a few small vessels belong to it. The exports are hides, hair, tallow, and lime.

Concepcion de la China, formerly called Uruguay city, on the Uruguay, is a small but old town of about 1500 inhabitants. It once carried on some trade with Monte Video, but it is now decayed and ruinous. The houses are mostly built of wood and mud, with thatched roofs. In the centre of the Plaza is a pyramid now falling to pieces. In the vicinity is a large saladero. *Concordia*, on the Uruguay, opposite Salta, from a village of a few mud huts, appears to be growing into a place of some importance. It has about 1000 inhabitants, and carries on a good deal of trade. But the situation is bad, as vessels are unable to reach the town at low water, and are obliged to anchor about two miles below it. It contains a church and a large school-house, endowed by the government. *Gualeguay*, on the river of the same name (33° 10′ S. lat.), is a town of between 2000 and 3000 inhabitants, of whom nearly 300 are foreigners, chiefly Basques and Italians. It is a place of a good deal of trade, but vessels cannot approach nearer than about three leagues from the town. In the neighbourhood is the most extensive estancia in this part of the country, belonging to an English subject. It is the property of Mrs. Brittain of Sheffield, and occupies 200 square leagues of land. Several other estancias belonging to English subjects are in the vicinity. *Gualeguay-chu*, near the mouth of the Gualeguay-chu, about 60 miles E.N.E. from Gualeguay, population about 2500, including nearly 300 foreigners, contains a neat church and a good school-house, and is a place of some trade; but the situation is inconvenient, as vessels drawing more than 6 feet of water are sometimes obliged to wait two or three weeks to get across the bar at the mouth of the river. In the neighbourhood are some large tallow-melting establishments.

(Woodbine Parish, *Buenos Ayres;* M'Cann, *Ride through the Argentine Provinces*.)

EPÉRVA, a genus of Plants belonging to the natural order *Fabaceæ*. It has four thick and concave sepals connected together into a permanent urceolate tube at the base, with the sides incumbent, the upper one the broadest. It has but one petal, which is roundish, fringed, and inserted in the middle of the calyx. There are 10 stamens, which are long thickened filaments, rather villous at the base, and joined into a short monadelphous ring. The ovary is stipitate. The style long and filiform. The legume compressed, dry, coriaceous, falciform, 2-valved, 1- to 4-seeded. When young it is tomentose.

E. falcata is a tree with abruptly pinnate leaves, bearing 2 or 3 pairs of ovate acuminated shining leaflets. The panicle is pendulous on a long peduncle, constantly composed of numerous distant racemes. It is the Wallaba-Tree of Guyana according to Sir Robert Schomburgk, who informs us that its wood is deep red, frequently variegated with whitish streaks, hard, heavy, and shining, and impregnated with an oily resin which renders it very durable. The bark is bitter, and is used by the Arawaak Indians as an emetic.

EPISTILBITE. [MINERALOGY, *S.* 1.]

EPITHELIUM. [TISSUES, ORGANIC, *S.* 1.]

EPSOMITE. [MINERALOGY, *S.* 1.]

EQUIDÆ. [HORSE.]

EQUITY. The proceedings of the Courts of Equity have been greatly simplified and cheapened by several recent statutes, founded on the first report, presented in 1852, of the Commissioners appointed to examine this subject in 1850. Instead of the writ of *subpœna*, which merely gave the defendant notice of a bill having been filed but afforded him no information of its contents, the bill itself, in a convenient printed form, is now served upon the defendant, either personally, or by being left at his house; or under special circumstances with some other person (as for instance, the solicitor or agent of the defendant) as his substitute. In default of appearance, the plaintiff may proceed against an *unprivileged* person, by having an attachment issued against him; against a privileged person, as a peer, or member of parliament, by a sequestration of his property; against a corporation, by a *distringas* and sequestration if necessary. Another course is, however, open to the plaintiff. Instead of proceeding by way of attachment and sequestration, he may *enter an appearance* for a defendant not appearing within eight days after the service, and thereupon proceed to judgment and execution.

Until the recent alterations, every bill in chancery contained what is called the *interrogating part* in which every statement and charge in the bill was converted into a series of questions, framed on the principle that the defendant might possibly be a dishonest defendant, disposed to answer evasively, and therefore suggesting modifications of the statement or charge. For example, if the statement were of a deed bearing a certain date, and made between and executed by certain parties in certain words, or to a certain effect, the questions would be, whether such a deed of that date, or of some other and what date, was not made between and executed by such parties, or some and which of them, or some other and what parties, in such words, or to such effect, or in some other and what words, or to some other and what effect. Originally these interrogatories were used much more sparingly, and were confined to those matters supposed to be within the knowledge of the defendant, as to which it was considered necessary or desirable to extract admissions from him. But in course of time the practice was altered, and the easier process was adopted of transmuting all the statements into questions of the nature above described. The length of the proceedings and the expense to all parties concerned were thereby greatly increased. There is now no interrogating part in any bill: but where the plaintiff requires an answer from any defendant or defendants to a bill, he may file interrogatories for their examination.

The demurrer, plea, or answer of the defendant to the bill, each remain very much as before;—except that the answer is no longer taken with the expensive formalities which used to accompany it. Formerly a *dedimus potestatem* or commission was issued to take the answer and oath of a defendant in the country, which was sealed up, and either brought by one of the commissioners to the court, or sent by a messenger, who swore he received it from one of the commissioners, and that the same had not been opened or altered since he received it. The answer is now however filed without further formality than in swearing and filing affidavits; and it may be sworn before any judge, court, notary public, consul, or vice-consul, lawfully authorised to administer oaths, the messenger's oath being dispensed with.

In many cases, indeed, when the facts in dispute between the parties are few and not of a complicated character, an answer is not now requisite. Affidavits may be filed by the plaintiff and defendant, upon which the Court will determine the case, unless it be thought proper, in addition thereto, to examine or cross-examine the parties orally.

The practice which formerly prevailed of examining witnesses on interrogatories, having been found in many respects very inefficient and objectionable, has also been abolished; the court retaining the power to order particular witnesses to be examined upon interrogatories, according to the old practice.

When therefore a suit commenced by bill is at issue, the plaintiff may give the defendant notice of the mode in which he desires the evidence to be adduced, namely, *orally* or upon *affidavit;* and if either party give no such notice, or if giving such notice, he expresses his desire that the evidence be adduced upon affidavit, then both plaintiff and defendant may verify their respective cases by affidavit, unless the defendant gives notice to the plaintiff that he desires the evidence to be taken orally. If evidence is to be thus taken, the witnesses are examined by or before one of the regular examiners of the court, or an examiner specially appointed if necessary. The principal defect in the old mode of examining witnesses was, that the examination being secret, and upon *written* interrogatories, the cross-examination being conducted in the same manner, the party cross-examining laboured under the disadvantage of not knowing what the witness had deposed to in his examination in chief; under the modern system, the *oral* examination of witnesses takes place in the presence of the parties, their counsel, solicitors, or agents;

and the witnesses are then and there subject to cross-examination and re-examination. Every deposition is taken down in writing by the examiner in the form of a narrative, and read over to the witness, and signed by him, in the presence of the parties. When concluded, the examiner transmits the original depositions to the Court, and the cause is then ripe for the hearing.

Another important change in equity procedure relates to the determination of questions of *law*, as distinguished from *equity*. Formerly, if a question of this nature arose in the course of a cause, it was the practice of the Court to refer it to the opinion of the judges of the Courts of Common Law, upon a case stated for that purpose; who certified their opinion to the chancellor, upon which certificate the decree was usually founded. The court must now itself determine any questions of law which require to be decided previously to the decision of the equitable question at issue between the parties; for which purpose any of the courts may obtain the assistance of the judges of the Courts of Common Law.

A shorter and simpler method of proceeding than that by Bill and Answer was introduced in the year 1850, namely, that of *Claims*. This plan was only intended to be used in certain definite cases of comparative simplicity; and subsequent legislative enactments have so much improved the mode of proceeding by *Bill*, that the advantage of having recourse to a *Claim* is not now so great as when that procedure was first introduced, and in many cases a Bill according to the new system is found to be far preferable. Claims are indeed nothing but short bills, without any interrogatories, the merits of which are to be decided upon affidavits on each side; every order made on the hearing of which has the same effect, and may be enforced as a decree in a suit commenced by *Bill*. Orders made on claims may also be discharged, varied, or set aside upon motion; and any order of the Master of the Rolls, or any of the Vice-Chancellors, may be discharged or varied by the Lord Chancellor or the Court of Appeal in Chancery.

A still more summary method of proceeding has been introduced, by the statute 15 & 16 Vict. c. 86, applicable to similar cases of administration. Any person claiming to be a creditor, legatee, or next of kin of a deceased person, may obtain a summons from the Master of the Rolls or any of the Vice-Chancellors, requiring the executor or administrator of the deceased person to attend and show cause why an order for the administration of the estate of the deceased should not be granted.

Upon proof of the due service of such summons, or on the appearance of such executor or administrator, and upon proof by affidavit of such other matters, if any, as the judge shall require, the judge may make an order for the administration of the estate of the deceased, with such variations, if any, as the circumstances of the case may require; and the order so made is to have the force and effect of a decree to the like effect made on the hearing of a cause or claim between the same parties.

A *special case* may also be filed, in order to obtain the opinion of the Court upon the decision of any question under Sir George Turner's Act, 13 & 14 Vict. c. 35; but as the Court can now make a merely declaratory decree, under 15 & 16 Vict. c. 86, the same end may be more conveniently obtained, in most cases, by a short Bill without interrogatories.

These are the principal alterations in the procedure of our Courts of Equity; some minor details of practice in which changes have been effected, it would be out of place to enlarge upon.

ERICSSON, JOHN, Engineer, a native of Sweden, but whose inventions have been brought before the scientific world in England and America, was born in the province of Vermeland in 1803. In 1814, by the friendship of Count Platen, who observed his mechanical tastes, he obtained a cadetship in a corps of Engineers. He subsequently entered the regular army as an ensign, and at length reached the rank of lieutenant. In 1826 he visited England in order to bring into notice a new kind of engine which he had invented, and which he proposed to work without steam, by the condensation of flame. The project failed from the impossibility of procuring suitable fuel for the engine. He competed for the prize which was offered by the Liverpool and Manchester Railway Company in 1829, for the production of the best locomotive, and presented an engine which went at the rate of fifty miles an hour. Ericsson's subsequent career lay chiefly in America. In the Great Industrial Exhibition of London in 1851, several instruments for the measurement of distances at sea, for measuring fluids under pressure, and other similar purposes, appeared in the American department under Mr. Ericsson's name, and were described by him in a small work which he issued at the time. His name is chiefly known in connection with a project for a caloric engine, which was to supersede steam, an object which, if accomplished would, by removing the necessity of carrying large cargoes of fuel, have effected a great commercial change in the intercourse between distant parts of the globe. As the principle did not obtain the sanction of the scientific men to whom the British government referred its consideration, Mr. Ericsson tried it in America, and obtained sufficient co-operation to enable him to launch a vessel named after himself, and measuring 2000 tons. This vessel made a trial trip, in which she sailed at the rate of twelve miles an hour, but on her return she was struck by a squall, filled, and foundered close to the city of Jersey. The Ericsson was subsequently raised, and the caloric engine was replaced by a steam engine, which possessed some improvements invented by Mr. Ericsson. Mr. Ericsson was a member of numerous scientific societies and a knight of the Swedish order of Vasa. He died on the 2nd of November, 1853.

ERINITE. [MINERALOGY, *S.* 1.]

ERLANITE. [MINERALOGY, *S.* 1.]

ERROL. [PERTHSHIRE.]

ERROR, IN LAW. The mode of appealing from the judgments of the Courts of Common Law to the appellate tribunals constituted to rectify their mistakes by bringing error, as it is technically termed, has been greatly simplified by the Common Law Procedure Acts of 1852 and 1854. These statutes have abolished writs of error in civil suits, and substituted for them a simple notice or memorandum of error, to the opposite party and to the Court, of the appeal having been made. The statutes have likewise extended and in so doing improved the jurisdiction of the Courts of Error. Formerly judgment could only be affirmed or reversed; but the Court of Error may now give the judgment which ought to have been given by the Court below, and award all necessary process for giving effect to it.

ERYTHACA, a genus of Birds belonging to the family *Sylviadæ*, the order *Insessores*, having the following characters:—Beak rather broad and depressed at the base, becoming narrower towards the point, and slightly compressed; upper mandible deflected and notched. Nostrils basal, lateral, oval, pierced in a membrane partly hid by feathers and hairs projecting from the base of the beak. Wings rounded; the three exterior quills graduated; the first only half as long as the second, which is shorter than the third; the fourth, fifth, and sixth longer than the third; the fifth the longest in the wing. The tarsus longer than the middle toe; the lateral toes nearly equal to each other in length; the outer toe united at its base to the middle toe; the claw of the hind toe longer and stronger than the others.

E. rubecula, *Sylvia rubecula*, *Motacilla rubecula*, the Robin Red-Breast, Robin-Redstart, Robinet, Ruddock, is so generally distributed over the British Islands, and so universal a favourite, that all are sufficiently interested in the bird to make themselves acquainted with its habits. These may be observed in any garden, field, or wood, for there is scarcely a hedge without its Robin inhabitant, and if Robins appear to be more numerous in winter than in summer, it is partly owing to the state of vegetation at the former season, which leaves them more exposed to observation, and partly because they resort to the habitations of men for food, when other means of supply fail. The song of the Robin is sweet and plaintive, but not very powerful. Mr. White of Selborne says, "The Robin sings all through the year. The reason that he is called an autumn songster is, because in the spring and summer his voice is lost in the general chorus, while in the autumn it becomes distinguishable."

The Robin is one of the latest birds to retire to rest, and the earliest to be seen moving in the morning, requiring apparently but little sleep."

This bird is very easily tamed, soon becomes familiar with those who feed it, and constantly builds its nest in places frequented by man.

Mr. Blackwall relates that a pair of Robins built their nest in a small saw-pit. Soon after the hen had begun to sit the sawing of timber was commenced at this pit, and though this noisy occupation was carried on every day close to the nest during the hatching of the eggs and rearing of the young birds, the old birds exhibited no signs of alarm or interruption. These birds exhibit great attachment to each other, and many instances have been related to prove that they pair for life. With all his interesting qualities the Robin is one of the most pugnacious of birds, and not only maintains his right against all intruders, but is said to kill those of his own family when they become troublesome to him. Robins breed early in the spring. The nest is composed of moss, dead leaves, and dried grass, lined with hair, and sometimes a few feathers; it is frequently placed on a bank sheltered by brushwood, or a short distance above the ground in a thick bush or lane hedge, sometimes in a hole of a wall partly covered with ivy. The eggs are from five to seven in number, white, spotted with pale reddish-brown; the length nine lines and a half, by seven lines and a half in breadth. The bird is found all over England, Ireland, and Wales; it is also an inhabitant of the most northern counties of Scotland. It also visits Denmark and Sweden in the breeding season; and so well does it bear cold weather, that among the summer visiters to the latter country, the Robin is one of the first to come and the last to go.

It is a constant resident throughout the year in all the temperate and warmer parts of Europe, abundant in Spain and Italy, Sicily and Malta.

In the adult bird the beak and irides are black, upper part of the head, neck, back, upper tail-coverts, and tail-feathers, a yellowish olive-brown; quill-feathers rather darker, the outer edges olive-brown; greater wing-coverts tipped with buff, over the base of the beak, round the eye, the chin, the throat, and the upper part of the breast, reddish-orange; encircling this red is a narrow band of bluish-gray, which is broadest near the shoulders; lower part of the breast and belly white; sides, flanks, and under tail-coverts, pale brown; under surface of wing and tail feathers dusky gray; legs, toes, and claws, purple brown. The whole length of the bird is 5¾ inches. The female is not quite so large as the male, and her colours are less bright. The young birds, after their first autumn moult, resemble adult females; but the red of the breast is tinged with orange, and the legs are dark brown. The Red-Breast is subject to variation in the colouring of the plumage. White and partly white varieties are not uncommon.

(Yarrell, *British Birds*; MacGillivray, *Manual of British Birds*.)

ERYTHRIC ACID. [Chemistry, *S.* 2.]

ESTRILDA, a genus of Birds belonging to the *Passerinæ*. The species are known by the name of Waxbills. They inhabit the Indian Archipelago and Australia.

ESZEK. [Essek.]

ETHAL. [Chemistry, *S.* 2.]

ETHALIC ACID. [Chemistry, *S.* 2.]

ETHER, AMYLIC. [Chemistry, *S.* 2.]

ETHER, BUTYRIC. [Chemistry, *S.* 2.]

ETHYLAMINE. [Chemistry, *S.* 2.]

ETHYLE. [Chemistry, *S.* 2.]

ETTY, WILLIAM, R.A., was born at York, March 10, 1787. His father rented a mill in the suburbs, and kept a baker's shop in the city; and the boy assisted in the shop till he was of age to be put to learn a trade. He had already shown a marked fondness for drawing, and his mother, as in after-life the great painter was fond of relating, had encouraged his propensity, while neighbours used to 'patronise' the incipient artist with halfpence and pennies to buy chalk and pencils. In his twelfth year he was apprenticed to a printer at Hull, in which situation, over-worked, without friends and distant from his family, and denied the privilege of drawing, he appears to have at first led a very uncomfortable life. But after awhile his master was persuaded to let the boy "at lawful hours" indulge his artistic tastes, and, though still without instruction, Etty soon began to acquire sufficient facility in drawing to make his companions in the printing-office desirous to possess, and some of them careful to preserve, his sketches and rude attempts at painting. At length, his seven years' apprenticeship having expired, he gladly obeyed the invitation of an uncle to come up to London. His uncle, himself a skilful draughtsman, saw promise in the youth's crude efforts, and generously afforded him the means of practically solving the question whether his inclination for the life of a painter was an impulse merely, or the result of a native aptitude.

At first, without any formal instruction, he drew, as he says in his 'Autobiographical Sketch,' "from prints, or from nature, or from anything he could; . . . his first academy being a plaster-cast shop, kept by Gianelli, near Smithfield." Having thus sufficiently mastered the difficulties of drawing "from the round," he obtained an introduction to Fuseli, then keeper of the Royal Academy, and was admitted by him to study there as a probationer. He entered as a student in January 1807, along with Collins, from whose companionship in study, with that of Hilton and Haydon, he derived considerable benefit. In the following July Etty became an in-door pupil for twelve months to Sir Thomas Lawrence, then in the height of his reputation—Etty's uncle kindly paying the hundred guineas required as a premium. From the great portrait painter Etty received little direct instruction; he however saw him paint, and though at first the extreme facility of the master's execution almost overwhelmed the pupil with despair, he gradually learnt this very important part of a painter's craft—"the great key to art," as he calls it; and he found, when he could copy Lawrence's pictures, that those of other painters, including the great painters of Italy, presented comparatively few difficulties. Etty laboured with untiring diligence in the school of the Royal Academy, and in copying at the British Institution and elsewhere, whilst preparing his earliest original works for the Academy Exhibition; but though his copies met with purchasers, and his original efforts with praise, it was long before he could find an opportunity to bring any of his works before the public. Year after year all the pictures he sent were returned from both the Royal Academy and the British Gallery. He applied in his despondency for advice to his old master. "Lawrence," he says, "told me the truth in no flattering terms; he said I had a very good eye for colour, but that I was lamentably deficient in all other respects almost." Etty took the reproof in good part, worked day and night, "and with such energy, to cure his radical defects, that at last a better state of things began to dawn." He had the delight to find one of his pictures, a 'Telemachus rescuing Antiope,' admitted to a place on the walls of the Royal Academy in 1811. But the place was a bad one, and the picture attracted no notice. However he went on, and at each succeeding exhibition of the Academy and the British Institution some of his paintings found a place. His subjects, with the exception of a few portraits, were mostly classical, though not of the kind by which he ultimately acquired fame and fortune; and the impression among his companions in the schools—where he was still one of the most regular attendants—as well as among artists and patrons, was, that he was a good-tempered plodding fellow, but would never become a successful painter. His friends suggested a visit to Italy, and for Italy accordingly—intending a year's stay in the land of Art—he set out in the autumn of 1816. But he soon became home-sick—moreover one of his oft-recurring love-fits—for "one of my prevailing weaknesses was a propensity to fall in love"—was strong upon him, and within three months he was back again and hard at work in London.

But his run into Italy, and still more a short stay among the painters of Paris, did him good service. He saw a new style of art, and new methods of execution, and had a fresh range of subjects suggested to his mind. It was not however till some three or four more years had passed away that he began to catch the eye of the artistic world. In 1820 he says, "I sent a small picture to the British Gallery, highly finished and carefully wrought; it made a considerable noise. I sent a larger the same year to the Royal Academy; it made a still greater noise." This last was the 'Coral Finders—Venus and her youthful Satellites arriving at the Isle of Paphos,' the first of his long series of representation of the undraped feminine form, for which Grecian and Roman poetry or legend suggested the subject or furnished the apology. This was followed the next year by his 'Cleopatra's arrival in Cilicia,' a work far more glowing in colour, skilful in composition, and brilliant in general effect; and its success was complete. The painter at once became famous. It was commissioned by Sir Francis Freeling, who, however, startled by the then unusual freedom with which the painter had depicted his bevy of fair forms—for Etty, reading as literally as possible the statement that Cleopatra appeared in the character of Venus, with her attendants as Nereides, Graces, Cupids, and Tritons, had rendered the voluptuous subject with infinite gusto—besought the painter to add a little drapery; and, though he never added too much, the hint was not lost, for while, during the rest of his life the nude female form continued to be the chief subject on which he exercised his pencil, he henceforth seldom suffered one to appear without some, however scant and unserviceable, clothing.

After this great success Etty resolved again to visit Italy, and though he this time also carried with him a new love sorrow, he did not suffer himself again to return without seeing Rome. There, and at Venice, where he stayed seven months, he laboured with a diligence and copied with a rapidity and decision of execution, which astonished the degenerate native painters; and the effect of his studies of the great Venetian colourists was displayed in every picture he subsequently executed. On his return he painted a 'Pandora crowned by the Seasons,' which at the exhibition of 1824 won for him new laurels, had the singular honour of being purchased by the President, and procured hiselection as Associate of the Royal Academy. "Strike while the iron is hot; you see what may be done by a little courage," was the advice now tendered by his old master, and Etty profited by the well-timed counsel. A succession of important works followed, some of large size and in the historical style, but mostly classic subjects of the order indicated above, and each succeeding one,—until he became careless or negligent under the pressure of competing patrons claiming ever new pictures from him,—contributing its share towards placing him in the position he ultimately obtained by general consent of the first English colourist of his day, and also by far the first English painter in his own peculiar walk of any day.

His life was a very quiet one. His days were almost entirely spent in London and in his painting-room—the only breaks being an occasional visit to a friend in the country, a run to Edinburgh or to the Netherlands, and a brief stay on account of illness at York. His evenings he passed, during the academic session, almost invariably in the Life School at the Royal Academy, where to the last he was one of the most regular and diligent among the students—it being his practice to paint studies in oil from the living model as shown there by gas-light—a practice which explains much that is evil as well as good in his painting of flesh: and so much attached was he to the Life Academy, that when it was formally suggested to him from the academicians, in prospect of his election as R.A. in 1828, that those gentlemen wished him to discontinue his attendance, as they deemed his taking his place among the students incompatible with the dignity of an academician, he replied that he would rather forego that honour, though the chief object of his ambition, than give up the Life Academy. Though always in love, Etty never married. A niece kept his house, and his quiet and blameless life passed on without adventure, in the steady practice of his calling, till 1848, when failing health and powers induced him to return to his native city; where in a pleasant little house his remaining days, with the exception of his visits to London, passed in almost unbroken tranquillity. He died there on the 13th of November 1849, and was buried in the churchyard of St. Olave Marygate; his funeral being attended by a large number of the citizens, headed by the mayor and other municipal authorities, with the Council of the Yorkshire Philosophical Society, the pupils of the York School of Design (in the establishment of which he took an active part), &c.

We have not attempted to record the appearance of more than a few of Etty's earlier pictures. To have mentioned in succession even the more attractive of the works of so prolific a painter during his career of nearly forty years would have been manifestly impossible here. The great event of his life was the collection of as many of his works as could be obtained, and their exhibition in 1849, in the rooms of the society of Arts, and on that occasion were exibited about 130 paintings, many of them of very large size. Few who saw that remarkable gathering will be likely to forget it, and the painter may well have felt proud as he gazed on so splendid a spectacle—and all the work of his own right hand.

Etty has himself, in the 'Autobiography' so often quoted, given a list of his principal paintings. And first he places of course his great historical pictures, his account of which will serve in some measure to illustrate the peculiar character of the man:—"My aim in all my great pictures has been to paint some great moral on the heart: 'The Combat,' the *Beauty of Mercy;* the three 'Judith' pictures—*Patriotism*, and self-devotion to her country, her people, and her God; 'Benaiah, David's chief Captain,' *Valour;* 'Ulysses and the Syrens,' the importance of resisting *Sensual Delights*, or an Homeric paraphrase on the 'Wages of Sin is Death;' the three pictures of 'Joan of Arc,' *Religion, Valour, Loyalty and Patriotism*, like the modern Judith; these in all make nine colossal pictures, as it was my desire to paint three times three." Of his other principal works the following may be mentioned as characteristic examples:—'The Judgment of Paris;' 'Venus attired by the Graces;' 'Hylas and the Nymph;' 'The Bevy of Fair Women;' 'The Rape of Proserpine;' 'La Fleur-de-Lis;' 'The Parting of Hero and Leander;' 'Diana and Endymion;' 'The Death of Hero and Leander;' 'The Graces;' 'A Bivouac of Cupid and his Company;' and numberless Cupids and Psyches, Venuses, Ledas, or as he more prudishly terms them 'Nymphs with Swans,' &c.; besides his 'Samson and Delilah;' 'Magdalen;' 'Captives by the Waters of Babylon;' 'Parable of the Ten Virgins;' and other scriptural subjects treated in a very unpuritanic style. The 'Judith' series, the 'Combat,' and 'Benaiah,' five colossal pictures magnificent in colour and execution, and in many respects admirable in conception and composition—even if they are not fairly to be classed in the highest style of historic art,—were purchased in a fine spirit by the Royal Scottish Academy; 'Ulysses and the Syrens' is the property of the Royal Manchester Institution. In the Vernon Gallery are eleven paintings by Etty, of which the chief is his 'Youth at the Prow and Pleasure at the Helm;' and in the Sheepshanks Collection are two others.

Etty is undoubtedly one of the greatest names in English art. He chose for himself a somewhat remarkable path, and in it he walked without a rival. His want of classical knowledge—his learning being pretty nearly confined to Lemprière's Dictionary—together with his deficiency in every kind of intellectual culture, except in the technics of painting, of course militated against his taking a first rank as a painter of classic themes. All his works evince his want of acquaintance with the history, the archæology, and even with the poetry of Greece and Rome. But, allowance being made for these deficiencies, or rather regarding his pictures as the mere vehicles for the exhibition of the undraped human form, his paintings must be allowed a very high place in comparison with those of any other modern painter.

To the highest order of female beauty either in face or form he never attained—hardly pretended; yet there is evidenced in all his female figures such a thorough sense of enjoyment, so much life and heartiness, and, looking at them as pictures, there is shown so remarkable a knowledge of the female form, and such facility in rendering it in free spontaneous action, as few if any modern artists of any country have equalled, and none even in olden times surpassed.

Etty towards the close of his life seems to have become especially disturbed by the strong remarks occasionally made on his choice of subjects, and still more on his mode of treatment. He seems to have thought (and his admirers have spoken as though they thought so too), that the objections raised to so free a display of the female form on the score of morality, was in fact an implication that the painter was immoral. But no such charge could have been intended by any one who knew anything of the painter. Few men in private life have given less occasion to the breath of scandal. He was scrupulously upright, sober, and pure. An enthusiast in his art, he was one of the most single-minded of men; but it was not to be wondered at that the painter of works so opposed to the current notions of propriety should have had to bear with some hard judgments on the tendency of his works. He sought to vindicate himself and his intentions with his pen as well as his tongue, but while personally he needed no vindication, the only vindication his pencil can receive must be that which the works themselves furnish.

(*Autobiography* in *Art-Journal*, 1849; Gilchrist, *Life of William Etty, R.A.*, 2 vols. 8vo, 1855.)

EUCHROITE. [MINERALOGY, *S.* 1.]

EUGENINE. [CHEMISTRY, *S.* 2.]

EULIMELLA, a genus of *Mollusca* belonging to the family *Pyramellida*, founded by E. Forbes, to receive forms that had been previously referred to *Eulima* and *Odostomia*. The shell is elongated, and consists of many whorls, solid, smooth, and polished; the apex of the spine has a persistent embryonic sinistral shell; the aperture subquadrate; peristome incomplete; columella not plicated, straight or nearly so; operculum corneous, pyriform. There are four British species. *E. scillæ* (*Eulima crassula*, Jeffreys), *E. acicula* (*Melania acicula*, Philippi), *E. affinis* (*Eulima affinis*, Philippi), *E. clavula* (*Turbinella clavula*, Loven).

EUNICE, a genus of Dorsibranchiate *Annelida*. It is furnished with tuft-like gills; the trunk is armed with three pairs of horny jaws; each of the feet has two cirri and a bundle of bristles; two tentacles upon the head above the mouth, and two on the neck.

E. gigantea is the largest Annelide known. It attains a length of from one to four feet, and inhabits the sea around the Antilles.

EUPATORIA, previously named *Kozloff*, a sea-port town in the Russian government of Taurida, on the west coast of the Crimea, is situated on the north shore of the Bay of Kalamita, in about 45° 14′ N. lat., 33° 25′ E. long., 40 miles N.W. from Simpheropol the capital of the Crimea, and 45 miles N. by W. in a straight line from Sebastopol. The population according to the census of 1851 was 8200, chiefly Tartars and Karaitic Jews, with a few Greeks and Armenians. The port is shallow, admitting only vessels of about 8 feet draught, but tolerably safe and never frozen up. The bay forms an excellent road-stead, and ships may approach within cable's length of the shore, but it is exposed to the west and south winds which cause a heavy surf all along the coast. The town, which is surrounded by an old crumbling wall, is ill built; the streets are narrow, crooked, and dirty; the houses, low and built of bricks and clay, open upon courts or gardens in the Turkish fashion, but present to the street only low dead walls. The principal buildings are a Russo-Greek church, several mosques, an Armenian church, two pretty synagogues belonging to the Karaitic Jews, a bazaar, several khans, and the house in which the governor of the district resides. The principal industrial products are leather, felt stuffs, and wood-work. The town is famous for the preparation of the black lambskins, known in England as 'Astrakhans.' There are several shore-lakes to the south-east of the town on which a good deal of salt is gathered in summer. The water in the town and neighbourhood is bad. Before the Russian occupation of the Crimea, Eupatoria, it is said, had a population of 30,000, and was the centre of all the export trade of the country. In order to restore the prosperity of the place it was made a free port for a limited period from the year 1798, and its trade partially recovered, but subsequently dwindled away on the rise of Odessa. It still carries on some trade in salt, corn, flour, bar-iron, wool, hides, butter, wax, hairskins, &c. There is a quarantine station at Eupatoria.

Eupatoria is said to occupy the site of the ancient *Eupatoria*, or *Eupatorium*, founded by Mithridates Eupator, and named after him. The Russians call it Eupatoria, but this is no proof that the two places are identical. Some authors say that the site of the ancient Eupatoria is marked by the village of Inkerman on the north shore of the Bay of Sebastopol, where there are ancient ruins. Be this as it may, Eupatoria under the Tartars was one of the most important and populous towns in the Crimea. The Russians took it in 1736, 1771, and in 1783, when with the whole of the Crimea it came into the power of the Czars. In the Anglo-French invasion of the Crimea the town was occupied by the Allies Sept. 13, 1854, and they held it till the termination of the war, when it was restored to Russia.

EUXENITE. [MINERALOGY, *S.* 1.]

EVIDENCE. Great and important changes have been made during late years in the Law of Evidence. Not only have the means of obtaining and producing evidence been simplified, and facilities in doing so afforded to the suitor; but all the former disqualifications of the parties to and of the persons interested in the result of the proceedings have been entirely removed. The most important practical improvements have been in our Courts of Common Law, the want of a complete discovery by the oath of the parties having formed till recently one of the greatest and most prominent defects in the procedure of these tribunals. Each of the parties was indeed entitled to have such a discovery, by going through the expense and circuity of a Court of Equity, and therefore it was sometimes had by consent, even in the courts of law. But as it had long been established in our Courts of Equity, and as it seemed to be the height of judicial absurdity, that in the same cause between the same parties, in the examination of the same facts, a discovery by the oath of the parties should be permitted in some courts, and denied in others, the same power of compelling a discovery was at last conferred on the Superior Courts of Common Law as were possessed by the Court of Chancery. A second defect in the procedure of the Courts of Common Law was of a nature somewhat similar to the first; the want of a compulsive power for the production of books and papers belonging to the parties. In the hands of third persons they can generally be obtained by rule of court, or by adding a clause of requisition to the writ of *subpœna*, which is then called a *subpœna duces tecum*. But, in mercantile transactions especially, the sight of the party's own books is frequently decisive; as the day-book of a trader, where the transaction was recently entered, as really understood at the time; though subsequent events may tempt him to give it a different colour. As this evidence might be obtained, and produced on a trial at law, by the circuitous course of filing a bill in equity, an original power for the same purpose was also conferred on the courts of law, by the statute 14 & 15 Vict. c. 99.

This power to compel a party, on the application of his opponent, to produce documents, can only be exercised, however, where the applicant can satisfy the court or judge applied to, that the document, of which he seeks the production, is in the possession of his adversary. If he cannot do so, his application must fail. He must, in such a case, obtain a discovery from his opponent, if he has, in fact, the documents of which inspection is sought, which he is enabled to do by the Common Law Procedure Act, 1854. Upon an affidavit of his belief that any document, to the production of which he is entitled, is in the possession or power of the opposite party, the party against whom such application is made may be ordered to answer, on affidavit, what documents he has in his possession or power relating to the matters in dispute, or what he knows as to the custody of such documents, and whether he objects (and if so, on what grounds) to the production of such as are in his possession or power. Upon this answer being made, the court or judge may make such further order as is just; for the party may have the documents, and yet have good grounds on which to object to their production.

Until recently the Courts of Common Law possessed no power of compelling the discovery by one party of *facts* exclusively within the knowledge of his adversary. Each party may no doubt be called as a witness by his opponent; but this does not meet the difficulty, for a party ignorant of what his adversary will swear, will not, except in the most desperate emergency, put so interested a witness into the box. For the discovery, previous to the trial, of facts as well as of documents, the party desiring it had formerly no alternative but to resort to a Court of Equity. The Common Law Procedure Act, 1854, now, however, enables either party, by leave of the court or a judge, to *interrogate* his opponent upon any matter as to which discovery may be sought, and to require such party to answer the questions, within ten days, by affidavit, sworn and filed in court. By thus affording an opportunity for the examination of the parties upon matters relating to the question in dispute, prior to the trial, *facts* important for the applicant's case, but exclusively in the knowledge of the opposite party, may not only be discovered, but the trouble and expense of producing evidence of facts which he is prepared to admit may be entirely saved; while such an examination may in some cases tend to make manifest the matter really in contest, and thus prevent further litigation.

With regard to *parol* evidence, or *witnesses*, the process to bring them in by writ of *subpœna ad testificandum*, now runs (by statute 17 & 18 Vict. c. 34), into Scotland and Ireland; thus dispensing with the necessity of a commission to examine witnesses, which issues when a witness is abroad, or so ill as to be unable to attend and give evidence.

With regard to witnesses, the general proposition now holds that all witnesses, of whatever religion or country, that have the use of their reason, are to be received and examined, for all such are *competent* witnesses; though the jury from other circumstances will judge of their *credibility*. The law formerly excluded such persons as were *infamous*, or were *interested in the event of the cause*. Infamous persons are such as may be challenged as jurors; interested witnesses might however have been examined upon a *voir dire*, if suspected to be secretly concerned in the event, or their interest might be proved in court: which last was the only method of supporting an objection to the former class: for no man was to be examined to prove his own infamy. The law thus carefully excluded not only the parties to the cause, but any one who had the most minute interest in the result; for every person so circumstanced, however insignificant his interest, was presumed incapable of resisting the temptation to perjury; as every judge and juryman was presumed incapable of discerning perjury committed under circumstances especially calculated to excite suspicion. But as it is perfectly obvious that any witness who can throw any light upon the subject, should be allowed to state what he knows (subject, of course, to such observation as might be made, either as to his means of knowledge, or his disposition to state the truth), the stringent rules of our former law have been gradually relaxed by a series of modern statutes. The first inroad on the systematic exclusion of evidence, which was the result of the former state of the law, was made by the statute 3 & 4 Will. 4. c. 42, s. 96, which has been already mentioned, and is only again referred to for the sake of regularity. This statute enacted that, "in order to render the rejection of witnesses on the ground of interest less frequent, if any witness should be objected to as incompetent, on the ground that the verdict or judgment in the action would be admissible in evidence for or against him, he should nevertheless be examined; but in that case the verdict or judgment should not be admissible for or against him, or any one claiming under him." A much greater improvement was, however, effected by the 6 & 7 Vict. c. 85, which removed incompetency on the ground of *interest* in all persons, *except the parties to the suit*, or the persons whose rights were involved therein, or the husband or wife of such persons. The advantages found to flow from this alteration in the law led to the statute 14 & 15 Vict. c. 99, by the first section of which the proviso in the statute 6 & 7 Vict. c. 85 (which excluded all persons directly interested in the suit) was repealed. By the second section, the parties are made *competent* and *compellable* to give evidence on behalf of either or any of the parties to the suit in any court of justice. The third section of the statute provides that it shall not render any person charged with an offence competent or compellable to give evidence against himself, nor shall it render any person compellable to answer any question tending to criminate himself, nor shall it in any criminal proceeding render any husband competent or compellable to give evidence for or against his wife, or any wife competent or compellable to give evidence for or against her husband. The fourth section of the statute further provides that it shall not apply to any proceeding instituted in consequence of adultery, or to any action for breach of promise of marriage. It was decided, soon after it had become law, that the *second* section of the statute did not render a wife admissible as a witness for or against her husband, and accordingly the statute 16 & 17 Vict. c. 83, was passed, enacting that the husbands and wives of the parties to any suit, or of the persons on whose behalf any such proceeding is brought or defended, shall thereafter be competent and compellable to give evidence on behalf of either party or any of the parties. Neither husband nor wife is compellable, however, to disclose any communication made or received during marriage; and neither party is a competent witness in a criminal proceeding, or in any proceeding instituted in consequence of adultery. By these several statutes all rules tending to the exclusion of evidence have been abrogated, except in the particular instances above mentioned. (Blackst. 'Comm.' Mr. Kerr's ed., v. iii. p. 396.)

EXCELMANS, REMI-JOSEPH-ISIDORE, BARON, Marshal, was a native of Bar-le-Duc, where he was born November 13, 1775. He entered the army very young, and first drew attention to his services, in 1799, whilst under General Oudinot, during the campaign which terminated in the conquest of Naples. In 1800 he became aide-de-camp to General Broussier; but exchanged that for the same post under Murat. At the combat of Wertingen, on the Danube, October 8, 1805, he had three horses killed under him; and being commissioned to lay the numerous flags taken from the enemy at the feet of Napoleon I., he received from the hands of the emperor the decoration of officer of the Legion of Honour.

In 1806 he was made colonel of the first regiment of Chasseurs, and was mainly instrumental in the capture of Posen, in Poland. He was afterwards engaged at the doubtful battle of Eylau, and for his conduct in that action (1807) he was appointed to command a brigade, and placed on the staff of Prince Murat, whom he afterwards accompanied to Spain. It was General Excelmans who was commissioned to head the escort by which King Charles was attended to Bayonne, after he had been induced to abdicate in favour of his son. A few weeks after this special service, Excelmans was arrested, with other officers, and sent to England, where he remained a prisoner until 1811. On his release he again joined his former general, who had ascended the throne of Naples. Sent to Russia in 1812, in Junot's corps, as second in command, he was several times wounded, and was created a general of division, September 8, 1812. Savary, in his 'Memoirs,' ascribes entirely to Excelmans the merit of saving the remnant of their corps, which returned home after that arduous campaign.

In 1813 his division was placed under the orders of Marshal Macdonald; he took an active part in the operations in Saxony and Silesia, and was rewarded with the cordon of great officer of the Legion of Honour. In 1814 he commanded the cavalry of the Imperial Guard, and was present at most of the battles fought by Napoleon to defend the French territory. After the return from Elba, General Excelmans was called to the Chamber of Peers, June 2, 1815; and despatched to join the army of the north. He was not present at Waterloo, but he had the merit of bringing back his division to the walls of Paris, in time to defend the capital, and to check the advance of the Prussians, whom he defeated at Versailles in the last action of the war. Excelmans was included in the decree of July 24, 1815, and banished from France with many other generals, who had served the emperor during the hundred days. It was not until 1819 that he was permitted to return to France, during the ministry of Marshal Gouvion Saint-Cyr. In 1831 Louis Philippe restored to him his title and rank in the Chamber of Peers.

Louis Napoleon raised him to the dignity of Marshal of France in the early part of 1849, and nominated him Chancellor of the Legion of Honour in August of the same year. On the 2nd of December, 1851, Marshal Excelmans powerfully assisted in securing to the government of Napoleon the faithful adherence of the army. On the 21st of July 1852, the Marshal was on his way to the house of the Princesse Mathilde, in company with one of his sons, when he was suddenly jerked from his horse, and fell on the road, not far from the bridge of Sèvres. He never spoke afterwards, and expired at two o'clock the next morning.

(Rabbe; Savary, *Memoires; Biogr. des Contemp.; Dictionnaire de Conversation.*)

EXCHEQUER (Scotland). The Court of Exchequer in Scotland has been abolished by the statute 19 & 20 Vict. c. 56; and its jurisdiction, under an amended procedure, transferred to the Court of Session. This court was instituted with the object, carefully concealed however, of introducing into use in Scotland the Common Law process peculiar to England, by means of the writ of *quo minus*. Had this been effected, the legal procedure in both countries would probably by this time have become entirely assimilated. The first attempt of the Scottish Exchequer in this direction was, however, met by an assertion on the part of the Court of Session, of an authority to confine the jurisdiction of the former Court to matters of revenue, which being submitted to the writ of *quo minus* became useless for its intended object.

EXCRETIN. [CHEMISTRY, *S.* 2.]

EXECUTION. [ATTACHMENT OF DEBTS, *S.* 2; DETINUE, *S.* 2; GOODS, *S.* 2.]

EXECUTOR. [PROBATE, *S.* 2.]

EXHIBITION OF 1851. The great Industrial Exhibition of 1851 was in itself an event of so much importance, one which excited such very general interest, and has been the parent of so many other exhibitions of a somewhat similar kind both in this and other countries, that—without entering upon the larger question of its immediate or remote influence upon manufacturing art and skill, or commercial enterprise—it may be useful to present in this work a brief summary of facts and figures illustrative of the history of the undertaking.

There had been industrial exhibitions in England and on the Continent, but they had been of a more or less local character, or at the utmost confined to the manufactures of the country in which they took place. In England there had been no general exhibition of the products of national industry resembling the well-known Paris exposition. The proposition for a great exhibition of national manufactures to be held at intervals of three or more years seems to have originated in 1845 with the Society of Arts, London, of which Prince Albert was president. On its first announcement the project was coldly received, and some three years were suffered to elapse before it was again brought distinctly before the public. Meantime the annual exhibitions of the society were rendered more attractive, and manufacturers and commercial men began to feel increased interest in the proposal. By the beginning of 1849 the council of the society had matured a plan, of which in March of that year they published an outline. The society now petitioned parliament for pecuniary aid. Prince Albert, who had all along warmly supported the proposal, conceived that the time had arrived for imparting to it a much more magnificent form, by throwing the exhibition open to the industry of the world. The council adopted his suggestion, and measures were taken for enlisting in behalf of the scheme the sympathies in the first place of the manufacturers of this country, and then those of every other nation. The idea of an International Exhibition of Industry at once seized the general mind. At the preliminary meeting held in the city under the presidency of the Lord Mayor for the purpose of publicly enunciating the scheme, it was received with the utmost favour, and the provinces speedily gave in their cordial adhesion. The Council of the Society of Arts, which in the first instance assumed the direction of the undertaking, entered into a contract with a private firm, Messrs. Munday, who covenanted to deposit a sum of 20,000*l.* on the 30th of August, 1849, and to provide whatever additional money might be required between that time and three months after the final closing of the exhibition on the 1st of October, 1851. The cost of the exhibition building was in the first instance estimated at 20,000*l.*, but Mr. Cubitt on being consulted by Prince Albert named 50,000*l.* as a far more probable sum—so entirely at sea were the projectors of the scheme as to its extent and the amount of money required to carry it into effect.

Upon the suggestion of Prince Albert, application was made to the government for the appointment of a Royal Commission for managing an Exhibition of the Works of Industry of all Nations; and a royal warrant was accordingly issued in January 1850 appointing such a Commission with Prince Albert as its president. At the first meeting of the Commission, the contract entered into with Messrs. Munday, against which the public opinion had been strongly expressed, was annulled, and eventually a sum of 5120*l.* was awarded to the contractors as compensation for their probable loss. The Commissioners now appointed (January 24) a Building Committee, to whom was entrusted the entire arrangements for providing a suitable edifice. On the 25th of January a great meeting was held at the Mansion House, at which the hearty adhesion of various influential merchants and manufacturers was announced, and a general subscription was inaugurated with a view to raising funds for meeting every kind of outlay connected with the undertaking. It was followed by corresponding meetings in every part of the country, and it was soon made evident that ample funds would be furnished. In fact a total of very nearly 80,000*l.* was ultimately reported to the Commissioners as subscribed, though only 67,896*l.* was paid into their bankers—upwards of 11,200*l.* having been somehow absorbed in the several localities as expenses. On the 21st of February, the Commissioners were able to make a public announcement of the general plan of the exhibition, and to communicate the Royal permission to hold it in Hyde Park.

The site granted for the building was on the south side of Hyde Park, between Kensington Drive and Rotten Row. The Commissioners announced that the building would cover an area of from 16 to 20 acres; that it must be ready for the reception of goods by the 1st of January, 1851; that from that day to the 1st of March following goods would be received, and that the Exhibition would be open to the public on the 1st of May, 1851. In March 1850 the Building Committee appealed to architects and engineers to assist them with sketches and suggestions as to the form and general arrangements of the building required for the Exhibition. This appeal was responded to by a large number of professional men, including several foreign architects. In the course of May the Committee announced that they had examined the 243 designs sent in, but though several were of sufficient excellence to obtain special commendations, they were unable to select any one design which fulfilled all the conditions prescribed by the nature of the undertaking. Of the designs sent in 18 were however singled out by the Commissioners for special commendation, and it was noticed as a curious circumstance that, though only 38 out of the competing architects were foreigners, of the 18 who were specially distinguished only three were natives of the United Kingdom. However, though unable to recommend any one of the designs for adoption, the Commissioners stated that they had derived much valuable suggestion from the plans to guide them in preparing a design of their own. In this design, which they laid before the Commissioners, a building was proposed which was to be 2300 feet long, 400 feet across, and to cover upwards of 20 acres. It was to be constructed of brick and lighted by skylights. The great feature of the building was to be a grand central hall, in shape a polygon of 16 sides, the main walls, which were to be of brick, being carried up to a height of 60 feet, and it was to be covered with an iron domical roof, much larger than any hitherto constructed, being 200 feet in diameter, or nearly twice the size of the dome of St. Paul's, and 48 feet larger than that of the Pantheon of Rome. The report of the Building Committee gave general dissatisfaction in various ways, but their design—so obviously unsuited for a temporary purpose—called forth a storm of disapprobation. For awhile the whole scheme seemed in peril, when Mr. (now Sir Joseph) Paxton came to the rescue by proposing an entirely new plan, that of a vast building of iron and glass resembling in its general principles the great conservatory he had constructed for the Duke of Devonshire at Chatsworth. Having powerful influence, he was enabled—though at this late hour when tenders had been publicly invited for the committee's design—to obtain permission to lay his design before the Commissioners and their president. Its singular adaptation to the purpose of the Exhibition, as well as the great comparative facility with which it could be erected and removed, at once commanded their approval. With the general public it from the first became popular, and as soon as the contractors, Messrs. Fox and Henderson, undertook its erection upon terms which removed all doubt of its economy as well as practicability, the Commissioners determined upon adopting it, and accepted Messrs. Fox and Henderson's tender. They were to receive 79,800*l.*, the materials of the building remaining their property.

From this time all proceeded rapidly and smoothly. The contract was signed on the 26th of July; on the 30th the contractors obtained possession of the site; on the 26th of September the first column of the building was erected, and on the 4th of December the first rib of the transept was raised; by the 31st of December the building was sufficiently advanced to allow of a lecture being delivered within it to the members of the Society of Arts, and on the 3rd of February, 1851, the completed building was formally handed over to the Executive Committee.

The form and character of the building are too well known to need any detailed description. It will be enough to say, that its entire length was 1851 feet—its breadth, 408 feet, with an additional projection on the north side, 936 feet long by 48 wide. The central portion was 120 feet wide by 64 high; on either side of this was another portion 72 feet wide by 44 high; and the north and south portions were 72 feet wide by 24 high. The portions or great avenues here described ran east and west through the building; very near the centre the transept crossed, with a width of 72 feet and a height of 108. The entire area was 772,784 square feet, or about 19 acres—nearly seven times as much as St. Paul's Cathedral. The entire ground area was divided off into a central nave, four side aisles, and several exhibitors' courts and avenues. There were 3 entrances, with 8 pay places to each, and 18 doors for exit. Four galleries ran lengthwise along the sides of the building, and others around the transept; and access was gained to these galleries by 10 double staircases. The iron columns in the building, which, with their connecting pieces, were about 20 and 24 feet high respectively, were about 3300 in number; and there were 1074 base pieces beneath the columns, on which the whole structure rested. There were nearly 3500 girders, of three different lengths, 24, 48, and 72 feet, and of five different weights, 12, 13, 35, 120, and 160 cwts. Altogether there were about 4000 tons of iron built into the structure.

In the woodwork for the glass roof, the Paxton gutters were arranged 8 feet apart, with a ridge between every two. The squares of glass were 49 inches by 10. Besides the 17 acres of glass for the roof (none being wanted for the open courts) there were about 1500 vertical glazed sashes. The ground floor and the galleries contained 1,000,000 square feet of flooring. Of sash bars there were 200 miles, and 20 miles of Paxton gutters. The total woodwork in the building was estimated at 600,000 cubic feet. The form of the columns and girders was the same throughout, so was that of the sash-bars, so likewise was the size of the panes of glass. The structure itself was built up of a series of bays or cubical compartments, each 24 feet square; each of these bays being formed by four columns, which supported girders very ingeniously put together. Thus the entire ground-plan may be regarded as a series of these squares, the parallelogram being 77 of them in length and 17 in width—columns being of course omitted and longer girders substituted to form the nave, courts, and transepts. The additional portion on the north side of the building was

39 of these squares long and 2 deep. The whole building, in fact, from the ground-plan to the ridges of the roof, was a repetition of certain regular forms; and, one portion having been first thoroughly modeled, was a matter of simple arithmetical calculation, and consequently from the hour when the contractors commenced their work, from the simplicity of the plan and the singularly small number of castings required, all the parts were prepared and adjusted to each other with almost mechanical regularity and precision. The colouring of the building was entrusted to Mr. Owen Jones, already well known by his works on the Alhambra, and on various points of decorative art; and he, with great skill and originality, executed his task by boldly covering the whole framework of the edifice with the three primitive colours, blue, red, and yellow, "in such relative proportions as to neutralise or destroy each other." Of course the announcement of his system was met with much deprecatory criticism, but the result amply justified his views, and it was generally admitted that the colour added much to the general effect of the building, while it harmonised well with the contents. How admirably the building answered its purpose, what new and elegant combinations of form, light, and shade and colour, both the exterior and interior offered to the eye, or what a magnificent and surprising appearance it presented as a whole, whether regarded externally, or when, looking down its unrivalled vista, with its rich and varied contents, from one of the end galleries, it belongs not to an article like the present to dwell upon or even to describe. As is well known, the building has been re-erected at Sydenham as a permanent structure, with great improvements on the original design.

As soon as provision had been made for the building, the Commissioners turned their chief attention to the means necessary for obtaining its contents. The outline of an elaborate system of classification, drawn up by Dr. Lyon Playfair, was issued, showing what a wide range of articles was sought to be brought together under the title of 'Objects of Industrial and Productive Art.' The whole was arranged under four great sections: Raw Materials, Machinery, Manufactures, and Fine Arts; and these were divided and subdivided into a vast number of classes and smaller divisions. To facilitate the collection of the objects, and to serve as ready means of intercourse between the producers and the commissioners, district committees were formed in all the principal towns and manufacturing localities, by whom all the arrangements respecting the allotment of space in the building and the transmission of the goods were conducted. Formal communications were made to the various foreign governments, as well as to the governors of British colonies, by most of whom commissioners were appointed to conduct the operations in those countries required for their adequate representation in the great undertaking. And so judicious were these several arrangements, that though from almost every country in Europe—from almost every state in the North American Union—from the republics of South America—from each of our own wide-spread colonies—from India, Egypt, Persia, and even from the Society Islands, specimens more or less bulky, valuable, and numerous were sent, the numbers were comparatively few that reached their destination materially later than the date at first fixed for their arrival. Considering the entire novelty of the whole proceeding, the immense difficulty there must have been in many instances experienced in getting the collections together, the little knowledge that a large proportion of the contributors could have had of the extreme importance of punctuality, as well as their comparative want of interest in the success of the scheme, and the various physical as well as conventional obstructions which had to be encountered, this must, we think, be regarded as by no means one of the least remarkable circumstances connected with the successful issue of the whole.

Of the actual number of objects exhibited no record was kept; and as often a large number of articles was included under a single entry, no close approximation was, perhaps, possible. The Jury Council, however, in their report to the Royal Commissioners, said that the duties of jurors had "involved the consideration and judgment of at least a million articles;" but this, though it tells much for the zeal and industry of the jurors, does not do anything towards explaining how the units of the million were determined. Of the value of the articles contained in the building, many wild guesses were hazarded during the continuance of the Exhibition; the Commissioners state in one of the appendixes of their Report that, taking in each case the owner's estimate of the value of his possession, the gross value of the articles exhibited—the famous Koh-i-noor being alone excluded from the reckoning—was under two millions (1,781,929*l.* 11*s.* 4*d.*) The total number of exhibitors was about 15,000.

The Exhibition was formally opened by her Majesty, on the 1st of May, 1851; it remained open 144 days, being finally closed on the 11th of October. The entire number of visits paid to the Exhibition was 6,063,986, being a daily average of 4[illegible],111. This average was not reached till June, but from that time till the close of the Exhibition there was comparatively little variation till the last week when the average was doubled. The number of visitors during this week was so extraordinary that we are tempted to set down the figures in detail. Monday, October 6th, 107,815, Tuesday, 109,915, Wednesday, 109,760, Thursday, 90,813, Friday, 46,913, Saturday, 53,061. The following are three pairs of contrasts presented by the daily returns: Highest five-shilling day, May 24th, 44,512; Lowest, July 19th, 9,327; Highest half-crown day, October 11th, 53,061; Lowest, September 6th, 12,672; Highest shilling day, October 7th, 109,915; Lowest, May 26th, 25,402.

The six million visits paid to the Exhibition plainly indicate but very roughly the actual number of visitors. Some persons went doubtless ten or even twenty times during the season, a very large proportion went twice. After weighing carefully the probabilities of the case, the authorities arrived at the conclusion that the probable average of visits would be about three, and that consequently about two millions of persons visited the Exhibition. Further, an attempt was made to arrive at the number of *foreign* visitors by an examination of the lists furnished to the Home Office by the captains of all steamers plying between the ports of England and the continent of Europe, and of returns furnished by the United States Legation, from which it appeared that the total number of aliens who arrived in England from all parts of the world, between the 1st of April and the 30th of September, 1851, was 58,427; a number very far below what the common imagination had supposed. During the same period in 1850 the number of aliens who landed in England was 15,514, so that 42,913 would seem to be the utmost number that can be supposed to have visited this country for the express purpose of seeing the Exhibition, though probably few of the remainder left these shores without visiting it. The largest number of visitors was from France, 27,200, then came Germany, 10,400, the United States, 5000, Belgium, 3,700, Holland, 2,900. But if the numbers be considered in relation to the population of the several countries, it will be seen that Holland sent most visitors, Belgium next, then France, Germany, and the United States. The respective proportions of town and country visitors was attempted to be arrived at by comparing the arrivals in London, from April to October, by steam-boats and railways—of course a very rude method, but the only available one—when it appeared that the arrivals in 1851 were 4,237,240, against 2,791,753 in 1850, a difference of 1,445,487. But as against this there had to be set off the regular yearly increase in the number of travellers by railway, and other allowances to be made; the inference was drawn that the number of persons who came from the provinces to view the Exhibition slightly exceeded a million: roughly, we may say that the Exhibition was visited by about a million of the inhabitants of London, the same number from the provinces, and about 50,000 foreigners.[*]

The details of the jury awards do not come within our present object; but the following are the general results, as affording materials for comparison.

There were 166 'Council Medals,' 2876 'Prize Medals,' and 2042 'Honourable Mentions,' making a total of 5084 honorary distinctions of all kinds. If we take the exhibitors at the estimated number of 15,000, about one-third were deemed worthy of some kind of recognition. Of the total number, 2039 were taken by exhibitors belonging to the United Kingdom, and 3045 by foreign exhibitors. Our foreign guests occupied about two-fifths of the space, and took off three-fifths of the honours. The greatly-coveted 'Council Medals' were awarded in the ratio of 79 to British and 87 to foreign exhibitors; the 'Prize Medals,' 1244 British and 1632 foreign; the 'Honourable Mentions,' 716 British and 1326 foreign.

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[*] It may be interesting to compare these numbers with somewhat corresponding statistics of the Paris Universal Exhibition of 1855, given in the 'Third Report (1856) of the Commissioners for the Exhibition of 1851.' "The total number of visitors to the 'Palais de l'Industrie,' between the 15th of May, the date of its opening, and the 1st of December, when it was finally closed to the public, was 3,626,934, in addition to 906,530 visitors to the 'Palais des Beaux Arts;' of this number 40,000 were British subjects, including 2,768 furnished with workmen's passports free of charge. The total number of exhibitors was 20,839, about one-half of whom were French, while of the remainder 1,555 were from the United Kingdom, and about 1,070 from the British colonies."

In relation to different classes of exhibited articles, there were a few striking and instructive facts. In machinery, in manufactures, in metal, and in glass and porcelain manufactures, the British exhibitors gained more prizes than all the foreigners combined. In textile fabrics, in fine arts, and in miscellaneous manufactures, the foreign exhibitors took off the honours in the ratio of about three-fifths to two-fifths British. But in the section of raw materials for food and manufactures, the foreign exhibitors gained nearly *four times* as many prizes as the British (988 to 262). It would be a hasty generalisation to infer from thence that Britain is a manufacturing and not a producing country; but the simple facts themselves are worthy of note, whether we theorise concerning them or not.

The great honours, the Council Medals, were very unequally distributed as regards the classes of exhibited articles; for out of the whole number of 166, no less than 88 (more than one-half) were awarded for machinery alone. This is a significant fact; showing that the Juries, or rather the Council of Chairmen, were not deterred by the gorgeous display around them from doing justice to the great working agencies by which modern wealth is produced.

We must devote a paragraph to the Financial results. The receipts at, and in relation to, the Exhibition, by which it was made a self-supporting concern, were truly remarkable. The admissions were by season tickets, and by payment at the doors. Of the season tickets, no less than 10,892 gentlemen's tickets at three guineas each, and 8615 ladies' tickets at two guineas each, were sold before the Exhibition commenced, making together 19,507, for which more than 52,000*l*. were paid. About 6000 more tickets were sold during the period of the Exhibition; and it is worthy of note that of these 6000, the ladies took off nearly a thousand more than the gentlemen. The smallest money receipt at the doors was on the second day after the opening: the largest was on the third day before the closing: these sums were 482*l*. and 5283*l*. respectively, the former in sovereigns and the latter in shillings. The average of the daily receipts at the doors was 2533*l*. There were two admission days at 1*l*., twenty-eight at 5*s*., thirty at 2*s*. 6*d*., eighty at 1*s*., one for season-tickets only, two for exhibitors and their friends, and one for exhibitors and the officials; making up the total of a hundred and forty-four.

The total receipts amounted in round numbers to 506,000*l*., that amount being thus made up: subscriptions 67,800*l*., entrance fees 425,000*l*., casual receipts (*i. e.* refreshment and catalogue contracts, royalty on medals, washing-rooms, &c.) 13,200*l*. The total expenditure connected with the Exhibition was about 330,000*l*., leaving a surplus of 176,000*l*. in the hands of the Commissioners, but the final balance, including interest on Exchequer Bills and additional small receipts was 186,436*l*. How to apply this large surplus was a most important question. The original announcement to the subscribers was to the effect that, should any surplus remain, it was the intention of the Commissioners "to apply the same to purposes strictly in connection with the ends of the Exhibition, or for the establishment of similar exhibitions for the future." This latter purpose they were however led on more mature reflection to abandon, and they arrived at the conclusion that instead of applying it to any purposes of a temporary, partial, or local character, they could in no way so properly act in the spirit of the pledges held out to the public as by assisting in carrying out a comprehensive scheme which should have for its object to "increase the means of industrial education and extend the influence of science and art upon productive industry:" they having been compelled by their experience, in connection with the Exhibition, to regard as a matter of urgent importance the "systematically imparting instruction in science and art to the industrial classes of the community, to enable them to maintain their pre-eminence in the markets of the world." In their Second Report (1852) the Commissioners review the existing means and deficiencies of the country in respect to these matters, and develope their idea of the means required to supply the deficiencies which they have pointed out. Properly to carry into execution any comprehensive scheme would require the liberal co-operation of the public and the government. The sum in the hands of the Commissioners would go but a small way towards meeting the requirements of the case. It would suffice however to prepare the ground, and they determined so to employ it, leaving it to the public to complete the work when its importance and necessity shall have become fully understood and appreciated. They say, "The Commissioners feel it their duty to deal with the funds in their hands in such a manner as may ensure the greatest amount of advantage being derived from the mode of their application; and they consider that in no manner could this be ensured so well as by carefully preparing the basis and framework of a large and comprehensive plan, and securing facilities for its execution, leaving it to the various interests concerned to give substance to it, whilst the perfect development of the system must be left to the progressive action of time, commencing with the wants at present manifested, and extending it as those wants become greater and find expression on the part of the public. In investigating the causes which have led to the deficiency in England of larger institutions of the character alluded to, and the reasons why the great amount of private exertion and of State endowment already mentioned has not operated with all the advantage that might have been looked for, we have found two, which have more especially attracted our notice: the first being the want of that harmony of system which would admit of an economic and combined action of the forces already in existence towards a common end; and the second, the want of actual space for their development in this overcrowded metropolis." And having enlarged on these points at some length, they add that it appears to them that, "The two things to be aimed at are the adoption of a *system* and the securing of a *locality* where that system may be developed. We feel that we are best discharging the duties intrusted to us by her Majesty, by submitting for consideration and discussion on the part of the public such a system, and by ourselves providing such a locality, bearing in mind that the filling up of the plan that may be adopted must be left to the wants expressed, to the interest felt by the public at large, and to the voluntary efforts of institutions, societies, and individuals, aided by the efforts of the Government to develope more fully the institutions already founded by it, and which are so much appreciated by the public."

Acting on the suggestions of this report, the Government in the speech from the Throne at the opening of the session of 1852-53 invited the "aid and co-operation" of parliament in promoting a "comprehensive scheme" for the advancement of the Fine Arts and of Practical Science, which was in effect the scheme of the Commissioners. After some discussion the House of Commons voted the sum of 150,000*l*. towards the purchase of a site on which a National Gallery and Museum might be erected, and which should be available for the other purposes indicated. An equal sum was provided by the Commissioners out of the surplus remaining at their disposal. The land purchased by the Commissioners consisted of the well-known Gore House estate of 21 acres, situated nearly opposite the site of the Exhibition of 1851; the Villars estate of 48 acres, and some other adjacent land, which "were deemed indispensable for the completeness and development of the capacities of the property." Altogether it formed a compact estate of about 86 acres, its extreme length being half a mile, its average width a quarter of a mile. The Commissioners were anxious to secure other adjoining property to the extent of about 80 acres then obtainable, making in all about 170 acres, but the Government demurred, and the opportunity was lost, it being speedily purchased for building purposes. For the completion of the purchases the government subsequently obtained an additional vote of 27,500*l*.; and the Commissioners, having obtained the necessary powers from parliament, have formed upon the estates lines of road, sewers, &c. The total expenditure upon the Kensington estate up to Jan. 31, 1858, has been 312,036*l*., and 54,716*l*. remains to be paid in completion of one of the purchases. The Commissioners wish to retain in their hands a balance of 20,000*l*., which they consider to be "the minimum which they could safely retain for the purpose of meeting current expenses and providing for contingencies." The Commission itself has been incorporated as a permanent body, and certain members of the Government are now *ex officio* members of it.

The "comprehensive scheme" of the Commissioners proposed eventually to bring together, upon the locality they have purchased, all the existing metropolitan institutions, whether dependent on government or on private support, which have in view the advancement of science and art in their various branches, and to "establish a central point of union for those who in so many ways devote their energies to the same ends, especially in respect of the practical application of science and art to productive industry." They thus, in connection with the enlarged system of industrial instruction of which they urged the necessity, hoped that instead of being behind most other European nations we might take the lead in industrial science and art, as well as in manufacturing industry and enterprise. But the Commissioners have been doomed to see their scheme, like so many another castle in cloudland, reduced to much humbler dimensions than that in which it at first presented itself to their imagination. As a first step it was proposed to remove the National Gallery, and a noble site with a frontage of a thousand feet (the depth being practically unlimited) nearly facing the site of the Exhibition of 1851, was proffered by the Commissioners. A Committee of the House of Commons in 1853 reported unanimously in its favour, and the Government appeared to be inclined to support the proposition, but the Commissioners appointed to consider the subject in 1857 decided by a majority of three votes to one against removing the national collection from Trafalgar Square; and in consequence of their report a survey has been made of the ground in the rear, and estimates given of the cost of enlarging the present building, or erecting a new one on its site. So with reference to the Art-Collections in the British Museum, the feeling of the Trustees has been decidedly expressed against any removal. So again, a new building has been erected for the collection of vegetable products at Kew, which were proposed to be taken to Kensington. Then the Learned Societies were averse to migrating so far westward, and provision has been made for their accommodation at Burlington House, Piccadilly, which was purchased by the Government.

But a very definite advance has been made. By manufacturers and artisans, and by the general public, as well as by the Commission, the great importance of systematic art instruction is now generally admitted. A new department of the Government has been created, whose special duty is the promotion of Industrial Art and Science; and to which was intrusted the direction of all previously existing government scientific and art institutions, and the encouragement of all local institutions of a similar order. [Science and Art, Department of, *S.* 2.] Upon the estate purchased by the Commissioners a great practical step towards the realisation of a main feature of their scheme has been taken. In a building which has been adapted to the purpose, instruction in practical art and science by professors and teachers of the highest standing is regularly given, and an excellent library has been formed for the use of the students; more strictly scientific courses of lectures are at the same time delivered at the Metropolitan School of Science, in Jermyn Street—the two institutions making together a school nearly resembling that desired by the Commissioners. In a spacious temporary iron building at the south-eastern angle of the estate have been brought together for public exhibition industrial, educational, and art collections, which, though as yet necessarily very incomplete, and in some cases only rudimentary, are all of great value and interest; and having been arranged and shown so as most to suit the convenience of the industrial classes, they have proved remarkably attractive. These collections include a Museum of Patent Inventions, a Trade Museum, a Museum of Ancient and Modern Manufactures, a Museum of Animal Products, a Museum of Domestic Economy, the Architectural Museum formerly exhibited in Cannon Row, the fine collection of paintings by British artists presented to the nation by Mr. Sheepshanks, and collections of British sculpture, drawings, etchings, &c. At the present moment [March 1858], a collection of models and drawings submitted in competition for the Memorial to be erected in commemoration of the Great Exhibition is also being exhibited in the 'South Kensington Museum,' but the true memorial of the Exhibition of 1851 will be the Exhibition Estate, with the Museums of Art and Industrial Science collected upon it.

EXILE. [See Servitude, Penal, *S.* 2.]

EXOCETUS. [Flying Fish.]

EYEBRIGHT. [Euphrasia.]

F

FABER, REV. GEORGE STANLEY, was born on the 25th of October 1773. He was the eldest son of the Rev. Thomas Faber, who was descended from a French refugee who came over to England after the revocation of the edict of Nantes. He was educated at the grammar-school of Heppenholme, near Halifax in Yorkshire, where he remained till 1789, when he was entered of University College, Oxford. He took his degree of B.A. in 1792, and before he had reached his twenty-first year, was elected a Fellow and Tutor of Lincoln College. He took his degree of M.A. in 1796, served the office of Proctor in 1801, and in the same year, as Bampton Lecturer, preached the discourses which he shortly afterwards published under the title of 'Horæ Mosaicæ.' He took the degree of B.D. in 1803, and married in the same year. Having by this step relinquished his fellowship, he went to reside with his father at Calverley, near Bradford in Yorkshire, where for two years he acted as curate. In 1805 he was collated to the vicarage of Stockton-upon-Tees, in the county of Durham, which he resigned in 1808 for that of Redmarshall, in the same county. In 1811 he was collated to the vicarage of Long-Newton, where he remained till 1831, when Bishop Burgess presented him to a prebend in the cathedral of Salisbury. In 1832 Bishop Van Mildert gave him the mastership of Sherburn Hospital, near the city of Durham, when he resigned the vicarage of Long-Newton. During his mastership he considerably increased the value of the estates of the Hospital. He rebuilt the chapel, the house, and the offices, and greatly improved the grounds; he augmented the incomes of the incumbents of livings under his patronage, restored the chancels of their churches, and erected agricultural buildings on the farms. He died at his residence, Sherburn Hospital, on the 27th of January, 1854.

The theological writings of Mr. Faber, particularly those on prophecy, have had a very wide circulation. One of the principles for the interpretation of prophecy which he chiefly laboured to establish and exemplify, was, that the delineations of events in prophecy are not applicable to the destinies of individuals, but to those of governments and nations. His writings are numerous, and we can only mention a few of the most important:—'Horæ Mosaicæ, or a View of the Mosaical Records, with respect to their Coincidence with Profane Antiquity, their internal Credibility, and their Connexion with Christianity,' 2 vols. 8vo, 1801; 'A Dissertation on the Mysteries of the Cabyri, or the great gods of Phœnicia, Samothrace, Egypt, Troas, Greece, Italy, and Crete,' 2 vols. 8vo; 'Dissertation on the Prophecies that have been fulfilled, are now fulfilling, or will hereafter be fulfilled, relative to the great Period of 1260 Years,' 2 vols. 8vo, 1806; 'A General and Connected View of the Prophecies relating to the Conversion, Restoration, Union, and future Glory of Judah and Israel,' 2 vols. 8vo, 1808; 'The Origin of Pagan Idolatry,' 3 vols. 8vo, 1816; 'A Treatise on the Genius and Object of the Patriarchal, the Levitical, and the Christian Dispensation,' 2 vols. 8vo, 1823; 'The Sacred Calendar of Prophecy, or a Dissertation on the Prophecies which treat of the Grand Period of Seven Times,' 3 vols. 8vo, 1828; 'Eight Dissertations on certain connected Prophetical Passages of Holy Scriptures bearing more or less upon the Promise of a Mighty Deliverer,' 2 vols. 8vo, 1845.

FAIRFORD. [Gloucestershire.]

FALKINGHAM. [Lincolnshire.]

FAREHAM. [Hampshire.]

FAREY, JOHN, civil engineer and draughtsman, was born at Lambeth on March 20, 1791, and was educated at Woburn, where his father was agent to the Duke of Bedford, who took much interest in the progress of agriculture. John Farey, senior, was frequently employed in making reports on geological questions; wrote a 'General View of the Agriculture and Minerals of Derbyshire,' &c., (2 vols. 8vo, London, 1811,) a work which had some reputation, and contributed to the 'Agricultural Magazine.' Farey, junior—with his brothers and sisters, becoming at an early age attached to kindred pursuits—was engaged in making drawings for the plates of 'Rees's Encyclopædia,' 'The Edinburgh Encyclopædia,' 'Tilloch's Magazine,' 'Gregory's Mechanics,' and 'Mechanical Dictionary,' the 'Pantalogia,' and many other publications, some of which he contributed articles to, or edited. To him, in conjunction with the Messrs. Lowry, the engravers, has been ascribed in a great degree, the merit of introducing a better explanatory style of illustration in scientific works, and which has not since been improved upon in the bulk of publications, in a ratio commensurate with mechanical facilities. His avocations connected him with eminent scientific men of the time; and thus with Huddart, Jessop, Mylne, and Rennie, he was engaged in the publication of Smeaton's reports and drawings. In 1807 he had received the silver medal of the Society of Arts for an instrument for making perspective drawings, described in their 'Transactions;' and in 1813 the gold medal was awarded to him on the invention of his machine for drawing ellipses. This last he afterwards improved upon, besides effecting many improvements in the scales and drawing instruments now in use. In 1819 he went to Russia, and was engaged in the construction of iron-works. In Russia he first saw a steam-engine indicator—an instrument which it was attempted to keep secret—and on his return he had similar contrivances manufactured, and was often employed to use them in disputed cases. In 1821 he resigned his professional engagements in favour of his brother, and embarked in a lace manufactory in Devonshire, but gave that up in 1823. In 1825 he took the engineering direction of flax-mills at Leeds; but in 1826, on the failure of his brother's health, he returned to London, and from that time to near his death, which took place in his sixty-first year, on the 17th of July 1851, he was employed as a consulting engineer, or referee, in most of the novel inventions and litigated patent cases, during the quarter of a century. For such duties he was peculiarly qualified from retentive memory as to details of machines and processes, names and dates, and from habits of conscientious and laborious research into authorities for cases. In his investigations and in the preparation of drawings for specifications, he was assisted by his wife, a lady of great scientific attainments. From the shock of her decease he never wholly recovered. Some time before, part of his library and documents had been burnt with his house in Guildford-street. Farey commenced a 'Treatise on the Steam-engine, Historical, Practical, and Descriptive,' (4to, London, 1827, with plates,) a valuable work, but which did not get beyond a first volume, and he was an active member of the Institution of Civil Engineers, from whose Report of 1851-52 many of these particulars are derived.

FARINGDON. [Farringdon.]

FAT. [Tissues, Organic, *S.* 1.]

FAUCHER, LÉON, an ex-minister of the French government, and a writer on subjects of political economy and social progress, was occupied during the greater part of his life as a journalist. His connection with the periodical press of Paris commenced about the year 1830; from 1836 to 1843 he was a contributor to the 'Courrier Français,' and was afterwards a leading writer in the 'Revue des Deux Mondes,' which is published on the 1st and 15th of every month. and occupies an influential place among those periodicals which are chiefly devoted to the discussion of questions of political economy and the investigation of the actual condition of the various nations of the world. M. Léon Faucher was, during the last ten years of the dynasty of Louis Philippe, a member of the Chamber of Deputies for the department of Marne. He was re-elected by the same department in 1848 as one of its representatives in the National Assembly of the French Republic. He became Minister of the Interior, December 29, 1848, and held the office till May 14, 1849. He was again appointed Minister of the Interior, April 10, 1851, and was succeeded by the Comte de Persigny, January 22, 1852. M. Léon Faucher died on the 15th of December 1854, at Marseille.

M. Léon Faucher published in 1845 'Études sur l'Angleterre,' 2 vols. 8vo, Paris, a work descriptive of the social and industrial condition of certain districts of England—Whitechapel, St. Giles's, the City; Liverpool, Manchester, Leeds, Birmingham, and adjoining districts—together with dissertations on the Bank of England, the Lower Classes, Middle Classes, Aristocracy, the Corn-Laws and the League, and the Balance of Powers. Several portions of this work had appeared in 1843 and 1844 in the 'Revue des Deux Mondes,' and the description of Machester had been translated into English under the title of 'Manchester in 1841; its Present Condition,' 12mo. The work is written in a fair and impartial spirit, and affords evidence of diligent research and patient investigation; but contains many mistaken views and exaggerated descriptions. Other dissertations by M. Léon Faucher are the following:—'De l'Impôt sur le Revenue;' 'Du Système de M. Louis Blanc.' 'De la Situation Financière et du Budget,' 8vo, 1850, appeared originally in the 'Revue des Deux Mondes,' in 1849. 'Remarks on the Production of the Precious Metals and the Demonetization of Gold in several Countries in Europe, by Mons. Léon Faucher; translated by Thomas Hanley, Junior,' 8vo, Lond., 1852. These remarks appeared first in the 'Revue des Deux Mondes,' and were subsequently published, somewhat modified, in the Reports of the Académie des Sciences Morales et Politiques.

FAUJASITE. [Mineralogy, *S.* 1.]

FERRIER, MISS, was born at Edinburgh, about 1782, the daughter of a writer to the signet, and who was one of Sir W. Scott's colleagues as clerk of the Court of Session. This association almost necessarily produced an intimacy with the Scott family, and she had early access to the company of the best literary society of her native city. She was the author of 'Marriage,' published in 1818; 'The Inheritance,' in 1824; and 'Destiny, or the Chief's Daughter,' which appeared in 1831. They were all published anonymously, and thence Sir Walter Scott spoke of his "Sister shadow," at the end of his 'Legend of Montrose,' as one peculiarly fitted to excel in the depicting of Scottish character, as proved by "the very lively work entitled 'Marriage.'" In the latter part of his life, when Miss Ferrier was one of his most trusted friends, her name occurs in his diary. Her novels are not entirely national; the characters are vigorously drawn, and thoroughly individualised; the plots tolerably well imagined and ingeniously developed; and the dialogues are spirited and life-like, sometimes humorous, and occasionally witty. The use of the Scottish dialect is occasionally introduced with good effect, the dialect actually spoken and not the imitation which was occasionally heard upon the stage. All her novels were successful, and have become standards; but she seems to have written because she had accumulated observations and materials, and not from the love of either fame or profit. Sir Walter Scott, indeed, says of her, that in conversation "she was the least *exigeante* of any author, female at least, whom I have ever seen." He adds: "she was simple, full of humour, and exceedingly ready at repartee; and all this without the least affectation of the blue-stocking." This appears to be a good representation of her whole character: acute and observant, she was too kind to wish to give pain, and too placid and contented to seek for applause. Though her satire is sometimes sufficiently coarse and caustic upon the grosser errors of human conduct, the sketches are relieved by scenes of humour, which, if sometimes exaggerated, like those of Miss Burney, are certainly laughable.

Miss Ferrier passed a peaceful and quiet life in her native town, associated with all the more distinguished of her contemporaries, and respected for her kindness and urbanity by every one who knew her. She died, aged seventy-two, in November 1854.

FEVERFEW. [Pyrethrum, *S.* 1.]

FIBROUS TISSUE. [Tissues, Organic, *S.* 1.]

FICHTELITE. [Chemistry, *S.* 2.]

FIELDFARE. [Thrushes.]

FIELDING, COPLEY VANDYKE, was born about 1787, and belonged to a family several of the members of which were artists of greater or less ability. Copley Fielding exhibited his first pictures at the Artists' Exhibition, Spring Gardens, in 1810. It was by his water-colour landscapes that he first attracted notice, and though he subsequently made many attempts to achieve success as a painter in oil, it is by his paintings in water-colours that he will be remembered. Mr. Fielding began the practice of the art about the time that Girtin and Turner had succeeded in raising the practice of water-colour painting almost to a level with that of oil-colours, and Fielding devoted himself with thorough earnestness of purpose to the new art.

From an early period in his career he became a teacher, and he had in that line an unusual measure of success, as well in the progress of his pupils as in their number and social position. His success as a teacher of course did much to secure for him a wide circle of patrons and friends, which the merits of his works effectually maintained. His course was one of steady prosperity, quite devoid of adventure. His time was constantly occupied either in teaching or painting, or in those sketching excursions which were to furnish him with the materials for new pictures. For many years Mr. Fielding held the office of President of the Society of Painters in Water-Colours, and his position was generally recognised as that of the head and representative of this branch of art in England; the more readily, no doubt, in consequence of the estimation in which his personal as well as professional qualities were universally held. He died March 3, 1855, in his sixty-eighth year, at Worthing, Sussex, where, or at Brighton, he had for a long period been accustomed to spend his autumns.

FIGITES. [GALLICOLÆ.]

FI'LICES, or FILICA'CEÆ, a natural order of Plants, being the highest group of the class *Cryptogamia*, or Acrogens. The species are flowerless plants, consisting of leafy fronds, which are produced from a rhizoma unfolding in a spiral manner, and traversed by veins which form definite parts on the under surface, and produce unilocular, rarely multilocular, cases containing reproductive sporules.

The parts of these plants which require most attention in their study, and on modifications of which modern classifications depend, are the veins and organs of reproduction. The veins are either produced equally from both sides of a midrib, or they radiate from the base or axis of development, or from one side of an eccentric or unilateral costa. They are either simple, or once or repeatedly dichotomously branched, or the primary veins are pinnate; the branches are simple or forked. Their apices are either free, or they are combined by various forms of anastomosis. The organs of reproduction consist of a sporangiferous receptacle, which is a thickened point or lengthened portion of the ultimate venules or veinlets. It is generally superficial, sometimes immersed in the substance of the frond, or considerably elevated, and then globose or columnar. The sporangia, thecæ, or spore cases, are transparent, globose, oval, or pyriform unilocular cases, each girded by a more or less complete elastic articulated ring, or destitute of a ring; then sometimes oblong, opaque, and multilocular, and usually pedicillate. The sori are collections of sporangia, and have the same form, position, and direction as the receptacles. They are either naked, or each sorus is furnished with a membranaceous covering of various forms which rises from the receptacle. This covering is called an indusium, and is a plane, or vaulted, or cup-shaped membrane, produced from the receptacle of each sorus, and is generally deciduous as it becomes replicate. Often the entire margin (or lobules of the frond) is changed in texture, and forms an accessory indusium. Sometimes the whole of the sori of each segment are included within a universal indusium which is formed by the revolute margin of fertile contracted fronds.

The following account of the reproduction of the Ferns is given in a Report to the British Association in 1851, on the higher Cryptogamous Plants, by Mr. Henfrey. Speaking of the Ferns, Mr. Henfrey says:—

"This class formed for a long time the great stumbling-block to those who sought to demonstrate the existence of sexuality in plants. The young capsules were generally considered to be the analogues of the pistillidia of the Mosses, and the young abortive capsules which frequently occur among the fertile ones were supposed by some authors to represent the antheridia. Mr. Griffith noticed a structure which he was inclined to regard as the analogue of the antheridium in certain of the ramenta upon the petioles.

"In the year 1844 Professor Nägeli published an account of his observations on the germination of certain ferns, and announced the discovery of moving spiral filaments closely resembling those of the *Charæ*, on certain cellular structures developed upon the pro-embryo or cellular body first produced by the spore. It is not worth while to enter into an analysis of his observations, as they have since been clearly shown to have been very imperfect; it is sufficient to state that he only described one kind of organ, and from his description it is evident that he confounded the two kinds since discovered, regarding them as different stages of one structure. The announcement of this discovery seemed to destroy all grounds for the assumption of distinct sexes, not only in Ferns, but in the other Cryptogams, since it was argued that the existence of these cellular organs, producing spiral filaments, the so-called spermatozoa, upon the germinating fronds, proved that they were not to be regarded as in any way connected with the reproductive processes.

"But an essay published by the Count Suminski in 1848 totally changed the face of the question, and opened a wide field for speculation and investigation on this subject, just as it was beginning to fall into disfavour. Count Suminski's paper gives a minute history of the course of development of the Ferns, from the germination of the spore to the production of the regular fronds; and he found this development to exhibit phenomena as curious as they were unexpected. The cellular organs seen by Nägeli were shown to be of two perfectly distinct kinds, and moreover to present characters which gave great plausibility to the hypothesis that they represented reproductive organs; moreover, this author expressly stated that he had obtained absolute proof of sexuality by observing an actual process of fertilization to take place in the so-called ovules, through the agency of the spiral filaments or spermatozoa. The main points of his paper may be briefly summed up as follows:—The fern-spore at first produces a filamentary process, in the end of which cell-development goes on until it is converted into a Marchantia-like frond of small size and exceedingly delicate texture, possessing hair-like radicle threads on its under side. On this under side become developed, in variable numbers, certain cellular organs of two distinct kinds. The first, which he terms antheridia, are the more numerous, and consist of somewhat globular cells seated on and arising from single cells of the cellular Marchantia-like frond. The globular cell produces in its interior a number of minute vesicles, in each of which is developed a spiral filament, coiled up in the interior. At a certain epoch the globular cell bursts, and discharges the vesicles, and the spiral filaments moving within the vesicles, at length make their way out of them, and swim about in the water, displaying a spiral or heliacal form, and consisting of a delicate filament with a thickened clavate extremity; this, the so-called head, being said by Count Suminski to be a hollow vesicle, and to be furnished with six or eight cilia, by means of which the apparently voluntary movement of the filament is supposed to be effected.

"The second kind of organ, the so-called 'ovules,' are fewer in number and present different characters in different stages. At first they appear as little round cavities in the cellular tissue of the pro-embryo, lying near its centre, and opening on the under side. In the bottom of the cavity is seen a little globular cell, the so called 'embryo-sac.' It is stated by Count Suminski, that while the ovule is in this state one or more of the spiral filaments make their way into the cavity, coming in contact with the central globular cell. The four cells bounding the mouth of the orifice grow out from the general surface into a blunt cone-like process, formed of four parallel cells arranged in a squarish form, and leaving an intercellular canal leading down to the cavity below. These four cells become divided by cross septa, and grow out until the so-called ovule exhibits internally a cylindrical form composed of four tiers of cells, the uppermost of which gradually converge and close up the orifice of the canal leading down between them. Meanwhile the vesicular head of one of the spiral filments has penetrated into the globular cellule of the embryo-sac, enlarged in size and undergone multiplication, and in the course of time displays itself as the embryo, producing the first frond and the terminal bud, whence the regular fern-stem is developed. In considering the import of these phenomena, the author assumes the analogy here to be with the process of fertilisation in flowering plants, as described by Schleiden, regarding the production of the embryo from the vesicular head of the spermatozoa as representing the production of the phanerogamous embryo, from the end of the pollen tube after it has penetrated into the embryo-sac.

"The promulgation of these statements naturally attracted great attention, and since they appeared we have received several contributions to the history of these remarkable structures, some confirmatory, to a certain degree, of Suminski's views; others altogether opposed to them.

"In the early part of 1849, Dr. Wigand published a series of researches on this subject, in which he subjected the assertions of Suminski to a strict practical criticism; the conclusions he arrived at were altogether opposed to that author's views respecting the supposed formation of the organs, and he never observed the entrance of the spiral filaments into the cavity of the so-called ovule. About the same time M. Thuret published a series of observations on the 'Antheridia of Ferns.' In these he merely confirmed and corrected the statements of Nägeli respecting the antheridia, and did not notice the so-called ovules.

"Towards the close of the same year Hofmeister confirmed part of Suminski's statements, and opposed others. He stated that he had observed distinctly the production of the young plant (or rather the terminal bud for the new axis) in the interior of the so-called ovule; but believed the supposed origin of it from the end of the spiral filament to be a delusion. He regards the globular cell at the base of the canal of the ovule as itself the rudiment of the stem, or embryonal vesicle (the embryo originating from a free cell produced in this), analogous to that produced in the pistillidia of the Mosses. He also describes the development of the ovule differently, saying that the canal and orifice are opened only at a late period by the separation of the contiguous walls of the four rows of cells.

"About the same time appeared an elaborate paper on the same subject by Dr. Hermann Schacht, whose results were almost identical. He found the young terminal bud to be developed in the cavity of one of the so-called ovules, which were developed exactly in the same way as the pistillidia of the Mosses. He stated also that the cavity of the ovule is not open at first, and he declares against the probability of the entrance of the spiral filament into it, never having observed this, much less a conversion of one into an embryo. In the essay of Dr. Mettenius, already referred to, an account of the development of the so-called ovules is given. His observations did not decide whether the canal of the ovule, which he regards as an intercellular space, exists at first, or only subsequently, when it is entirely closed above. Some important points occur in reference to the contents of the canal. The contents of the canal in a mature condition consist of a continuous mass of homogeneous tough substance, in which fine granules, and here and there large corpuscles, are embedded. It reaches down to the globular cell, or embryo-sac, and is in contact with it. This mass either fills the canal or diminishes in diameter from the blind end of the canal down to the embryo-sac; in other cases it possesses the form represented by Suminski, having a clavate enlargement at the blind end of the canal, and passing into a twisted filament below; in this latter shape it may frequently be pressed out of the isolated ovules under the microscope, and then a thin transparent membrane-like layer was several times observed on its surface. In other cases the contents consisted of nucleated vesicles, which emerged separately or connected together.

"The embryo-sac consists of a globular cell containing a nucleus, and this author believes that the commencement of the development of the embryo consists in the division of this into two, which go on dividing to produce the cellular structure of the first frond.

"With regard to the contents of the canal the author says, 'Although I can give no information on many points, as in regard to the origin of the contents of the canal of the ovule, yet my observations on the development of the ovule do not allow me to consider them, with Suminski, as spiral filaments in course of solution; just as little have I been able to convince myself of the existence of the process of impregnation described by that author. It rather appears to me that the possibility of the entrance of the spiral filaments and the impregnation cannot exist until the tearing open of the blind end of the canal in the perfectly-formed ovule, as after the opening of the so-called 'canal of the style' in the pistillidia of the Mosses.

"Another contribution has been furnished by Dr. Mercklin, the original of which I have not seen, but depend on analyses of it published in the 'Botanische Zeitung,' and the 'Flora' for 1851, and further in a letter from Dr. Mercklin to M. Schacht, which appeared in the 'Linnæa' at the close of last year.

"He differs in a few subordinate particulars from M. Schacht, in reference to the development and structure of the prothallium, or pro-embryo, and of the antheridia and spiral filaments; but these do not require especial mention, except in reference to the vesicular end of the spiral filament described by Schacht, which Mercklin regards as a remnant of the parent vesicle, from which the filament had not become quite freed. The observations referring to the so-called ovule, and the supposed process of impregnation, are very important; they are as follows:—

"'1. The spiral filaments swarm round the ovule in numbers, frequently returning to one and the same organ.

"'2. They can penetrate into ovules. This was seen only three times in the course of a whole year, and under different circumstances; twice a spiral filament was seen to enter a still widely open young ovule, then come to a state of rest, and after some time assume the appearance of a shapeless mass of mucilage; the third case of penetration occurred in a fully developed ovule through its canal; it therefore does not seem to afford evidence of the import of the spiral filament, but certainly of the possibility of the penetration.

"'3. In the tabular portion of the ovule, almost in every case, peculiar club-shaped granular mucilaginous filaments occur at a definite epoch; these filaments, like the spiral filaments, acquiring a brown colour with iodine. These mucilaginous bodies sometimes exhibit a twisted aspect, an opaque nucleus, or a membranous layer, peculiarities which seem to indicate the existence of an organisation.

"'4. These club-shaped filaments are swollen at the lower capitate extremity, and have been found in contact with the embryo-sac, or globular cell, which forms the rudiment of the future frond.

"'5. The spiral filaments, which cease to move and fall upon the prothallium, are metamorphosed, become granular, and swell up.'

"Hence the author deduces the following conclusions:—

"'That these clavate filiform masses in the interior of the ovule are transparent spiral filaments, which at an early period, while the ovule was open, have penetrated into it; which leads to the probability that—

"'1. The spiral filaments must regularly penetrate into the ovules; and, 2. They probably contribute to the origin or development of the young fruit frond (or embryo). In what way this happens the author knows not, and the details on this point given by Suminski remain unconfirmed facts.'

"An important point in this essay is the view the author takes of the whole process of development in this case. He regards it as not analogous to the impregnation in the *Phanerogamia*, since the essential fact is merely the development of a frond from one cell of the prothallium, which he considers to be merely one of the changes of the individual plant, while all the other authors who have written on the subject, with the exception of Wigand, call the first frond, with its bud and root, an Embryo, and regard it as a new individual; or at all events, even a distinct member of a series of forms, constituting collectively the representatives of the species.

"Finally, Hofmeister, in his notice of this essay in the 'Flora,' declares that the development of the so-called embryo, or first frond, commences not by the subdivision of the globular cell, or embryo-sac, but by the development of a free cell, or embryo vesicle in this, like what occurs in the embryo-sac of the *Phanerogamia;* and he asserts that this is the first stage of development from the globular cell in all the vascular Cryptogams, including that found in the pistillidia of the Mosses."

The position of the Ferns in a natural system of classification has not been a matter of much difference. Their imperfect organs of reproduction have at once led to their being placed by most botanists among *Cryptogamia;* nevertheless Bory St.-Vincent elevates Ferns to the rank of a class intermediate between Monocotyledons and Acotyledons, or *Cryptogamia;* at the same time he rejects the view of Jussieu, who, from the mode of germination of their sporules, placed the Ferns among the Monocotyledons. Their relation with the flowering-plants is seen through *Cycadaceæ*, with which order they agree in their gyrate vernation and their pinnate leaves. Their affinity with Cryptogamic plants is obvious in the *Equisetaceæ* and *Lycopodiaceæ*. The order of Ferns may be divided into the following sub-orders, which Lindley regards as of the rank and value of orders:—

I. Gleicheniaceæ. The thecæ with a transverse or obliquely transverse complete elastic annulus or ring, bursting vertically. The species are tropical, or extra-tropical only in the Southern Hemisphere, of a harsh and rigid texture, simple or generally with copious dichotomous branches and gemmæ in the axils; the ultimate branches pinnatifid. None of the genera of this order, as understood by Hooker, are British. It includes about forty species.

II. Polypodiaceæ, with the sori dorsal, often near or at the margin, various in form, sometimes constituting an uniform linear or spreading mass, naked or furnished with an involucre, the thecæ 1-celled, with a longitudinal or oblique elastic articulated generally incomplete ring, bursting transversely and irregularly. This is a very extensive sub-order: the species inhabit almost every part of the world, from the tropics to the arctic and antarctic regions; they are exceedingly variable in size and appearance, including the largest tree-ferns and the smallest herbaceous species. It contains by far the largest number of genera of any of the sub-orders of Ferns. Many of these are very extensive, and have no British representatives, as *Cyathea, Hemitelia, Alsophila, Dicksonia*, &c.

III. Osmundaceæ has the thecæ with an operculiform ring, or without one, reticulated, striated with rays at the apex, bursting lengthwise, and usually externally. The species of this sub-order are not numerous.

IV. Danæaceæ. The thecæ sessile, without any ring, concrete into multilocular sub-immersed masses, opening at the apex. This is also a small sub-order, with three genera —*Danæa, Marattia*, and *Kaulfussia*.

V. Ophioglossaceæ. The thecæ single, roundish, coriaceous, opaque, without ring or cellular reticulation, half 2-valved, with a straight vernation. It embraces the genera *Ophioglossum, Helimnthostachys*, and *Botrychium*.

The following is an arrangement of the British genera of Ferns;—

Sub-Order *Polypodiaceæ*.

Tribe *Polypodieæ*. The sori nearly circular, without an indusium.
Genera, *Allosorus, Polypodium, Woodsia.*
Tribe *Aspidieæ*. The sori nearly circular, covered by an indusium.
Genera, *Lastrea, Polystichum, Cystopteris.*
Tribe *Asplenieæ*. The sori oblong or linear, covered by an indusium opening longitudinally on one side.
Genera, *Athyrium, Asplenium, Scolopendrium.*
Tribe *Grammitideæ*. The sori elongate, without an indusium.
Genus, *Ceterach.*
Tribe *Adiantariæ*. The thecæ covered by a marginal or sub-marginal elongated part of the frond, or by a separated portion of the cuticle, resembling an indusium.
Genera, *Blechnum, Pteris, Adiantum.*
Tribe *Hymenophylleæ*. The thecæ opening irregularly; the ring oblique, eccentric, transverse, complete; the receptacle terminating a vein at the margin of the frond.
Genera, *Trichomanes, Hymenophyllum.*

Sub-Order *Osmundaceæ*.

Tribe *Osmundeæ*. The vernation circinate; the rachis solid; the thecæ stalked.
Genus, *Osmunda.*

Sub-Order *Ophioglossaceæ*.

Genera, *Ophioglossum, Botrychium.*

The Ferns have a wide geographical distribution, the herbaceous and shrubby kind being found towards the north and south poles; whilst the tree-ferns rival the gigantic palms in the forests of tropical climates. It is these last which give a peculiar character to the vegetation of the countries where they grow, as their foliage and stems differ altogether from any that are observed amongst flowering plants. The proportion which they bear to other plants varies much in different parts of the world. In Jamaica they are in the proportion of 1 to 9; in New Guinea as 28 to 122; in New Ireland as 13 to 60; in the Sandwich Islands as 42 to 160; on continents they are less numerous; in equinoctial America 1 to 36; in Australia 1 to 37; in France 1 to 63; in Portugal 1 to 116; in the Greek Archipelago 1 to 227; in Egypt 1 to 971. In the north their proportions are greater; they form in Scotland 1 to 31; in Sweden 1 to 35; in Iceland 1 to 18; in Greenland 1 to 10; and the North Cape 1 to 7.

The properties and uses of the Ferns are not in proportion to their numbers in the vegetable kingdom. Many of them deposit starch in their rhizomata, from which food may be prepared. The roots of *Nephrodium esculentum* are eaten in Nepaul; those of *Angiopteris evecta* are used in the same manner in the Sandwich Islands. *Diplazium esculentum, Cyathea medullaris, Pteris esculenta*, and *Gleichenia dichotoma*, all yield starch, and are employed as food in different countries. The *Adiantum Capillus Veneris* yields astringent and aromatic secretions. Some of the American polypodiums are said to possess powerful medicinal effects, and are used as anti-rheumatic, anti-venereal, and febrifugal remedies. The *Angiopteris evecta* yields an aromatic oil, which is used in the Sandwich Islands to perfume the fixed oils, as cocoa-nut oil. The stems of many species contain bitter principles, and have hence been used as tonics. Species of *Aspidium* and *Asplenium* have been used in European medicine. The Brazillian negroes form tubes for their pipes from the stems of *Mertensia dichotoma*. *Osmunda regalis* had at one time a great reputation in medicine.

(Babington, *Manual of British Botany*; Lindley, *Natural System*; Hooker, *Species Filicum*; J. Smith, *The Genera of Ferns*; *Journal of Botany*, vol. iv.; Newman, *History of British Ferns*; Burnett, *Outlines of Botany*; Meyen, *Pflanzen-Geographie*.)

FILLANS, JAMES, sculptor, was born at Wilsontown, Lanarkshire, on the 27th of March, 1808. His father having become reduced in circumstances, removed into Renfrewshire while James was yet a child, and the boy was early set to the keeping of sheep and similar employments, and consequently received scarcely any school education. When old enough he was apprenticed to a weaver at Paisley; but disliking the occupation, was at the end of a year placed with a stone-mason. At this business, after having served his apprenticeship, he for awhile worked as a journeyman. But he had, during his spare hours, even when engaged as a weaver, been teaching himself to draw and to make clay models, and by perseverance he attained sufficient skill to win some local celebrity. Motherwell, the poet, was at this time the editor of the 'Paisley Advertiser,' and he warmly encouraged the young man's tastes, and judiciously guided his aspirations. Fillans found in Paisley, at his moderate prices, patrons for small portraits, busts, and fancy figures; but he determined to try the wider field of Glasgow, as much in order to avail himself of the additional facilities that city afforded for improvement in art, as in the expectation of increased patronage. He however met with both, and after a time was in a condition to visit Paris for the purpose of further study. On his return in 1836 he established himself in London, where he found many warm Scotch friends, among others Allan Cunningham, who sat to him for his bust, and introduced him to Chantrey.

At the exhibition of the Royal Academy in 1837, Fillans had seven busts, including one of Allan Cunningham, which attracted some attention. He now produced a Tam o' Shanter jug; 'The Birth of Burns,' an alto-rilievo, and other designs of a similar kind, forming a Burns' series, which have been more than sufficiently praised; and he received a commission for a bust of Mr. Oswald of Auchincruive, for his tenantry, which led him to visit Italy, Mr. Oswald being then resident on the continent. While still depending upon portrait busts for his means of support, Mr. Fillans was not negligent of loftier subjects. His chief work of this order was a life-sized group in marble, 'The Blind teaching the Blind,' a work of real merit and some originality: it was exhibited in Glasgow, where it produced a great sensation. His 'Boy and Fawn' was another admirable production. But the works which established his fame were his colossal statue of Sir James Shaw, for the baronet's native town of Kilmarnock, and the bust of John Wilson—both characteristic works, that of Wilson being indeed by far the most striking head of the poet which has been produced. In Scotland they were received with enthusiasm, and the sculptor was congratulated with two or three public dinners given in his honour. Still, though so far successful, he found his income insufficient to maintain establishments in London and Glasgow, and he resolved to quit the metropolis, his commissions having been chiefly derived from his countrymen. He removed to Glasgow in 1851, but his health, already impaired, became gradually worse; and at length an attack of rheumatic fever carried him off on the 12th of September 1852. He had been engaged as long as his strength permitted upon a colossal statue of 'Rachel weeping for her Children,' but left it unfinished.

A life of James Fillans, by James Paterson, was published at Paisley in 1854, in a handsome quarto volume. It contains engravings of his principal statues, of his designs for Motherwell's tomb, the Burns' series, an elaborate series of designs of 'Taming the Wild Horse,' and a set of designs illustrative of a tale by a friend. It also contains several pieces of poetry, in which Mr. Paterson finds much to admire, but which would have been as well left in the manuscript, except as evidence of the sculptor's kindheartedness. Fillans used the pencil as well as the chisel, but with by no means equal success.

FINANCE. [Revenue and Taxation, *S.* 2.]

FINDEN, WILLIAM, line engraver, was born in 1787. He was apprenticed to Mr. Mitan, an engraver of shop-bills, coats of arms, &c., but by devoting his leisure to the study of the works of James Heath, and others, he acquired, by his own industry and intelligence, so much facility in the use of the burin, and displayed so cultivated a taste, that after he began to work on his own account he soon found ample employment in engraving book plates. Among his first successes in this line, his engravings of Smirke's illustrations of 'Don Quixote' have been singled out for special commendation.

Being very industrious, and always remarkable for a certain neatness of line and smoothness of finish, he grew in course of time to be one of the most popular engravers of the day; and he was selected to engrave 'the royal portrait' by Lawrence, of George IV. seated on the sofa. It was a plate of large size, and for engraving it Mr. Finden received the sum, unparalleled for a portrait, of 2000 guineas. Finden bestowed upon it the utmost care, and it was so extremely popular that proofs and prints are said to have been advertised for at a large advance of price. But both the picture and the engraving were in an essentially false style of art, and, the fashion having passed away, they have sunk in general estimation even below their proper level. Among Mr. Finden's other more celebrated large engravings, may be mentioned the 'Village Festival,' from the well-known picture by Wilkie, now in the National Gallery, which, with something of effeminacy in the handling, is much his finest engraving; and the 'Highlander's Return,' also after Wilkie.

Still his greatest success had been in small plates, especially in book-plates, and the great request in which he was with publishers, led him to call in the assistance of inferior hands for the completion of his many engagements. To such an extent did he carry this, that he had at length, in conjunction with a younger brother, Mr. Edward Finden, also a skilful engraver, established a complete manufactory for line engravings on steel and copper. The effect was, of course, mischievous to art; injurious to his own reputation, as necessarily tending to destroy individuality of style; and eventually it was ruinous to his fortune, by inducing him to undertake—partly no doubt to keep his establishment in full employment, and partly to secure to himself a share of the profits which he fancied belonged of right to the engraver rather than to the publisher—the publication of various extensive series of engravings. Of these, the first and most successful was the popular 'Byron Gallery.' Other galleries and sets of illustrations followed with less success; and ultimately by far the best of the whole 'the Gallery of British Art'—a generally well selected, well-engraved, and characteristic series of engravings from our best painters—on a larger and more costly scale than any of his previous speculations, was undertaken at an unfortunate time, and, being persevered in, in hopes of eventually retrieving the losses, swept away the fruits of all his previous labour.

After this, Mr. Finden's only important work was a large engraving, executed for the Art Union, of Hilton's 'Crucifixion'; but it was the work of a man broken in spirit, and is a very unsatisfactory production. He completed it shortly before his death, which occurred on the 20th of September, 1852.

FLAGS. [IRIS, *S.* 1.]

FLIXWEED. [SISYMBRIUM.]

FLORIS, an island in the Indian Archipelago, lying between 8° and 9° S. lat., 120° and 123° E. long. Its length is about 200 miles from east to west, and its average breadth about 35 miles. The surface of the island is hilly, particularly on the south side, where there are several high volcanic mountains, from one of which there was an eruption in 1810. Cotton is one of the products. Sandal-wood, bees'-wax, horses, and slaves are exported to Singapore. The principal port, Endé, is on the south side of the island: it has an excellent harbour. Larantuka, a town on the east side, on the straits of Larantuka, in 8° 45′ S. lat., 123° E. long., is in the possession of the Portuguese, who have succeeded in bringing many of the natives to the profession of the Roman Catholic faith. This is the only part of the island in possession of Europeans. Endé was formerly subordinate to the Dutch presidency at Coopang in the island of Timor; but in 1812 the Bugis inhabitants succeeded in expelling all Europeans. The coast is mostly colonised by Bugis and Malays, but the interior is inhabited by aborigines, a dark curly-headed race, who resemble the Papuas of New Guinea. The island gives name to the strait of Floris, which separates it from the islands of Solor and Adenar on the east.

FLOWER, that part of a plant in which the organs of reproduction are placed. The flower originates from a bud, and is nothing more than a particular modification in the perfecting of the parts contained in the bud; namely, the several foliar organs and internodes. Only two essential processes of development can exist, and from those only two essential organs, as fundamental organs, can be formed in the plant; namely, the Axis and the Leaf. All the several parts of the flower must therefore be referrible to these fundamental organs, and be traced back to them. Since Göthe's time this tracing back has been termed the Metamorphosis of Plants. Originally this mode of considering the flower rested solely on Comparative Morphology, and the observation of cases in which the interruption of the usual processes of development, in some or all parts of the flower, caused those parts to reassume forms in which it was not difficult to recognise the nature of the fundamental organ from which they had been produced. This latter has been termed Retrogressive Metamorphosis. As examples of it, we may mention the different monstrosities, the doubling of a flower through the transition of the stamens into petals, the transition of the petals and sepals into the common leaves of the plant, &c. This mode of establishing the foundations of the doctrine of metamorphosis has however two essential faults: since, in the first place, it seeks to obtain individual facts by means of hypotheses and comparisons; while, secondly, its progress depends entirely upon favourable circumstances. The only correct and sure ground on which to rest this doctrine is the history of development.

In Phanerogamic Flowers the following parts are distinguished, proceeding from without inwards:—1. The Floral Envelopes, as the External Calyx (Epicalyx), of which the parts are Leaves (Phylla); the Calyx, the parts of which are Sepals; the Corolla, the separate portions of which are Petals; or, instead of these three, the Perianth (Perianthium), whose separate parts are Leaves (Phylla): 2. The Stamens (Stamina), around and within which some stunted accessory foliar organs appear under very various names: and lastly, 3, in the centre of the flower, the Pistil (Pistillum), the separate foliar organs of which are Carpels (Carpella). In the stamens the lower thread-like portion, which is termed the Filament (Filamentum), is distinguished from the upper thick and hollow part, containing the Dust (Pollen), called the Anther (Anthera). In the pistil, the lower part surrounding the Ovules or Seed-Buds (Gemmulæ) is called the Germen; the upper free part, which is usually covered with papillæ, is termed the Stigma, and between these two frequently a stalk-like elongation of the germen occurs, called the Style.

The flower of *Phanerogamia* is the only physiologically determinate organ of the plant, since it contains the apparatus for the regular propagation. But to this only two parts contribute—namely, the stamens, as generators and receptacles of the pollen: and the seed-bud or ovule, as the place in which the pollen is developed into the embryo. All the remaining parts of the flower—namely, the envelopes of the whole perianth, the calyx and corolla, the receptacles containing the seed-bud (the germens, styles, and stigma), are not, in a physiological sense, essential, and they may be absent, without the flower losing its correspondence to the character by which a flower is defined.

In the correct (morphological) view of the flower, there is no distinction between essential and inessential forms, and therefore it is necessarily more proper to divide it into axial and foliar organs. The following relations should be borne in mind:—The axis and its modifications are the basis of the flower, because to them the foliar organs are attached. Attached to the outer part of the axis of the flower occur several forms of true foliar organs, the floral envelopes, accessory leaflets, and stamens. The innermost part is occupied by organs which are formed from true axial organs, or an intimate blending of these with foliar organs, which are termed the female apparatus, or better, the rudiment of the fruit. At the same time the parts of the flower are usually grouped together and treated generally, according to the relations of number and position, as well as of duration. Thus we obtain this plan for our following investigations:—

A. The Axial Organs of the flower.

B. The number, relative position, and duration of the parts of the flower.

C. The true Foliar Organs of the Flower.
  a. The Floral Envelopes.
  b. The Stamens.
  c. The Accessory Foliar Organs.

D. The Rudimentary Fruit.
  a. The Pistil.

b. The Spermophore.
c. The Seed-Buds.

The Anthers have been called the male organs of a plant (with the superfluous collective term Andrœceum); the Seed-Buds and their receptacle the Pistil, the female parts (together the Gynœcum). A flower that contains both parts is termed Hermaphrodite (Flos Hermaphroditus). Flowers that contain only one of those kinds of organs are termed Unisexual Flowers (Flores Unisexuales, Diclini). When, in the last case, male and female flowers (mas et femina) appear on the same individual plant, such plant is termed Monœcious (Planta Monoica); when they appear on separate individuals the plant is termed Diœcious (Planta Dioica). An Inflorescence which contains both male and female flowers, also is termed Inflorescentia Androgyna. Here again it must be distinguished whether the male and female blossoms are formed upon different plans, as in the *Cupuliferæ* (Diclines); or whether, through the suppression of one or other part, a pseudo-diclinous condition appears in a flower formed on the plan of a hermaphrodite. This latter condition, which is never found to run through all the examples of any species of plant, brings monœcious and diœcious species into hermaphrodite genera, and suggested to Linnæus the establishment of his 23rd class, *Polygamia*, where in one and the same species male, female, and hermaphrodite flowers are present.

There are very few flowers of so simple a structure that they consist only of one simple essential part, so that no formation of internodes is possible within the flower; and the extremity of the pedicels immediately supports the floral parts existing. This is the case in the male flower of the *Euphorbiæ*, where the end of a pedicel bears one single stamen; also in the male flower of the *Abietineæ*, where one single foliar organ, converted into a stamen, constitutes the entire flower. It is also the case in the female flower of *Taxus*, where the small pedicel, clothed with bracts, terminates immediately in the naked seed-bud. In the generality of flowers however several parts are united which do not stand at equal heights on the axis, and thus more or fewer undeveloped internodes take part in the structure of the flower. The original condition of the internodes, is here also most frequently permanent; and the pedicel, after the detachment of all the parts of the flower, frequently ends in a small slightly thickened knot, which represents the collective internodes of the flower in an undeveloped condition,—the simple base or receptacle of the flower (Torus). Examples in which individual internodes become elongated are rather rare. In some families they are elongated between the inner floral envelopes and the stamens (Androphorum), and between the stamens and the germen (Gynophorum). The latter is generally termed Germen Stipitatum. There are examples of both in the *Passifloraceæ* and the *Capparidaceæ*.

A considerably longer part, without elongation of the individual internodes, frequently occurs as a gynophore in flowers which contain many germens (as in the *Rosaceæ*, the *Ranunculaceæ*, *Magnoliaceæ*, &c.) Again the gynophore is often presented as a hemispherical or cushion-like part, as in some other *Rosaceæ* and *Ranunculaceæ*. A very rare form of it is that of a reversed cone, which bears the germens upon a base turned upward, as in *Nelumbium*. In the rarest instances, with the exception of this case, the axis of the flower is elongated within the floral parts even without ending as a germen; but this does sometimes occur, as in the male flowers of some Palms and other plants; for example *Chamædorea*, where the points of the petals unite with the apex of the axis of the flower which passes up through them.

In very crowded inflorescences, the torus of an axillary bud developes obliquely, and rises up on one side, especially beneath the germen, so as to appear as a part of its side-wall; this happens with most of the Grasses. A similar circumstance, arising from a similar cause, happens when many single germens are present in one flower, by the division of the torus, which forms the basis of each of those germens, and thus assumes the appearance of forming a part of the wall of the germen (as in *Potamogeton* and *Dryadaceæ*).

But the development of the internodes into a Disc, or in a hollow cup, is far more frequent in the flower. If the collective internodes of the flower form a hollow body, or even a cylindrical elongated tube, which incloses only seed-buds, and bears all the floral parts upon its upper edge, all this is the so-called Inferior Germen or Ovary (Germen Inferum).

Every other similar expansion of the internodes of the flowers which does not immediately bear seed-buds, is called the Disc (Discus). This may be situated beneath the rudiment of the fruit (Discus Hypogynus), and then may be flat, as in *Potentilla* and *Fragaria;* or cup-shaped, as in *Rosa*, *Populus* (*mas*), &c. This latter may be free (*Rosa*), or may be blended with the germen situated inside it (*Pyrus*); or it may pass off from the middle of the (half-inferior) germen (Discus Perigynus), as in many *Myrtaceæ;* or, lastly, it may rise above the (inferior) germen, and stand upon it (Discus Epigynus). Here it is very rarely (or never ?) flat, but funnel-shaped, as in *Godetia;* in the form of a long tube, as in *Œnothera:* or resembling a style, as in the *Orchidaceæ* and *Aristolochiaceæ*. In all these cases the foliar organs of the flower may be situated in very different places. Usually, indeed, they collectively form a zone around the edge of the flat or concave discs; then the discs may be said to correspond to as many discs lying one above another as there are internodes implied by the number of foliar organs. Frequently the true foliar organs stand around the edge of the disc; and upon its inner or upper surface the germens are arranged in one or more circles (as in *Rosa*, *Punica*, *Onagraceæ*). More rarely the floral envelopes alone stand on the border, while the stamens are then at a distance from them, upon an internal prolongation of the disc, as in the *Orchidaceæ*.

The disc is by no means always regularly developed, but sometimes enlarged at one side only, whereby the whole flower appears oblique, thus in *Reseda*. The most remarkable structure is in *Pelargonium*, where the disc forms a cavity to one side of the peduncle, and in *Tropæolum*, where the spur is formed solely by the disc.

There are but few special observations to be made respecting the structure of the internodes of the flower; it is in general like that of annual stems; but it should be remarked that they often possess fewer vascular bundles, and these of simpler development. The internodes (as also some of the foliar organs) within the flower, frequently do not have the epidermis developed, but, instead of this, a delicate soft cellular tissue, somewhat yellowish in colour, and often containing a saccharine secretion, forms the investment of the surface (Nectarium).

It is very rarely that a flower consists of one part only, as in the male flowers of *Euphorbia*, *Lemna*, and *Wolffia*, which are formed of one foliar organ, the anther; or the female flower of *Taxus*, which is formed of one axial organ, the seed-bud. Usually more parts unite to form a flower: thus the female flower of most of the *Araceæ* consists of one or more seed-buds, and a carpel surrounding them. The male flower of the *Salicaceæ* consists of a scale-like disc and several stamens. In the generality of cases, both male and female organs are present in the same flower: they are seldom naked, as in *Hippuris*, but usually surrounded by floral envelopes.

In axillary flowers, those parts which are turned towards the peduncle are termed the upper, and those turned towards the bract, where it is present, the lower. Some plants exhibit the peculiarity that the pedicel, until the time of the blooming, makes a half turn (analogously to the twining stem), and it may be the true pedicel, as in *Calceolaria* and some *Orchidaceæ;* or the inferior germ, as in most of the *Orchidaceæ*. By this curve, the upper parts of such a flower (in those plants the lip) become apparently the under; and such flowers are termed Flores Resupinati. The term is sometimes falsely applied to those *Orchidaceæ* in which no such twisting takes place, but in which the lip stands regularly as the upper part of the flower, as, for example, in *Epipogium*.

The individual organs of the flower taken generally, according to the common view, and known by collective names, may originally consist either of one piece or of more than one: in the first case they are partes monomeræ; in the second case partes di-, tri-, or polymeræ. In the latter case the parts may be entirely separated and independent of one another, or they may be grown together in various ways. These coherent sets were formerly also called partes monomeræ. De Candolle better termed them partes gamomeræ; as, for example, *Hemerocallis* = perianthium gamo- (mono-) phyllum, hexamerum; *Salvia*, corolla gamo- (mono-) petala, pentamera; *Rosa*, corolla pentapetala, &c.

The coherence occurs here in the same manner as in the stem-leaves, but on account of the crowded position in the flower-bud, much more frequently. It happens either that a single foliar organ grows together by its edges into a tubular or cup-like organ, as, for example, occurs frequently in the so-called monomerous floral envelope (Bracteole); or that several foliar organs grow together by their edges: this commonly affects all the edges of a circle of leaves, but sometimes two edges remain ununited, as with the calyx of *Gentiana lutea.* So, again, this process is usually simultaneous in development at all the edges of a circle; but it sometimes happens very much later—*a*, on two uppermost leaf-edges, whereby the single-lipped forms arise, as in the corolla of *Teucrium* and the flores ligulati of the *Compositæ;* or, *b*, with each pair of leaf-edges at the side of the leaf-circle, whereby the two-lipped forms (partes bilabiatæ) of descriptive botany arise. Another kind of blending also occurs in the flower, of which no example occurs in the stem-leaves, and only one in the bracts and bracteoles, namely, the cupula of the *Capuliferæ;* this is, the blending together of two or more circles, as in the two circles of the floral envelopes of many *Liliaceæ;* or in these and the two circles of stamens, in the circle of petals and stamens, in the *Labiatæ*, &c.; and in general in all flowers to which are ascribed stamina perianthio vel corollæ (not calyci) inserta.

The coherence of the stamens of one or more circles has been well termed, since Linnæus's time, fraternity (Adelphia); and, according to the number of brotherhoods in a flower, Monadelphia, Diadelphia, Polyadelphia. When the foliar organs of the flower are coherent, the blended part is termed the Tube (Tubus Perianthii, Calycis, Corollæ, &c.); the free parts, the Limb (Limbus); and the boundary of the two, the Throat (Faux). One of the most striking examples of coherence, which also has no analogue in the stem-leaves, is found in the blending of the foliar organs of the flower at the point only, the union never extending farther; so that the foliar organs are connected above, but free below, as in the corolla of the male flowers of *Chamædorea*, *Casuarina*, and in the androphore of *Symphyonema montanum* (?).

Abortion in the flower means that some part present in the rudimentary condition is arrested during the development and gradual perfecting of the flower, and thus at last retires from observation. There is no other kind of abortion. So soon as the individual parts of a flower become distinct members, the foliar organs appear arranged around an ideal and real axis of the flower (the axial organs of the flower), and in the rudimentary condition always regularly. Through subsequent unequal development of the single parts, the flower frequently becomes unsymmetrical, or, as it is called, irregular. This irregularity is always such that the upper part of a flower becomes developed differently from the under. Such irregularity very seldom affects the germen, which almost universally remains regular even in unsymmetrical flowers; yet there are cases in which this is the only symmetrical part, as in many of the *Scrophularaceæ*, *Acanthaceæ*, and *Cryptocoryne spiralis.* If the unsymmetrical flower, with or without coherence of its parts, is divided into two halves, an upper and under, developed in different ways, they are generally termed bilabiate; but if only one single foliar organ is developed in an aberrant form, that leaf acquires the name of Labellum, or Lip. Rare indeed are the cases where the entire flower is unsymmetrical, as in *Goodyera discolor.*

It is not possible to state in general terms the number of parts which may unite to form a flower. We find of foliar organs alone sometimes as many as fifty or sixty united in one flower. Certain combinations, on the contrary, are rarely met with: no monomerous flower possesses double floral envelopes. When the various parts of the flower are present in large numbers, these arise universally in one or more circles (Whorls) at the same height on the axis, and at the same time. When circles containing members of equal number follow in succession, the members of the one circle usually stand opposite the interspaces between the members of the preceding circle (the circles and their members alternating); they seldom stand precisely before them (the circles and their members opposite). But it by no means is to be assumed that the members of each circle are always of equal number in a flower. The number of members often increases up to the stamens, and thence diminishes; it is rare for the circle of the carpel to contain the greatest number, as in the *Malopeæ* and *Malvaceæ.* The generality of monocotyledonous plants with perfect individual flowers have regular homomerous circles through the entire flower: in dicotyledonous plants this is relatively rarer; the outermost and innermost circles have usually fewer members. Again, respecting the number of circles which follow one another, no general statement of importance can be given. Seven different forms of foliar organs may possibly exist in the same flower, namely, the epicalyx, calyx, corolla, accessory corolla, the stamens, accessory stamens, and the carpels; but there is no flower in which all occur in conjunction. All these foliar organs may be present in one or more circles, with the exception of the epicalyx, in which there is no example of a double circle. Perianth, calyx, corolla, accessory corolla, and carpels occur in one, or more rarely in two circles. Stamens may be present in one, two, three, or possibly even four circles; more circles than this are not exhibited in the normal condition of the flower. If the number is increased, which seldom happens except in stamens and carpels, as in *Ranunculaceæ* and *Dryadaceæ*, the *Magnoliaceæ*, &c., they stand no longer in circles but in a spiral. In monocotyledonous plants with perfect individualised flowers, with the single exception of some *Scitaminaceæ*, five trimerous circles of foliar organs of the flower appear to be formed in those where a second circle of petals exists. The greatest multiplicity of forms occurs in the dicotyledonous plants. *Lavatera*, for example, has an epicalyx, calyx, corolla, stamens, and carpels in five circles, with increasing numbers of members; those of the calyx and corolla alone are equal. *Gnidia virescens* has perianth, stamens, accessory stamens, and carpels, but in eight circles, which are throughout composed of two members each. It is by no means necessary that all the parts of a circle of floral foliar organs should be ultimately developed in the same manner; and many floral structures which have hitherto been apparently inexplicable, may probably, by keeping this truth in mind and following out the history of the development, be readily traced back to the original type.

The duration of the individual parts of the flower is very various; the axial organs, so far as they support the rudiment of the fruit or aid in its formation, persist naturally at least until the ripening of the seed, then fall away with it; or if it becomes disengaged from them, die away with the remainder of the plant. When axes bear only male organs, or flowers, their duration is different; sometimes they are cast off at a true articulation, sometimes they remain upon the parent plant, and gradually die away. The foliar organs of the flower are equally various in their duration. Perianth, corolla, and accessory corolla commonly perish soon after the perfecting of the flower; either they are cast off by true disarticulation, or they wither upon the parent plant. The epicalyx and the calyx frequently share the fate of the axial-organs supporting the rudiments of the fruit; the carpels almost invariably. The carpels are rarely destroyed before the perfecting of the seed, as in *Leontice*, and according to Robert Brown in *Peliosanthes Theta.* The stamens die away almost immediately after the dispersion of the pollen; either they are cast off, or they dry up and die away within the flower.

The terminology in use is as follows:—Those parts which fall away immediately, when their perfect formation is but scarcely completed, are termed caducous or fugacious (partes caducæ); those which endure somewhat longer are termed, if they are cast off by disarticulation, deciduous (partes deciduæ); if they retain their position, and die by gradual withering and drying up, marcescent (partes marcescentes); those parts which remain long, still vegetating, are termed persistent (partes persistentes); if they change their forms by further growth they are termed excrescent (partes excrescentes).

As among the floral envelopes are usually reckoned the perianth, the calyx, and the corolla, we may also include here the epicalyx. Under the term perianth, in its narrowest sense, only those foliar organs fall which, at least two in number, are applied closely to the flower and upon one level; so that all individual foliar organs on the axis of the flower, which only inclose stamens or germens, may be termed bracts. All these bracts have this in common, that they are merely foliar organs peculiarly modified; and consequently all the peculiarities of form which occur in the latter naturally appear in the former also. It is not often that the leaves of the floral envelopes have great thickness; they are almost always more or less flat. But the forms analogous to the pitchers or pouches are here frequent, much more so than is the case with the stem-leaves; and these are termed, according to their various resemblances to objects, cup-shaped, as in the lower petal of *Polygala;* hood-like as in the upper leaf of the perianth of *Aconitum;* and so on. If a long sac-like appendage is formed at the basis of a perianthial leaf expanded above, it is called a spur (calcar), as in

Orchis, Delphinium, Fumaria, &c. The formation of the spur is frequently conjoined with the formation of a symmetrical flower, where one upper or lower foliar organ forms a spur. The flattened expanded form, which is connected with the axis by a linear prolongation, frequently occurs in the sepals (?). This expanded surface is termed the limb or blade of the leaf (lamina); the narrowed base is not termed petiole but claw (unguis). True articulation is frequent between the floral envelopes and the axis, but it never occurs in the continuity of these leaves (?); thererefore there are no true compound perianthial leaves, though a simply divided limb is frequent, as the petala palmatifida in *Reseda*, the petala pinnatifida in *Schizopetalum*, &c. An indication of true articulation may probably be afforded in the separation of the upper part of the tube of the flower in *Mirabilis*, of the calyx of the *Datura* from the lower, and in some similar cases.

True stipules are not met with in the floral envelopes, but appendages analogous to the ligula appear, to which indeed a part of the structure described as the corona belongs. As in the *Narcissus* and the *Lychnis*, the scales of the throat of the *Boraginaceæ* also belong here. These parts are formed in very various fashions on the floral envelopes, and such appendages are sometimes exhibited standing upon the surface of the foliar organ, in three or more rows, one above another. Almost all parts recognised as corona and accessory corolla (paracorolla) belong here, in particular a part of those elegant forms exhibited in the *Stapeliaceæ* and the *Passifloraceæ;* so also does a portion of the so-termed nectaria, as, for example, in the petals of *Ranunculus*. All these are mere dependent appendages of the foliar organs, which are developed originally simple and flat, all these parts being produced from them subsequently. Here also occurs the one-sided development of a foliar organ; this is seen frequently in the petals of the *Apocynaceæ* (*Vinca, Nerium*, and *Cerbera*)

The collective form of one or more circles, whether coherent with each other or not, is more accurately designated according to further peculiarities, as tubular (tubulosum), bell-shaped (campanulatum), funnel-shaped (infundibuliforme), salver-shaped (hypocrateriforme), rotate (rotatum), &c.

Five kinds of floral envelopes are easy to be distinguished. When all the foliar organs are similarly or nearly similarly developed in a circle of one evident form, colour, and structure, they are described under the general name of perianth, the single organs of which are called perianthial leaves. If in the floral envelopes of one flower we can distinguish two circles differing in form, colour, and structure, the outer is named the calyx, its component organs being sepals; while the inner is termed the corolla, its single parts petals. Then if three circles of forms are distinguishable the outermost is called the epicalyx, the leaves of which may be denominated phylla. When between the simple or manifold floral envelopes and the stamens other independent foliar organs occur which exhibit a structure very imperfect and abnormal compared with the true envelopes, these are called a paracorolla, of which it will be necessary to speak further on, among the accessory parts of the flower.

The Perianth consists, according to the preceding considerations, of one or more circles of leaves, which are developed so as to be similar in colour, form, and structure. The following series of its forms may be more minutely characterised:—

The individual foliar organs are always expanded in a flattened form, seldom divided into limb and claw, and, at least when they are not coherent, usually oval or lanceolate. They may be green, as in the male flower of *Urticaceæ*, or of various colours, as in *Thymeliaceæ;* they may be firm and solid, and that especially when green, as in *Elæagnaceæ:* or of delicate texture, as in *Aristolochiaceæ;* or they may be developed as delicate sapless scales (paleæ), or bristles and hair, as in the *Typhaceæ* and *Cyperaceæ*. The perianth is almost universally regular, rarely (in some *Ranunculaceæ* and *Orchidaceæ*) symmetrical; in these cases never (?) 2-lipped, but often with one lip, as in the *Orchidaceæ*. This is then not unfrequently developed, hollow (cucullatum in *Aconitum*, calcaratum in *Orchidaceæ*), and it is commonly the uppermost leaf of the perianth. Its foliaceous portions may be free, as in *Juncaceæ;* or coherent, as in *Funkia, Hemerocallis*, &c.: they may consist of one circle, as in *Urticaceæ;* or of more, as in *Liliaceæ*. The parts are frequently blended with the stamens: in the coherent perianth the tube is sometimes straight, as in *Narcissus;* sometimes curved, as in *Aristolochia*. The mouth is mostly naked: sometimes, but seldom, as is the case in *Narcissus*, furnished with appendages which form a corona, which however are rare in the perianth, and in free foliar organs only (?) occur on the lip: the inner circle often has a beard.

The structure of Perianthial Leaves, is, on the whole, that of very simple leaves, which exhibit no special peculiarities, particularly if they are green. The ramifications of the vascular bundles are therefore simple; the separation into an upper and under parenchyma layer is seldom exhibited; but the epidermis usually. In the coloured and delicate parts the cells of the parenchyma contain colouring matter. In general the parenchyma is very loose and almost spongy, with homogeneous transparent fluid contents, and large intercellular cavities filled with air; hence the white colour. The epidermis is less developed in coloured leaves, and more resembles the structure of epithelium; stomates are sometimes present, especially upon the under surface, but the epidermal cells of the upper surface are often raised in shorter or longer papillæ, which give the upper surface a peculiar velvet-like appearance. It is very frequent here to find the secreted layer of the epidermis (cuticle) regularly and delicately striated (aciculatus), which certainly contributes to heighten the brilliancy of the colour, and perhaps, by its effect upon the rays of light, to the production and modification of the peculiar tints.

Occasionally, especially at the base of hollow parts, no epidermis is produced at certain points, and the parenchyma assumes a peculiar structure, to perform the function of secretion of a juice containing much sugar; as, for instance, the nectary at the base of the perianthial leaves of *Fritillaria*, very various parts on the labellum of the *Orchidaceæ*, &c. In rare cases the texture is hard and almost woody from the interspersion of many thickened porous parenchymatous cells, as in the species of *Banksia* and *Dryandra* (?). In paleaceous perianths the spiral and other vessels are not found in the usually simple vascular bundles, and in hair-like perianths even the vascular bundles themselves are wanting.

The Calyx only exists when a corolla occurs with it; it therefore can never be confounded with it. It is always the external of two dissimilar sets of envelopes. Its series of forms very much resembles those of the perianth; perhaps it is not so frequently delicate in structure and colour, as in the *Scitaminaceæ, Musaceæ, Butomaceæ, Ranunculus, Tropæolum*, &c. Usually it consists of one circle of sepals, more rarely of two (as in the *Berberidaceæ*). These sepals are always very simple, oval, or lanceolate, seldom pinnatifid, very frequently broad at the base and tapering to a point, or very small (dentes calycis obsoleti); sometimes they appear only as dry scales, or as tufts of hair (the pappus of the *Compositæ*). Appendages seldom occur upon the sepals, but they are frequently of hollow or concave form. The number of the sepals in each circle is in Monocotyledons, frequently three, more rarely four or two; in the Dicotyledons it is most frequently five, but also two, three, or four, and perhaps sometimes more. Coherence of the sepals with one another may occur in every way, but never with the corolla and stamens nor with the germens; that which is so called being quite another condition. Both in free and in coherent sepals, regularity and symmetry are met with; the latter often exhibit the bilabiate structures.

That which has been said of the structure of the perianth applies also to the calyx, only that here green foliaceous sepals are the more frequent.

The corolla, which only exists as the inner set of floral envelopes accompanying a calyx, may be compared to a very delicate and coloured perianth. No true corolla occurs perfectly green and resembling the leaves; its series of forms is greater than that of any other of the floral envelopes. In the Monocotyledons it presents in general only simple, round, oval, or lanceolate leaves, very seldom having claws. In the Dicotyledons the forms are infinite, as are also the variety and splendour of the colour. The following are the main points in the structure of this organ:—

The individual petal exhibits, on a reduced scale and in a delicate condition, almost every variety of form of the leaf, with the exception of the truly compound. Concave forms are here frequent, such as the hood-shaped, pitcher-shaped, or spurred petals, &c.; these latter very often on individual petals of an otherwise regular corolla, as in *Fumaria*. Fringed and feathered forms, as well as variously lobed petals, are also by no means rare. The limb and the claw are often clearly to be distinguished. Parts analogous to the ligule, and every imaginable form of appendage, with the exception only of the stipules, occur frequently, and characterise genera and families.

On this account it is indispensable to distinguish the simple appendages of the petals from the independent foliar organs. To the former belong the scales (fornices) of the *Boraginaceæ*, the scales of the corona of the *Silenaceæ*, the formations generally described as coronæ in the *Stapeliaceæ* and some other *Asclepiadaceæ*, the nectaria of *Ranunculus*, *Parnassia*, &c.

The corolla consists of one circle, rarely of two (three series in *Berberis*), or more (four series in *Nymphæa*). In Monocotyledons the number of members is equal to those of the calyx; in Dicotyledons the number of five in a circle predominates, though it is sometimes composed of two, or four, or of a greater number in *Dryas*. The number of members is equal to that of the calyx, or greater; very rarely indeed it is smaller; this last case occurs with *Hibiscus*. Suppression is not infrequent, and sometimes involves all the foliar organs of a corolla at once, as in the summer flowers of many species of *Viola*, in *Lepidium ruderale*, and in some species of *Acer*. The coherence of organs in every way is still more frequent; never indeed with the calyx or the germens, but frequently with the stamens.

The corolla, whether with free or with coherent petals, may be regular or only symmetrical. In the latter the bilabiate formation is the most frequent, especially in five-membered circles, in such a way that, according as the odd petal is on the upper or the under side of the flower, the upper lip consists of three or of two petals. In the latter case these two are very often little or not at all coherent, as in *Teucrium*, the so-called radiated flowers of the *Compositæ* (floribus ligulatis vel radiatis). Peculiar forms of symmetrical flowers are, for instance—the personate flowers (corolla personata), in which the upper petals of a coherent corolla are so curved inward that they close the entrance of the tube (as in *Antirrhinum*), the incurved portion is termed the palate (palatum); the true bilabiate or mouth-like corolla (corolla ringens), in the *Labiatæ*, in which the two petals forming the upper lip often present a concave form overhanging the lower lip, termed galea; the so-called papilionaceous flowers of the *Leguminosæ*, in which the uppermost leaf, which is broad and large, surpassing the others, is termed the standard (vexillum), whilst the lateral petals, as wings (alæ), are usually dissimilarly developed, and the two undermost, very frequently coherent, also developed unequally at the two sides, approach each other in a concave form, so as to form the keel (carina). Sometimes all the petals of the papilionaceous flowers become coherent at the lower part, and form a tube, as in *Trifolium*; or individual petals are abortive, &c. The most irregular of all the forms have hitherto received no names; such as appear for instance in the *Polygalaceæ*, the *Balsaminaceæ*, *Tropæolaceæ*, &c.

All that was said respecting the structure of the perianth holds also for the structure of the corolla, remembering only that this is more delicate. The contents of the cells vary much in colouring matter, and their distribution in groups is sometimes very remarkable. Very dense texture, in consequence of the presence of much-thickened porous cells, as in the *Amarantaceæ*, is infrequent. The structure of the epidermis, and its development into papillæ, hairs, &c. is very manifold. Development into surfaces secreting nectar, both at the bottom of concave forms and upon the appendages, is especially common. The petals also occasionally secrete a viscous substance, in consequence of which they adhere together, as happens at the points of the inner petals of the *Fumariaceæ*.

The Epicalyx is seen where three separate series of foliar organs are distinguishable in the floral envelopes, and it is the outermost of these. There are not many plants which exhibit an epicalyx. In form and structure it much resembles the calyx. It occurs with free leaves (as in *Passiflora*), and coherent leaves (as in *Lavatera*). Its leaves are seldom delicate, such as are seen in the corolla, but are often dry and membranous (as in *Scabiosa*), but generally green and leafy (as in the *Malvaceæ*).

For an account of the other organs of the flower, see Stamens; Fruit, *S.* 2; Stigma; Seed. For the functions of the flower, see Reproduction in Plants and Animals, *S.* 2.

(Schleiden, *Principles of Scientific Botany*.)

FOOD. The materials taken into the system of organised beings, and by which their functions are maintained, and out of which their bodies are formed, are called Food. Food in its widest sense is the raw material out of which plants and animals are manufactured. We shall confine ourselves here to the consideration of the food of animals, and of man in particular.

The great cause of the necessity of a constant supply of new matter or food to the body is the waste of the materials of which the blood and organs are composed, during the performance of their functions. The result of this waste is seen in the form of the various excretions which are thrown off from the body by the skin, liver, kidneys, and bowels. We shall find, then, that the food, the blood, and the excretions, represent each other, that they contain substances of the same nature, and are all composed of the same ultimate elements.

If we take a portion of human flesh or blood, and seek for its ultimate elements, we shall find that, on accurate analysis, they will yield the following elements:—

Carbon.
Hydrogen.
Nitrogen.
Oxygen.
Sulphur.
Phosphorus.
Potassium.
Sodium.
Calcium.
Magnesium.
Iron.
Manganese.
Aluminum.
Copper.
Chlorine.
Fluorine.
Silicon.

Few or none of these elements occur in the human body in their pure form, but are combined variously with one another, forming compounds having very different physical properties and chemical relations. These elements may be divided, for physiological purposes, into two classes; the first four, carbon, hydrogen, oxygen, and nitrogen, being called Organic, whilst the remainder are called Inorganic elements. The first are called organic elements because they are found universally present in plants and animals, and because no animal cell and no vegetable cell can grow unless the whole of these elements exist. Hence, as they lie at the foundation of all organic existence, they are properly designated by this term.

The inorganic elements, though very generally present in large classes of animals and plants, are not universal. Man requires phosphorus and calcium in the form of phosphate of lime for his bones; but many of the lower animals contain no phosphate of lime. Sea-animals and plants will not live without chlorine and sodium in the form of common salt; but fresh-water plants, and plants away from the sea-shore, do not require this constituent. The term inorganic, then, is applied to these elements to express their different relation to plants and animals, and will also point out their frequent occurrence in the mineral world. The elements of man's body however are all derived from the mineral world, and are identical with the same bodies in inorganic substances. The carbon found in the human body is identical with that which forms, in its pure state, the diamond—which enters into the composition of graphite and various kinds of coal, and is found in limestone and chalk, forming a part of the carbonic acid of the carbonate of lime, of which these rocks are composed. The hydrogen of the human body is the same as the gas which, united with oxygen, forms water, and when combined with nitrogen produces ammonia. The oxygen of the animal is identical with the gas which, with nitrogen, forms a fifth part of the atmosphere, and which, combined with the metals, forms oxides, of which the greater portion of the earth's surface is composed. The nitrogen of the organic world is identical with that which constitutes so large a portion of the atmosphere. Nor are these elements alone identical in and out of the human body; but we find that they possess the same chemical properties, and that their agency in the human body depends on these properties. Thus, carbon and hydrogen are inflammable bodies, and have a great affinity for oxygen, with which they unite, forming carbonic acid and water, giving out heat during the process of union. This very process goes on in the animal body, and constitutes one of the most important functions of the body. The characteristic features of the functions and properties of animal and vegetable bodies depend on the chemical relations of the four organic elements.

These elements never enter the system in their pure form. Carbon, however needed in the animal frame, cannot be appropriated pure; and a man would starve with the Koh-i-Noor diamond in his mouth, were he not allowed to exchange it for more digestible forms of carbon. The gases hydrogen, oxygen, and nitrogen, would, any one of them in their pure state, destroy human life; and even when the two last are mixed with the atmosphere, they will not support life in that form. Again, we may mix them in various ways, and not be more successful. Carbon combines with oxygen to form carbonic acid, and hydrogen combines with nitrogen to form ammonia, and these two compounds unite together to form common smelling-salts, or carbonate of ammonia. But smelling-salts, though they contain all the organic elements, will not serve for human food. Nevertheless what is not food for man is nutriment for plants. Carbonic acid and ammonia supply plants with materials of growth. It is from these two bodies that the vegetable kingdom elaborates all the secretions which give to plants elegance of form, beauty of colour, deliciousness of scent, deadliness as poisons, and nutritiousness as food. The plant stands between the mineral and animal kingdoms, preparing the former for the service of the latter. Without plants there could be no animals. In the whole range of natural history we are presented with no instance of an animal existing directly on mineral matter. It is true that many animals are carnivorous, and live on the flesh of lower animals. The lion and the tiger prey upon the deer and the antelope; but if we go one step further we still arrive at the vegetable kingdom as the source of animal nutrition. The deer and the antelope are herbivorous creatures, and the flesh of their body is formed directly from the plants they eat. So with the animals eaten by man; they are all grain or herb-eating animals, and supply to man the materials they have obtained from the vegetable kingdom. At the same time the best standard we can take of food is milk, which is derived from the animal. When human milk is examined, it gives the following results in every 1000 parts:—

Water	870
Butter	52
Sugar	63
Casein	10
Salts	5
	——1000

These five constituents of milk may be regarded as typical of all kinds of food, whether obtained from the animal or vegetable kingdom. Hence we may class alimentary substances according as they are represented by one or other of these constituents of milk.

1. *Aqueous.* Water is required not only as the medium of conveying the other substances into the body, but it forms a prominent constituent of the body itself. Blood contains 790 parts of water to 210 parts of solid matter in every 1000. Muscles contain 770 parts of water to 230 parts of solid ingredients. The brain and nerves contain about 800 parts of water in 1000. If food does not contain water naturally, it is taken into the system in the form of tea, coffee, beer, and also in its pure state. The quantity of water taken with the food should be about in the proportion of four to one, as we find it in milk. We cannot however judge of the quantity contained in solid food till we know its composition. Thus many substances which appear solid contain large quantities of water. In potatoes, for instance, there are 75 parts of water in every 100.

2. *Oleaginous.* The butter of the milk represents oily and fatty matters in general, which seem to enter into the composition of all healthy food. They are taken by the inhabitants of tropical countries in the seed of the cocoa-nut, as well as by those of the polar regions from the fat of the seal and many kinds of fish. They are obtained from both the animal and vegetable kingdoms, being known by the name of suets, fats, and lards, from the former source, and oils and butter from the latter.

3. *Saccharine.* The sugar of the milk represents several substances obtained from plants and used as food. Sugar itself varies in its composition according to its sources; hence we have cane-sugar, grape-sugar, maple-sugar, &c. Sugar has also a composition nearly approaching that of starch, and this substance is very generally found in the vegetable diet of man; pure in the form of arrow-root, tapioca, and sago; combined in the flour of wheat and other cereal grasses. Of all the animal products used as food, sugar is found alone in milk.

4. *Proteinaceous.* The casein of the milk, which, when separated, is known by the name of cheese, has in common with two other vegetable and animal substances, called fibrine and albumen, a principle for their basis named Protein. These substances form the chief part of the fabric of the body, and in their capacity of food perform a very different function in the body to the butter and sugar before mentioned.

5. *Inorganic.* The salts of milk are the saline substances which, entering into the composition of various parts of the human body, are necessary to its integrity and health. The importance of the presence of these substances is frequently overlooked in food, and many diseases of the human frame arise from their absence. They are conveyed into the system in both animal and vegetable food; but in common salt we have an instance of a substance belonging to this class taken directly from the mineral kingdom as food without the intervention of an organic body.

In addition to these forms of dietetic substances found in milk, the food of the adult human being constantly contains certain principles which do not appear to be represented in the milk. Thus, the substances called condiments, as the various spices, contain volatile oils, which, although not essential to the diet of man, seem to exert a very beneficial influence when taken into the system. In tea and coffee there is a principle called theine, which seems to be the active ingredient of these substances. In the fruit of plants also, we have acids, as the citric, tartaric, malic, and oxalic acids, which seem to act very beneficially in certain states of the system. As these substances seem to act medicinally rather than dietetically, they may be properly called, as a class, the medicinal constituents of food. The following classification will give an idea of the kinds of food:—

Class I. *Alimentary Substances.*

Group A. *Aqueous*, containing water as a principal ingredient. Examples:—Tea, coffee, beer, wine.

Group B. *Carbonaceous*, containing carbon as a distinguishing ingredient.
1. *Saccharine.* Examples:—Sugar, starch, cellulose.
2. *Oleaginous.* Examples:—Oil, butter, fat.

Group C. *Nitrogenous*, containing nitrogen as a distinguishing feature.
1. *Vegetable.* Examples:—Flour, oatmeal, maize.
2. *Animal.* Examples:—Butcher's meat, cheese.

Group D. *Inorganic.*
1. From organic sources. Examples:—Potash in fresh vegetables, phosphate of lime in flour and flesh.
2. From the mineral kingdom. Example:—Common salt.

Class II. *Medicinal Substances.*

Group A. *Acids.* Examples:—Citric acid in oranges, tartaric acid in grapes, oxalic acid in rhubarb-leaves.

Group B. *Volatile Oils.* Examples:—Mustard, pepper, nutmeg, cloves.

Group C. *Alkaloids.* Examples:—Theine in tea and coffee, theobromine in chocolate.

We shall here make a few general remarks on the nature of the substances in the groups indicated, referring for special information on the plants and animals yielding food to the various articles devoted to these subjects throughout the 'Penny Cyclopædia,' and its Supplements.

Under the head of WATER will be found an account of Water and the substances it usually holds in solution. In taking it as an article of diet, the following general remarks should be borne in mind:—

First, It may be taken in too large quantities to be carried off by the other emunctories, and then it remains in the system to impoverish the blood, and to reduce the amount of solid matter that is necessary for the performance of the functions of the tissues of the body. This is one of the results that take place from what is called the 'water cure.' Unless persons have sufficient vigour to take the exercise necessary to throw off by the skin the water that is taken into the stomach, serious ill effects must necessarily arise. The good that is effected by this system of the treatment of disease must be attributed more to the exercise it renders necessary than to the unnatural quantities of water taken into the system.

Secondly, Water may not be taken in sufficient quantities to carry on the healthy functions of the system. If the food is taken too dry, it is only imperfectly digested, and many important constituents, such as the salts, are not taken into the body in sufficient quantity. A deficient quantity of water in the blood will also prevent the healthy process of nutrition, and wasting and degeneration of the solid parts of the body will occur. It would be difficult, perhaps, to lay down any law with regard to the quantity of water individuals should take, and perhaps it is safer to rely on the instincts of the body, which seem to point out how much we ought to take by the feeling of satiety that comes on after enough has been taken. We may, however, get at something like an approximation of the proportion of solids and fluids required by the system in food, by examining the composition of milk, in which we find the proportion of water to solid parts is as 870 to 130 in 1000 parts, or as about seven to one.

Thirdly, The good effects of water may be destroyed by the substances with which it is taken. Although the stomach has the power of separating water from the food in which it exists, it yet often happens that the fluid articles of diet are injurious. Water itself may contain so large a quantity of saline matters, or of organic matters in a state of decomposition, as to cause serious disease. The taking habitually water in the form of fermented liquors, as beer and wine, as also the admixture of distilled spirits, may cause irritation and congestion of the mucous membranes, and derangement of the nervous system.

We now proceed to speak of the Carbonaceous Group. This class of substances is sometimes called Respiratory and Combustible. They are called respiratory, because it is through the function of respiration that they become useful in the system. They are called combustible, because it is through the process of combustion that their effects upon the system are developed. This class of food does not, in fact, contribute directly to the nutrition of the body, but they are consumed in maintaining the animal heat. The temperature of the human body is always a fixed one; and if we place a thermometer upon the tongue, or under the arm, or in any other unexposed part of the body, we shall find that it stands at the point in the index of Fahrenheit's thermometer marked 98°. This heat the human body maintains equally at the poles and under the tropics. No external temperature alters it, and we have thus conclusive evidence that it is produced from within. The cause of this heat is the combustion of the carbon and hydrogen contained in the carbonaceous group of foods. Starch, sugar, and oil are conveyed from the stomach into the blood, and whilst in the blood they are brought in contact with oxygen gas which is taken in during respiration, and the consequence of this contact is the union of the carbon and the hydrogen with the oxygen, the formation of carbonic acid gas and water, and the giving out of heat.

The human body is preserved at the same temperature by the regulating action of the skin. When large quantities of heat are generated in the body, by exercise or other causes, then the extra heat is carried off by the perspiration from the skin; but when the body is exposed to a low temperature, and its heat is rapidly conducted away by surrounding cold, the heat is maintained by increased supplies of food belonging to the carbonaceous group. The animal heat of the lower animals varies according to the circumstances of the creature. Those performing great muscular exertions, and living in cold climates, have a higher temperature than man; whilst those which are not active in their habits, and live in hot climates, have a temperature lower than that of man.

The substances belonging to this group which enter into the food of man are cellulose, starch, sugar, and oil.

Cellulose forming the external membrane of the cells of all plants is found in all food derived from the vegetable kingdom. It has a composition almost identical with starch, but differs in being insoluble and indiffusible in water. There can be little doubt, however, that it is taken up extensively into the system in the food of the lower animals, especially of the *Herbivora*. When cells are very thick with cellulose they are indigestible, and this will account for many articles of food as carrots, turnips, radishes, uncooked vegetables, &c., not being readily digested. Cellulose is converted into starch by the addition of sulphuric acid, and it is not improbable that some change of this sort may take place when it is taken into the stomach. It is however seldom taken by human beings alone, although recommended by no less an authority than Benjamin Franklin, who showed by example that saw-dust puddings might be used as an article of diet.

Starch enters very largely into the diet of man, and of the lower animals. It is distinguished from cellulose by its ready diffusibility in water. On this account it appears to be much more readily absorbed from the stomach or converted into the forms in which food is taken up into the system. Its property of uniting with water and forming with it at a high temperature a gelatinous mass, explains the change which takes place in boiling the flour of the grains in which it is contained.

Starch is found in some plants in greater quantities than in others; it is however very generally found in perennial roots and rootstocks, in the stems and in the seeds of plants. There are few or no vegetables or parts of plants that are eaten that do not contain starch. It is found in turnips, carrots, potatoes, cabbages, parsnips, beans, peas, wheat, barley, oats, and the rest of the *Cerealia*; in chestnuts, walnuts, hazel-nuts, and all other seeds; in the apple, the pear, the plum, and cherry, and all other fruits. In many of these things however it is not the distinguishing alimentary ingredient, but it is often separated, and is used pure as an article of diet. The substances in which it occurs pure are arrow-root, sago, and tapioca.

What is sold under the name of arrow-root in the shops, is a form of starch procured from the rootstocks of various species of plants belonging to the family *Marantaceæ*. There are three kinds of arrow-root known in the shops, the West Indian and the East Indian arrow-roots, and Tous les Mois.

Although there is much difference in the price of arrow-root, its composition is always the same. Even the substances used to adulterate arrow-root, as potato and sago starch, are of the same composition; and though the appearance and flavour of the arrow-root may be impaired, its ultimate dietetical action is the same.

Although arrow-root, sago, tapioca, and potato starch, are all composed of the same constituent, their flavour is very different; hence the preference given to arrow-root as an article of diet. This flavour depends on some peculiar principle which is produced in the plant from which the starch is obtained, and by very careful preparing can be entirely got rid of. Arrow-root is used for making cakes, puddings, and a thick gelatinous fluid in great request in the sick room. It is a property of starch to combine with water at a temperature of 180°, and form a gelatinous compound. This property of starch renders it very useful in cookery, and seems to increase the digestibility of the starch itself.

Arrow-root is frequently regarded as nutritious; but it will be seen that it is not nutritious in the proper sense of that word. Those foods can alone be called nutritious that contribute to the building up of the fabric of the body by adding those materials to the tissues which are being constantly removed by the wear of the body. Now, starch does not perform this function, and is entirely consumed in the body in maintaining its animal heat. Arrow-root however and the other forms of starch, are frequently mixed with nutritious matters, such as milk and bread; and in this way the food into which they enter becomes nutritious.

Another form of starch is Sago. It is starch obtained from the inside of the trunks of palms, and other trees. Many plants yield starch in their stems, which, on being prepared, is called sago by Europeans. The sago which is sold in the shops of England is principally imported from the islands of the Indian Archipelago, and is the produce of a palm called the true Sago-Palm, or *Sagus lævis*. There is however another palm belonging to the same genus, the *S. Rumphii* (the Prickly Sago-Palm), which yields the sago that is consumed by the natives of India.

Sago is not generally so carefully prepared as arrow-root, and it is a much cheaper article of diet. Its ultimate action is perfectly the same as arrow-root. It is now often employed by starch-makers to procure the finer kinds of starch used by manufacturers. When thus prepared, it is used to adulterate arrow-root.

Tapioca is another form of starch. It is brought to Europe from South America, and is the produce of a plant known to botanists by the name of *Janipha Manihot*. It is a poisonous plant, and the Indians in the countries where it grows extract a poison from it, which they use to poison their arrows, before they obtain the starch. Cassava, which is eaten by the natives, is procured from the same plant, but is prepared in a different way from tapioca. The starch of tapioca does not differ in chemical composition from that of sago and arrow-root, and it is used in the same way, and for the same purposes.

There are many other well-known plants which owe their dietetical properties to the starch they contain; amongst these we may mention the potato, the carrot, the turnip, the parsnip, the cabbage, the Jerusalem artichoke. From any of these starch might be prepared. The roots of *Arum maculatum*, though acrid, contain much starch. When cooked, the acridity of the plant is got rid of, and they are eaten with impunity. These roots are employed in making the substance called Portland sago, which is the starch separated from the rest of the matter of the plant. This sago is used for the same purposes as the other kinds of sago.

The roots of *Orchis mascula*, which is a common plant of our meadows, form the substance called salep. When it is boiled, it forms an agreeable article of diet, which, before the introduction of tea and coffee, was very generally used in this country. It is now almost entirely disused in Great Britain.

Starch differs in some of its chemical and physical properties according to the plants whence it is obtained. In this way chemists have distinguished several kinds of starch. Inuline is a form of starch obtained from the *Inula Helenium*, a plant not uncommon in our own fields. Lichen-starch is another form, which is found in almost all kinds of *Algæ* as well as Lichens. This starch has the same power of thickening water at a high temperature as arrow-root and tapioca; and hence, when any of these plants are boiled in water, they form a thick mucilaginous decoction. The thickness of the fluid thus obtained, under the erroneous notion of its being nutritious, has led to the use of many species of sea-weeds and lichens as articles of diet.

One of the plants of this kind, which has been used most extensively and is still largely employed, is the Iceland-Moss (*Cetraria Islandica*). It belongs to the family of Lichens, and is a native of the northern parts of the world. This and other lichens probably contain other dietetical secretions besides starch, as we find they are capable of supporting animal life. The Rein-Deer-Moss (*Cenomyce rangiferina*) is an instance of this. In the northern parts of the world as well as in mountainous districts this lichen grows in great abundance, and during the winter season is the principal support of the rein-deer. In spite of the extreme cold to which it is subjected, this plant grows with vigour, and the rein-deer, in order to obtain it as food, is obliged to remove with its nose the snow with which it is sometimes covered for many feet. The Cup-Moss (*Cenomyce pyxidata*) of our own moors belongs to the same genus as the rein-deer-moss, and is also used as an article of diet in the same way as the Iceland-moss. The Tripe de Roche is another of these lichens which has been used as an article of diet. It has a melancholy interest attached to it, as it has so often formed the chief article of diet of our arctic navigators. Two species of lichens, the *Gyrophora proboscidea* and *G. erosa*, afford the Tripe de Roche. Although they are said to be nutritious, they are described as having bitter, nauseous, and purgative properties.

Amongst the sea-weeds which have been used as articles of diet none is better known than the *Chondrus crispus*, which under the name of Carrageen-Moss, Irish Moss, and Pearl-Moss has been for a long time used in Europe. It grows on the rocky sea-shores of Europe; and when washed and dried, and then boiled with water, makes a mucilaginous decoction, which, like the same preparation of the Iceland-moss, has been recommended in consumption, coughs, diarrhœa, and other diseases. It has however no bitter principle, and is probably less tonic than the lichen. This and other sea-weeds have been occasionally had recourse to by the poor inhabitants of the sea-shores of Europe, more especially Ireland, when the ordinary corn or potato crop has failed. They contain however but little nutritious matter, and persons soon famish who live upon nothing else. There are certain forms of sea-weed which are often eaten as an addition to other kinds of food. There is in all of them a certain flavour of the sea, arising probably from the saline matter they contain, which renders them very objectionable to some persons as articles of food, and which will probably always form an objection to their general use. Of those which are eaten in various parts of England we may mention:—

1. Laver, Sloke, Slokam (*Porphyra laciniata*). It is on all our sea-shores; and when employed as food is salted and eaten with pepper, vinegar, and oil.

2. Green Laver, Green Sloke, Oyster-Green (*Ulva latissima*). The *Ulva* is not so good to eat as the *Porphyra*, and is only had recourse to when the latter is not abundant.

3. Tangle, Sea-Ware, Sea-Girdles, Sea-Wand, Red Ware (*Laminaria digitata*). It is cooked by boiling for a long time, and adding pepper, butter, and lemon-juice. Cattle are fed on it when young in some parts of the British Islands.

4. Badderlochs, Hen-Ware, Honey-Ware, Murlins (*Alaria esculenta*). The part of the plant which is eaten is the thick middle rib which runs through the frond. It is sometimes called the Eatable Fucus.

5. The Dulse of the south-west of England is the *Iridea edulis* of botanists. It is eaten by the fishermen of the south-west coasts of England, who before eating it pinch it between red-hot irons. In Scotland it is cooked in the frying-pan. It is said to resemble in its flavour roasted oysters.

6. Dulse of the Scotch, Dellisk, Dellish, Duileisg, Water-Leaf (*Rhodomenia palmata*). The Highlanders and the Irish, before the introduction of tobacco, were in the habit of drying this weed and using it as a masticatory. The Icelanders use it as an article of diet under the name of the Sugar-Fucus. In the islands of the Mediterranean Archipelago it is employed as an ingredient to flavour soups, ragouts, and other dishes.

Several other sea-weeds have been employed as food, but these are the principal that are at present used in this country. In China the people are very fond of sea-weeds, and many kinds are collected and added to soups, or are eaten alone with sauce. One of these, the *Plocaria tenax*, is sometimes brought to this country under the name of Chinese Moss. The decoction it makes is so thick that it is used as glue. The Corsican Moss, which has a reputation in medicine as well as a diet, is the *Plocaria Helminthocortos*, and is found on the coasts of the Mediterranean. Another sea-weed was recently imported into London under the name of Australian Moss; but although affording a very thick jelly, it tastes too strongly of the sea to be rendered pleasant by any kind of cooking.

The next dietetical substance of which we have to speak is Sugar. Sugar is distinguished readily from starch by many properties. Sugar is soluble in water, whilst starch is only diffusible through it. Sugar is susceptible of fermentation, and of being converted into alcohol, which starch is not. Sugar has a peculiar sweet taste, whilst starch is insipid. It is on account of the solubility of sugar that we never, or very seldom, find it in plants in a solid condition. It is always dissolved in the water naturally contained in the plants in which it exists. Sugar is not so frequent a product of vegetable change as starch; but is, nevertheless, very generally found during some period of the growth of the majority of plants.

Sugar, like starch, is not nutritious, but is taken into the system with the object of maintaining animal heat. Persons may even get fat on sugar, but the living tissues are not nourished by any of the carbonaceous productions of plants. It is true, that in countries where the sugar-cane is grown, slaves and their children, during the period of its gathering, partake of it in large quantities, and are nourished upon it; but the sap of the sugar-cane, and the cane itself, contain other alimentary principles besides sugar, which assist in the nutrition of the body.

Sugar, being readily soluble in water, is more digestible than starch. Of the substances which maintain animal heat, it is the most easily digested; and hence we may see a reason why it is supplied to the young of the higher forms of animals. For this purpose it is secreted, by the female of all the *Mammalia*, in the milk, which is furnished universally to their young during the first months of their existence. The instinctive love of sugar, so well known as a distinguishing character of the child, seems to point out its adaptation to the wants of the infant system. Readily digestible however as sugar is, it is one of those substances which speedily undergoes decomposition. When taken into the stomach and the system, its elements seem to enter into secondary combinations, which are very injurious. This is why so many persons find it necessary to limit the quantity of sugar which they take in their diet. The changes however which it so frequently undergoes in the adult system, do not appear to take place in children; hence the child may eat sugar with impunity, although its parents may not.

Although there are various kinds of sugar, having a different composition, they seem all to act dietetically in the same way upon the system. The most common form of sugar in plants, and that which is most frequently eaten in diet, is Cane-Sugar, so called from its being yielded by the sugar-cane. It consists of—

	Atoms.
Carbon	12
Hydrogen	9
Oxygen	9
Water	2

The other kinds of sugar which are eaten, are milk-sugar, $C_{24}H_{19}O_{19}+5HO$; and grape-sugar, $C_{12}H_{12}O_{12}+2HO$. It will be seen that cane-sugar resembles starch in its composition, and it is probably formed in the plant from that body. Although cane-sugar is found in the sugar-cane, the beet, and the maple, it is not so frequent in plants as grape-sugar, which is the form in which sugar is found in the fruits and other parts of plants which may be sweet.

The sources of sugar, as an article of diet, are of course very various; it is only separated however from a limited number of plants. Of these the principal is the Sugar-Cane (*Saccharum officinarum*).

The sugar eaten by the inhabitants of France is principally obtained from the Beet (*Beta vulgaris*). In tropical countries it is obtained from the juice of palms, as from the Jaggary Palm (*Caryota urens*), the Cocoa-Nut Palm (*Cocos nucifera*), and others. It exists in the stems of all grasses, and is prepared in America from Maize (*Zea Mays*). The Birch (*Betula alba*) in this country, and the Sugar-Maple in America (*Acer saccharinum*), also yield it in their sap.

Grape-sugar, also called Glucose, is found in the fruits of most plants. It seems to act on the system in precisely the same way as cane-sugar.

The result of the fermentation of grape-sugar is the production of Alcohol, which does not differ much in composition from sugar. The following is the decomposition:—

	C.	H.	O.
2 Atoms of Alcohol	8	12	4
4 Atoms of Carbonic Acid . . .	4	0	8
2 Atoms of Water	0	2	2
One Atom of Grape-Sugar . .	12	14	14

Alcohol is taken as an article of diet in the form of beers, wines, and spirits. Although resembling sugar in its composition, its effects on the system are very different. It acts on the nervous system as a stimulant and narcotic, and might perhaps be regarded as one of the medicinal forms of food. A question has arisen amongst physiologists as to the action of this substance on the system. Liebeg, and with him many others, maintain that, like starch and sugar and oil, the elements of the alcohol unite with oxygen in the system, and thus by combustion assist in maintaining animal heat. On the other hand Dr. Carpenter, and those who repudiate the use of alcohol in diet, maintain that it is not destroyed during respiration, and consequently does not promote animal heat any further than as it stimulates the heart's action.

Alcohol when taken as an article of diet not only acts upon the nervous system, but on account of its chemical action on albumen exerts an injurious influence when taken in large quantities upon the mucous membrane of the stomach. It is thus that when indulged in, it becomes a source of indigestion, and lays the foundation of serious diseases. Taken in small quantities in the form of wine or beer, it seems to exert a favourable influence on the digestive function, and to belong to that class of foods to which spices and condiments are referred. Taken medicinally it is often capable of exerting powerful effects, on account of its rousing action upon the vascular system. It does not seem to be necessary to health, as there are many nations that never use it, and individuals, in countries where it is habitually taken as an article of diet, find their health not materially injured by debarring themselves from its use.

The quantity of alcohol contained in fermented beverages varies very much.

With regard to wines, when the juice of the grape contains large quantities of sugar in comparison with the water, and the fermentation is complete, then the alcohol is abundant, and strong wines are produced; whilst, when the sugar is in small quantities, or the fermentation is incomplete, weak or thin wines are the result. Ports and sherries are strong wines, whilst those of the Rhine are generally weak.

Sweet wines are those in which all the sugar is not converted into alcohol. This is mostly the case with wines made from other fruits besides grapes. Hence the well-known sweetness of what are called British wines. This does not however arise from an imperfect fermentation, but from the acid contained in other fruits not being tartaric acid. One of the most remarkable properties of tartaric acid is that it forms an insoluble salt (the cream of tartar) with potash, which is generally found in fruits; and in wines made from the grape this salt falls to the bottom of the cask, forming the tartar or lees of the wine. But other acids, as citric, malic, and oxalic acids, are not thus precipitated from their solutions, and they remain in wines, giving them a very acid flavour, which would render them unpleasant, unless sugar was added to cover their acidity. Sweet wines are objectionable as articles of diet, on account of the sugar they contain, which, when held in solution in wine, seems more likely to decompose, and thus prove injurious to the system, than when taken in its pure form. In wines made from other fruits besides grapes, the acid is also liable to objection.

Effervescing wines are those which are bottled before the fermentation is complete, so that a large quantity of the carbonic acid, which would be otherwise got rid of, is retained in solution in the wine, and escapes when the bottle is uncorked. Such is champagne. Effervescing wines are more liable to disagree with delicate stomachs than others, on account of their imperfect fermentation rendering them liable to further change in the stomach; and this state of change is probably communicated to the substances used as food contained in the stomach.

The skins and stalks of the grapes, if not the juice, contain tannin. This substance is a powerful astringent, and its presence seems to be the cause of the astringent character of many red wines, as port, claret, and others. There is also a difference in the quantity of free tartaric acid contained in wines; and those which have the largest proportion of this constituent have an acid flavour. Some of the wines made from grapes are so sour as to be very unpalatable: this is more especially the case with the poorer white wines of the Rhine.

The quality in which wines differ from each other most is what is called their bouquet, or flavour. It differs in wines made from different kinds of grapes, and differs in the same grape in different districts and in different seasons. It is well known that the vintage of one year produces a better or worse wine than that of another, and this depends on the development of the peculiar flavour of the wine. Liebig says that the bouquet is dependent on an acid which he calls œnanthic, and which, combining with the alcohol, forms an ether which gives the odour and flavour to wines.

The quantity of alcohol contained in wines differs very much. The ports and sherries consumed in England contain the largest quantity. But then much of this is added. It is added in the form of brandy. Brandied wines keep best, but are not the best to drink. Unless wines are naturally strong, they will not keep without the addition of alcohol. Clarets, hocks, and Moselles, are seldom brandied. Some of the hocks do not contain more than seven per cent. of alcohol, whilst port and sherry contain twenty-five per cent.

Ardent spirits, distilled liquors, differ from wine in their having been submitted to distillation after the fermentation, which produces the alcohol. Brandy is distilled from wine; and peach-kernels, or other vegetable matter containing oil of bitter almonds, are added to give it a flavour. All the parts of the plants belonging to the division of the order *Rosaceæ*, called *Amygdaleæ*, contain oil of bitter almonds. Rum is distilled from molasses or treacle in the West India Islands, and pine-apples are added to give a peculiar flavour. Gin is distilled in Holland, from rye; in this country from wheat, the grains of which are allowed to become saccharine, and then fermented. Juniper berries are employed to give the peculiar flavour to gin. Whiskey is distilled from wheat, barley, or oats, treated in the same manner as for gin. Nothing is added to flavour it; but the smoke of the peat, by the aid of which the distillation is effected in both Ireland and Scotland, gives a characteristic flavour to this liquor. Liqueurs belong to this division; they are distilled spirits containing large quantities of sugar, and are flavoured with all kinds of substances, as celery, bitter almonds, gentian, wormwood, &c.

Beers, ales, and porters, differ from wines in the addition of a bitter principle, most frequently the hop, to the fermented liquor. The saccharine matter for fermentation is obtained through barley. The grain of barley is steeped in water, and allowed to germinate. When the starch of the grain is converted into sugar, it is submitted to heat, and malt is formed. The malt is placed in boiling water, and hops added; when cooled, the process of fermentation is allowed to take place, and the beer is completed. When the malt is slightly charred during the process of drying, it gives a dark colour to the beer. It is then called porter. These fluids vary much in strength and bitterness, according to the quantity of malt and hops employed.

Beer is the safest of these beverages for habitual use; but even this may be indulged in too freely, and disease may be the result. Of the various kinds of beer, that which is to be most commended, is the weak form of bitter ale, which is now so generally employed in the households of London and its neighbourhood. Beer acts as a tonic on account of its bitter principle, as well as a stimulant, and is frequently, on this account, found to be a valuable addition to the ordinary diet.

The Oleaginous group of foods is somewhat peculiar. They are taken in various forms from both the vegetable and animal kingdoms, and are known under the name of butter, oil, lard, suet, fat, &c. The following formula will express the composition of this class of bodies:—

Carbon	11
Hydrogen	10
Oxygen	1

It will be seen that the oxygen is in considerably less proportion than in the foregoing substances of this group, and we may consequently conclude that the hydrogen as well as the carbon is consumed in the system in maintaining the animal heat. This is an important point, as it frequently happens that the value of the heat-giving group of foods is estimated by the quantity of carbon alone. That oil has more power in maintaining animal heat than sugar or starch, is seen in the fact that it is eaten in larger quantities by men who live in cold regions than by those who live in the warmer parts of the earth. Just as we pass north or south from the tropics, man adds oil to his food according to the degree of cold to which he is exposed.

Oil seems also to be deposited in the tissues of man and other animals as a source of combustible materials when these fail in their natural food. Thus the *Ruminantia* get fat in summer to supply them with their winter's store of fuel. Hybernating animals, which are fat when they commence their sleep, wake up quite thin. Their fat has been exhausted in maintaining their animal heat during hybernation.

Oil performs another function in the system. It is very evident from its general presence in every tissue of the body that it has an action in connection with the development of the proteinaceous tissues. It seems to assist their development, to act as a kind of preparation for their growth. In this way its curative action in certain forms of disease may be explained. There is no doubt of the beneficial action of cod-liver oil in scrofulous diseases, and its action can only be explained on the above supposition. In connection with the use of cod-liver oil it may be stated that animal oils appear to be in a different physical condition of aggregation from vegetable oils, and are certainly more readily digested and appropriated by the system.

The vegetable oils chiefly used as food are those obtained from the Olive (*Olea Europæa*) and the Almond (*Amygdalus dulcis*). Many seeds, as the Cocoa-Nut (*Cocos nucifera*), Almond (*Amygdalus*), Chestnut (*Castanea*), Walnut (*Juglans*), Hazel-Nut (*Corylus*), Brazil-Nut (*Bertholletia*), contain oil.

The fat of animals is the great source of oleaginous food from the animal kingdom.

We now come to speak of the Nutritious, Proteinaceous, or Nitrogenous articles of diet. The substance called Protein is the basis of these. It is the first element that appears in the development of the vegetable cell. It is consequently universally present in plants. It also constitutes the chief material of the tissues of animals. It assumes in both kingdoms various forms, and is called albumen, fibrine, and casein, according to its physical and chemical properties.

Some animals derive this constituent of their bodies directly from the vegetable kingdom, as all the herbivorous and graminivorous creatures; others derive it indirectly from the plant through the animal, as the various forms of *Carnivora*. Man obtains his supply of protein from both sources. As a sect has arisen of persons who deny the propriety of man's taking animal food, it may be well to examine the evidence on which his claim to be regarded as a flesh-eating animal rests. We shall dismiss the sentimental objection, that life ought not to be taken as unworthy of serious refutation, as every one must feel that for carnivorous animals to prey upon lower animals is a natural law.

"In the first place, the experience of the races and nations of men who partake of animal food is decidedly in its favour. Amongst the northern and European nations this practice is universal; and it is precisely amongst these people that we see the greatest amount of physical power, and moral and intellectual development existing. Amongst these nations, those individuals and classes who partake most largely or exclusively of a vegetable diet, are alike physically, intellectually, and morally degraded. It is a well established fact, that amongst those classes who get the least animal food, as also in those public establishments where meat is only sparingly allowed, mortality is greatest, and disease is most rife. One of the most common forms of disease generated by an exclusively vegetable diet is scrofula, and when traceable to this cause, the most speedy remedy is the addition of animal food to the diet. There are also many other forms of disease produced by the want of animal food, which require for their cure but an abundant supply of the needed material. I need not, I am sure, specify facts to verify this statement. The experience of every medical man would confirm it; and there is no surgeon or physician connected with the great medical charities of this country, but has every day, unfortunately, ample opportunities of witnessing the ill-effects of a vegetable diet, and the benefit, in such cases, of the administration of animal food.

"Nor are we at a loss in accounting for the beneficial action of the flesh of animals as food. From what I have before said, it will be recollected that the muscles and other tissues of animals are composed principally of protein; so that they truly constitute the most nutritious kind of diet. It has also been found, not alone as a matter of general personal experience, but by direct experiment, that animal food is more digestible than vegetable food. The experiments to which I allude are those performed by Dr. Beaumont of America, on a man that had received a gun-shot wound in such a position as to form a perforation into his stomach. This wound never healed, and enabled Dr. Beaumont to perform the experiments alluded to. By placing various kinds of food in the stomach of this man, he was enabled to ascertain how long each required to digest; and it was found that the flesh of animals was much more digestible than any of the more nutritious forms of vegetable food, as bread, and the preparations of flour.

"Could we not find reasons for partaking of animal food in its nutritiousness and digestibility, we might find ample justification from the structure of man as compared with some of the lower animals. To the comparative anatomist it is sufficient that he knows the structure of the teeth, jaws, or stomach of an animal, to tell whether it fed on vegetable or animal food; and when he finds the structure that characterises the one or the other combined, he likewise knows that the animal will require both kinds of food. Let us, then, for one moment glance at the structure of the teeth, jaws, and stomach of vegetable-feeding animals, and compare them with creatures feeding entirely on animal food. We may take the ruminant animals, as the sheep and the ox, as specimens of pure vegetable-feeding animals. On examining their teeth it will be found that they have broad surfaces, made rough for the purpose of rubbing on each other, and between those teeth the grass and grain they eat are well ground before they are swallowed. In order that these teeth may be moved with facility over each other, the jaw, in addition to the up and down movement, which is essential to the reception of the food into the mouth, has a lateral movement, by which the trituration of the food between the teeth may be effected. The food thus prepared passes down a long œsophagus, or gullet, into a complicated bag or stomach. In the ruminants, though not in all the vegetable-eating animals, a process of digestion or maceration is carried on previous to the final mastication of the food between the teeth, and its ultimate digestion in the stomach.

"If we turn now to the structure of flesh-eating animals, of which the *Carnivora*, embracing such animals as the lion, and the tiger, may be taken as the type, we shall find that instead of teeth furnished with broad surfaces, they have teeth with sharp points for holding and cutting their food. Their lower jaw has no lateral movement, but a powerful up and down action, by which their sharp teeth are brought over each other and made to act in dividing their food, something in the way of the blades of a pair of scissors when used in cutting. In passing to the stomach, we find the gullet short, and the stomach small and simple in its form, adapted for food that is readily digested and speedily conveyed into the system.

"On an examination of these organs in man, it will be found that they are a true mixture of these two classes. His teeth are partly adapted for grinding, while some of them are supplied with the sharp projections which are characteristic of the *Carnivora;* thus evidently adapting them for the mastication of both vegetable and animal food. A slight lateral movement of the lower jaw with the up and down action is expressive of the subserviency of his structure to a mixed diet. In the stomach also we find indications of the same intermediate position in its structure; and the same conclusion is forced upon us, that it is part of the apparatus of an animal intended for subsisting upon a diet composed of animal and vegetable substances.

"That man can live on food derived entirely from plants, or entirely from animals, is a well known fact. The natives of many parts of Asia never eat animal food, whilst the Hudson's Bay hunter, some tribes in the northern part of the world, and the Guachos of the Pampas of America, seldom or never have vegetable food; but neither the physical, moral, nor social condition of either the one or the other would prompt the suggestion that man attains his highest development exclusively on either vegetable or animal diet. In the various positions in which man is placed in the world, there can be no doubt that the relative quantities of flesh to food derived from plants, may vary much with great advantage; but there seems to be no position in which man in health can be pronounced to be the better with abstinence from either the one or the other kind of food. That man does subsist on either exclusively only proves the great range of his adaptation to the varying conditions in which he may be placed on the surface of the earth; but certainly it is no proof of his labouring under a necessity for the supply of one to the exclusion of the other." (Lankester 'Letters on Diet.')

Of the three forms of protein referred to above, fibrine is found in the flesh and blood of all animals, as gluten in wheat, barley, oats, rye, and the other *Cerealia*. Albumen is found in the juices of many plants, as cabbage, cauliflower, asparagus, &c.; it is also found in the nervous system and blood of animals. Casein is present in milk, also in the seeds of leguminous plants, as peas, beans, and lentils.

In the animal body is found a substance called Gelatin, which appears to be formed out of the proteinaceous tissues. This substance is necessary to the existence of the animal body, and what cellulose is in the vegetable kingdom, gelatin appears to be in the animal kingdom. Although often taken into the system with animal food, especially in soups and jellies, there appears to be no evidence that it is even converted into a proteinaceous tissue. Experiments on this subject have been performed both in France and Belgium on an extensive scale, and the conclusion arrived at was the same, that gelatin is not used for forming any of the proteinaceous tissues of the body; at the same time it is not improbable that the gelatin may be appropriated for the purpose of renewing the gelatinous portions of the tissues, which are very extensive in the animal body.

It will be thus seen that although gelatin cannot be said to be nutritious in the sense of nourishing the actively vital parts of the body, it may assist in keeping up certain parts of the fabric. It need not then be rejected from our food; but it cannot be too widely known, that, as the basis of soups and jellies, it may be administered under the supposition of its being nutritious, and thus lead, if used alone in diet, to disastrous results.

Of the forms of protein which occur in food, Casein demands a short notice. Although, as dissolved in milk, it is very digestible, it becomes, when separated and known by the name of cheese, very indigestible. When milk is deprived of its butter, and the pure casein made into cheese, as is the case with some English cheeses, as those from Suffolk, it becomes so hard as scarcely to be digestible. [CHEESE.] But in most cases the casein is curdled with the butter, and a large per-centage of this substance is found in all good cheeses. Stilton cheese is made by adding the cream of one milking to that of another, so that this cheese has double the quantity of butter that other cheeses possess. The indigestibility of separated or insoluble casein will perhaps explain the neglect of beans, peas, and lentils, as articles of diet, although they contain a much larger quantity of nutritious ingredients than most seeds.

In concluding these general remarks upon diet, we present our readers with a summary of the conclusions on this subject arrived at by one of our most recent physiological writers. Dr. Carpenter, in his 'Principles of General and Comparative Physiology,' thus concludes this part of his subject:—

"The waste of the tissues, of which gelatin is the basis, may be supplied either by albuminous, proteinaceous, or gelatinous compounds, since there is no doubt that albumen may be converted into gelatin, although the reverse process cannot be performed. As gelatin does not exist in plants, it must be formed in herbivorous animals at the expense of the albuminous elements of their food; whilst in carnivorous animals it is probably derived immediately from the gelatinous components of the bodies on which they prey. The materials of the adipose tissue, and the oleaginous particles which seem requisite in the formative operations of the system, generally are derived in the carnivorous races from the fatty substances which the bodies of their victims may contain; whilst the herbivorous not only find them in the oleaginous state in their food, but have the power of producing them by the conversion of farinaceous and saccharine matters.

"The foregoing statements are applicable to all tribes of animals 'cold-blooded' as well as 'warm-blooded.' We have now to consider the special case of the latter. In the carnivorous tribes the waste of the tissues is so great, in consequence of the restless activity which is habitual to them, that it appears to furnish a large proportion of the combustible material required for the maintenance of their proper temperature. The remainder is made up by the fat of the animals on which they feed; and it is to be observed that the amount of this is much greater in the bodies of animals inhabiting the colder regions of the globe than in the inhabitants of tropical countries. In the herbivorous tribes the case is different: they are for the most part much less active; and the waste of their tissues consequently takes place in a less rapid manner, and is far from supplying an adequate amount of combustible material, especially in cold climates. Their heat is in great part sustained by the combustion of the saccharine and oleaginous elements of their food, which are appropriated to this purpose without having ever formed part of the living tissues; and the demand for these will be larger in proportion to the depression of the external temperature, a greater generation of caloric being then required to keep up the heat of the body to its proper standard. Hence, cold-blooded animals can usually sustain the privation of food longer than warm-blooded, and this more especially when they are kept cool, so that they are made to live slowly, and death when at last it does ensue is consequent upon the general deficiency of nutrition. On the other hand, warm-blooded animals, whose temperature is uniformly high, must always live fast, and deprivation of food is fatal to them, not only by preventing the due renovation of their tissues, but also by destroying their power of sustaining their heat. The duration of life under these circumstances depends upon the amount of fat previously stored up in the body, and upon the retardation of its expenditure by external warmth, or by the inclosure of the body in non-conducting substances; and there is evidence that if this be duly provided for, and all unnecessary waste by nervo-muscular activity be prevented, the life even of a warm-blooded animal may sometimes be prolonged for many weeks without food."

It will be gathered from the foregoing general remarks that food may be divided into two great classes—the heat-giving and the flesh-forming; and we now present a table of some of the more ordinary kinds of food, in which one or the other, or both, of these classes of substances are found mixed.

[100 grains of Tea gives in an infusion 5 grains of theine and 26·5 grains of non-nitrogenous substances. (Peligot.)

By adding the first three columns of this table together, and deducting the sum from one hundred, it will give the quantity of water contained in each article of food. Thus, taking butcher's meat:—

Nitrogenous material	22·3
Carbonaceous material	14·3
Mineral matter	·5
	37·1
Water	62·9
	100·0

The quantity of carbon expresses the relative heat-giving power of the food. With foods containing fat the quantity of hydrogen should also be taken into consideration.]

Table of Composition of Food in 100 *parts.*

Food.	Nitrogenous Flesh-forming Ingredients.	Non-Azotised Heat-giving Principles.	Mineral Matter.	Carbon.
Milk . .	4·50	7·90	0·60	6·94
Butcher's Meat free from bone . . .	22·30	14·30	0·50	21·56
Bacon, Pork .	8·36	62·50	0·50	58·92
Fish . . .	14·00	7·00	1·00	9·15
Flour . .	17·00	66·00	0·70	45·50
Barley Meal .	14·00	68·50	2·00	40·50
Oatmeal . .	18·60	70·30	3·30	44·10
Indian Meal . .	10·71	72·25	1·04	36·41
Peas . . .	23·40	60·00	2·50	35·70
Rice . . .	5·43	84·65	0·52	36·00
Potatoes . .	1·41	22·10	1·00	12·20
Carrots . . .	1.48	11·61	0·81	5·40
Turnips . .	1·64	10·00	1·62	5·20
Parsnips . .	2·10	17·70	0·80	8·63
Mangel Wurzel .	1·60	12·26	1·14	5·50
Cabbage . .	1·75	4·05	2·20	2·65
Cocoa (nibs) . .	9·56	85·76	2·70	68·56
Sugar . .	0·00	100·00	0·00	42·58
Suet, Fat, Butter	0·00	100·00	0·00	79·00
Bread . . .	6·83	48·65	1·51	25·19
Cheese . .	31·02	25·30	4·90	36·80
Beer . . .	·85	9·17	0·20	4·33
Vinegar . .				

Such a table as this will be found useful in constructing dietaries for large institutions, which are very often erroneously constituted, and a large waste thereby entailed. The following table contains examples of dietaries, drawn up by Dr. Lyon Playfair, from various sources. This table accompanied an abstract of a lecture by Dr. Lyon Playfair on the 'Food of Man,' delivered at the Royal Institution in May 1853. The following extracts from this lecture will explain some of the valuable results obtained by Dr. Playfair:—

"It was now admitted that the heat of the body was due to the combustion of the unazotised ingredients of food. Man inspires annually about 7 cwt. of oxygen, and about 1-5th of this burns some constituent and produces heat. The whole carbon in the blood would thus be burned away in about three days unless new fuel were introduced as food. The amount of food necessary depends upon the number of respirations, the rapidity of the pulsations, and the relative capacity of the lungs. Cold increases the number of respirations and heat diminishes them; and the lecturer cited well-known cases of the voracity of residents in artic regions, although he admitted, as an anomaly, that the inhabitants of tropical climates often show a predilection for fatty or carbonaceous bodies. He then drew attention to the extraordinary records of arctic dietaries shown in the table, which, admitting that they are extreme cases even in the arctic regions, are nevertheless very surprising.

"Dr. Playfair then alluded to the second great class of food ingredients, namely, those of the same composition as flesh. Beccaria in 1742 pointed to the close resemblance between these ingredients of flesh, and asked, 'Is it not true that we are composed of the same substances which serve as our nourishment?' In fact the simplicity of this view is now generally acknowledged; and albumen, gluten, casein, &c., are now recognised as flesh-formers in the same sense that any animal aliment is.

"The old mode of estimating the value of dietaries, by merely giving the total number of ounces of solid food used daily or weekly, and quite irrespective of its composition, was shown to be quite erroneous; and an instance was given of an agricultural labourer in Gloucestershire, who in the year of the potato famine subsisted chiefly on flour, consuming 163 ounces weekly, which contained 26 ounces of flesh-formers. When potatoes cheapened he returned to a potato diet, and now eats 321 ounces weekly, although his true nutriment in flesh-formers was only about 8 or 10 ounces. He showed this further by calling attention to the six pauper dietaries formerly recommended, to the difference between the salt and fresh meat dietary of the sailor, &c., all of which, relying on absolute weight alone, had in reality no relation in equivalent nutritive value.

"Taking the soldier and sailor as illustrating healthy adult men, they consumed weekly about 35 ounces of flesh-formers, 70 to 74 ounces of carbon, the relation of the carbon in the flesh-formers to that of the heat-givers being 1 : 3. If the dietaries of the aged were contrasted with this it would be found that they consumed less flesh-formers (25—30 ounces), but rather more heat-givers (72—78 ounces); the relation of the carbon in the former to that of the latter being about 1 : 5. The young boy about 10 or 12 years of age consumed about 17 ounces weekly, or about half the flesh-formers of the adult man; the carbon being about 58 ounces weekly, and the relations of the two carbons being nearly 1 : 5½. The circumstances under which persons are placed influence these proportions considerably. In workhouses and prisons the warmth renders less necessary a large amount of food fuel to the body; while the relative amount of labour determines the greater or less amount of flesh-formers. Accordingly it is observed that the latter are increased to the prisoners exposed to hard labour. From the quantity of flesh-formers in food we may estimate approximately the rate of change in the body. Now, a man weighing 140 lbs. has about 4 lbs. of flesh in blood, 27½ lbs. in his muscular substance, &c., and about 5 lbs. of nitrogenous matter in the bones. These 37 lbs. would be received in food in about eighteen weeks; or, in other words, that period might represent the time required for the change of the tissues, if all changed with equal rapidity, which however is not at all probable.

"All the carbon taken as food is not burned in the body, part of it being excreted with the waste matter. Supposing the respirations to be 18 per minute, a man expires about 8·59 ounces of carbon daily, the remainder of the carbon appearing in the excreted matter."

The substances used as food which we have called medicinal are very numerous. They include acids, volatile oils, and the vegetable alkaloids.

The acids are eaten in fruits, such as the citric, malic, tartaric, and oxalic acids. It is possible they may be decomposed in the system, and furnish the materials of animal heat. They seem however to perform a more important part in dissolving up the mineral ingredients taken into the system as food. This seems one way in which carbonic acid acts beneficially when taken in wines, beers, and effervescing waters. Acetic acid, or vinegar, acts probably in the same manner as the other acids.

The volatile oils are added to other kinds of food, and, as condiments and spices, form a conspicuous feature in diet. We may class these, with alcohol, as stimulants of the mucous membrane of the stomach.

The use of tea, coffee, chocolate, and Paraguay tea, in infusion, constitutes a curious class of alimentary substances. In tea, coffee, and Paraguay tea, a principle is found identical in every instance, to which the name Thein or Caffein has been given. A substance very similar, Theobromine, is found in chocolate. It is undoubtedly upon the action of these substances that the dietetical uses of these plants depend.

Two theories have been advanced to explain the action of this principle. Liebig suggested that the taurin found in the bile was formed from the waste tissues of the body carried into the blood; and that this taurin was necessary for the production of carbonic acid gas, or rather to get rid of the carbonaceous matter in the system in the form of carbonic acid gas. The taurin must be constantly formed, otherwise the heat of the body is not maintained, the carbonaceous matter not got rid of, and disease is engendered. If persons have not sufficient food, or if the digestive organs do not enable them to carry a sufficient quantity of nutriment to the system, the tissues of the body are consumed to form taurin. Liebig found that thein had a composition identical with taurin, or so nearly as to render it a sufficient substitute for taurin, and thus by the use of thein, he supposed we were actually preventing the waste of the body, and so maintaining health at less expense than we could by taking more solid food.

Persons who cannot consume a sufficient quantity of food to yield the carbon necessary for generating animal heat, have recourse to tea, and find it actually a nutritious article of diet; and it is only, says Liebig, "by such means as this that it can act as a nutritious agent." But another theory has been advanced by Dr. Playfair. He says thein has a composition very similar to nervous matter. Now, seeing that every operation of the mind must be attended with a loss of nervous matter, there is a necessity for a supply of that nervous matter to enable the mind to carry on its operations. A large quantity of proteinaceous matter would be required to be supplied to form the nervous matter with proper constituents if taken in by means of meat or bread. But these alkaloids at once become a constituent of nervous matter; and this accounts for the agreeable stimulus and permanent effect on the mind produced by the use of tea and coffee, particularly by studious persons, as well as those whose nervous systems are exhausted from various causes.

In any just estimate of diet the mineral ingredients should be considered. The forms which they assume in the system are not well known, but we have a capital instance in the phosphate of lime, which, forming a part of the bones, we know must be supplied through the diet. This substance is found in the cereal grasses, and perhaps one reason that man takes these grasses everywhere for the substantive articles of his diet is the possession of this substance. Iron is another substance which is frequently deficient in the blood. It is naturally supplied in the food; but this failing, iron is given medicinally. Potash in combination with vegetable acids seems to have the power of preventing scurvy. Chloride of sodium is another well-known instance of the necessity of mineral ingredients in the food.

Examples of Dietaries.

	Weight in ozs. per week.	Nitrogenous Ingredients.	Substances free from Nitrogen.	Mineral Matter.	Carbon.	Proportion between	
						Carbon in Flesh formers.	Carbon in Heat givers.
Dietaries of Soldiers and Sailors.							
English Soldier	378	36·15	127·18	4·92	71·68	1	3·66
English Soldier in India	261	34·15	103·19	2·39	66·32	1	3·58
English Sailor (Fresh Meat)	302	34·82	102·89	3·17	70·55	1	3·70
English Sailor (Salt Meat)	290	40·83	132·20	6·03	87·40	1	3·94
Dutch Soldier, in War	198	35·21	102·08	1·85	74·08	1	3·87
Dutch Soldier, in Peace	383	24·52	106·80	4·15	70·77	1	5·32
French Soldier	347	33·24	127·76	4·62	85·25	1	4·72
Bavarian Soldier	242	21·08	102·10	3·32	62·45	1	5·47
Hessian Soldier	423	23·00	136·00	—	77·00	1	6·16
Dietaries of the Young.							
Christ's Hospital, Hertford	216	17·16	61·27	2·47	39·18	1	4·21
Christ's Hospital, London	242	17·27	76·82	2·84	46·95	1	5·02
Chelsea Hospital, Boys' School	245	12·89	93·28	5·93	57·67	1	8·29
Greenwich Hospital, Boys' School	231	18·43	86·73	2·62	52·87	1	5·29
Dietaries of the Aged.							
Greenwich Pensioners	269	24·46	122·21	3·54	72·43	1	5·46
Chelsea Pensioners	332	29·95	112·64	4·65	78·03	1	4·80
Gillespie Hospital, Edinburgh	156	21·02	92·32	2·35	71·39	1	6·26
Trinity Hospital, Edinburgh	192	19·63	97·34	3·33	57·30	1	5·38
Old Pauper Dietaries.							
Class 1	—	20·21	88·61	3·27	54·30	1	4·95
Class 2	—	14·96	89·59	2·89	51·10	1	6·31
Class 3	—	15·78	99·88	3·91	55·43	1	6·50
Class 4	—	19·22	116·84	3·96	67·87	1	6·50
Class 5	—	15·49	96·51	3·58	54·72	1	6·53
Class 6	—	14·67	88·03	2·84	49·57	1	6·25
Average of all English Counties in 1851	—	22·00	99·00	—	58·00	1	4·85
St. Cuthbert's, Edinburgh	175	14·80	89·37	3·31	46·98	1	5·85
City Workhouse, Edinburgh	107	13·30	49·99	1·74	31·48	1	4·36
English Prison Dietaries.							
Class 2. Males	206½	15·28	111·85	3·46	59·23	1	7·13
Class 3. Males	276	18·26	123·60	4·05	67·53	1	6·81
Class 4, 8, and 7. Males	271½	20·97	125·98	5·03	69·88	1	6·13
Class 5. Males	326	20·29	130·57	4·23	73·31	1	6·65
Bengal Prison Dietaries.							
Non-Labouring Convicts	224	18·43	163·16	2·08	76·35	1	7·62
Working Convicts	296	28·16	191·12	2·97	91·07	1	5·96
Contractors' insufficient Diet	167½	12·70	135·95	1·30	61·33	1	8·88
Bombay Prison Dietaries.							
All Classes of Prisoners not on Hard Labour	182	28·00	101·50	2·03	68·81	1	4·52
Prisoners on Hard Labour	224	35·63	128·80	2·45	87·22	1	4·50
Arctic and other Dietaries.							
Esquimaux	—	250·00	1280·00	—	1125·00	—	—
Yacut	—	999·00	640·00	—	966·00	—	—
Bosjesman	—	574·00	368·00	—	555·00	—	—
Hottentot	—	424·00	400·00	—	604·00	—	—
Agricultural Labourer, England	163·6	26·64	106·57	1·10	74·70	—	—
Agricultural Labourer, England	114·6	20·39	72·46	1·18	51·72	—	—
Agricultural Labourer, India	218·0	14·02	138·27	2·41	61·54	—	—

A few plain rules for taking food will properly conclude this article.

In the first place, food should be properly cooked. Many substances which are very indigestible when in the raw state are rendered perfectly digestible by cooking. Although the stomach is capable of digesting fruits and some kinds of seeds without any exposure to heat, yet, as a general rule, the breaking down of the tissues which occurs in cooking greatly facilitates the digestion of both animal and vegetable food. But whilst that cooking is proper which enables the stomach more easily to reduce the food to the condition of chyle, there are extremes of preparation which however palatable are to be avoided. Food that is much prepared, so as to reduce it to a fluid condition, as soups, stews, and various made dishes, do not present sufficient solid matter for the healthy process of digestion to be carried on. When the object is to prevent the stomach from doing duty such food is proper. It may also be taken occasionally with advantage as a variety in diet, but food taken long together in this form is injurious.

Much indigestible food at a time should be avoided. Many of the articles of our diet are less digestible than others, and when taken in small quantities are not injurious. It is when such substances are made the principal constituents of a meal that danger is likely to arise. To mention only a few of the less digestible kinds of foods:—Unfermented bread and biscuits, uncooked vegetables eaten as salad, unripe fruits, cheese, pie-crust, fat meats smoked, as bacon, and the fat of meat, some kinds of fishes, especially the *Crustacea*, crabs, lobsters, &c. Heavy meals of any one of these articles of diet, or mixtures of them, may be very injurious, and produce serious attacks of indigestion, if not other diseases.

Solid food should be well masticated before it is swallowed. The teeth are organs given us on purpose to perform this function, and its accomplishment is attended also with the mixture of the saliva with the food, which seems to be an important step in the process of digestion. Although by hasty mastication persons in business hope to save their time, they should know that at least it is a loss of food, if not immediately a loss of health. Much more food is digested when it is well masticated than when it is swallowed very hastily in large masses. Food that is imperfectly masticated is digested with difficulty, and remains sometimes so long in the stomach as to produce irritation of the stomach, and remaining unacted upon it putrifies, producing pain and tainting the breath.

Even where mastication is very complete it is always better to swallow slowly, as by this means every part of the food is brought more fully under the influence of the gastric acid of the stomach, by which it is prepared for absorption into the blood.

Full and heavy meals should be avoided. It is better to get up from table with an appetite than to feel that no more food could be taken. It is always difficult to say how much should be with propriety taken. Some systems will bear twice as much food as others, whilst there are those who require twice as much food as others. Scales and weights are dangerous instruments at table, as some men will starve on what others will thrive. There is an instinct which, if obeyed, constantly cries "Hold, enough;" which if men would listen to would always guide them right. The feelings after eating should be those of refreshment and comfort—feelings that are not often present when too large a meal has been eaten. All food taken into the system and not wanted is likely to be in the way, and the processes adopted by nature for getting rid of the incubus are not unfrequently attended by disease and death.

Persons who habitually over-eat are frequently obliged to have recourse to medicines to correct the errors of their indulgence. Such an unnatural way of correcting the evils of an unnatural habit is itself likely to produce disease in the system.

Active bodily exertion should not be taken immediately after the principal meal. The stomach requires a supply of blood to perform its functions. If the current is diverted to other organs digestion is prevented. On this account reading at meals is an objectionable practice. The brain in this process gets the blood which the stomach requires. Long walks and hard study should both be avoided after a full meal.

Long fasting is bad. It is bad when the body is resting; it is much worse when the body is actively engaged. The stomach, like all other organs, performs its functions in virtue of the stimulus afforded it by the blood. If the blood is allowed to go a long time without a renewal of its constituents it no longer supplies the nervous system with energy; the stomach, and even other organs, flag in the performance of their duty, and as a consequence digestion is imperfectly performed. How often should man eat in the day? In the morning, at noon, and at night, is the answer given by the instincts of man.

The body can go longer without food whilst resting than when awake; hence persons may with safety go a longer number of hours between the night and morning meal than between the morning and noon, or the noon and night meals.

There are no rules without exceptions in certain cases, and there are many circumstances which must modify the application of the foregoing rules, as well as in other ways regulate the taking of food.

Age is a perpetually modifying influence. The new-born infant requires the food which nature has provided for its use every hour or two. As it grows older the intervals at which it takes its food become longer; but it should be always recollected, that as a rule children should have more eating times than adults. Grown-up people are too apt to assume that what is good for themselves is good for children; hence as great an amount of suffering is entailed on children by restricting the quantity and times of taking their diet amongst the rich as come upon them from absolute want amongst the poor. The craving appetite of children is no vice of fallen human nature, but the incessant demands of an ever-wasting yet ever-growing human body. Bread and butter, or treacle, or common cake, should always be allowed if asked for by rapidly growing boys and girls between the hours which adults find convenient for their meals. An evil however arising out of the healthy appetite of youth should be guarded against; it is, that whilst growing a habit is acquired of eating large quantities of food which are no longer required when growth has ceased. If the appetite is not checked by reason at this period of life, the habit of eating more than is necessary may be productive of evil results.

Old age requires a more frequent recourse to food than the adult, though not in so large a quantity. "A little and often" is a maxim that enables many aged persons to continue their influence in the world, whilst an attempt to maintain the habits of youth and middle age has cost many declining ones their lives.

The mode of life influences the diet. The sedentary, the inactive, do not consume so much muscle and nerve in their existence as the active and laborious, and accordingly require less food. The tailor ought not to eat so much as the day-labourer; and the lady all day in her drawing-room or carriage cannot expect the appetite or the enjoyment of food which is bestowed by the laws of nature on her housemaid.

Other things being the same more food is required in winter than in summer, more in cold climates than in hot ones. This arises from the greater consumption of certain parts of the food in maintaining the animal heat in order to keep off the external cold. Hence, to bring the appetite of Christmas to the Midsummer meal is to run the hazard of a surfeit; whilst the traveller who carries the eating habits of the north to countries under the line frequently perishes of fevers brought on by repletion.

(Moleschott, *Physiologie des Nahrungs Mittel;* Ward, *Science of Health; Food of Man*, in Knight's Shilling Volumes; *Lectures on the Food of Man*, by Dr. Lankester; *Letters on Diet*, by Dr. Lankester; Pereira, *On the Diet of Man;* Liebig, *Chemistry of Food;* Liebig, *Letters on Chemistry;* Archer, *Popular Economic Botany;* Carpenter, *Principles of Physiology*.)

FORAMINIFERA (*Foramen, fero*), a group of minute Marine Animals of low organisation, consisting of a slimy transparent jelly, invested with a hard, usually calcareous shell; found in sea-sand and amongst marine refuse dredged up from deep water. Owing to many of their shells having a spiral form, these creatures were long thought to be highly organised *Mollusca*, allied to the living *Nautilus*—an error into which most naturalists fell until recently, when these animals became the subject of a more rigorous and searching investigation than they had previously undergone.

Though usually very minute, their elegant forms early attracted the attention of naturalists. They were noticed by Gualtieri, Planchus, and Ledermuller, prior to the appearance of the 'Systema Naturæ' of Linnæus. In the latter work they are included amongst the *Nautili*, the animal, as well as that of the recent *Nautilus pompilius* with which Linnæus associates them, being alike unknown to the Swedish naturalist. In the 12th edition are descriptions of 15 species. In 1780 Soldani, an Italian priest, published two elaborate works, abundantly illustrated, and largely devoted to the recent and fossil forms of Foraminiferous Shells. He divides them into groups (such as *Nautili, Hammoniæ*, and *Orthocerata*) in the most arbitrary manner; but the works are monuments of his labour and perseverance. In 1784 some of the British species were figured by Walker in his 'Testacea Minuta Rariora.' The 'British Conchology' of Montague, 1803 (and 'Supplement,' 1808), contained a still larger number of British forms, respecting the majority of which the error of Linnæus was still followed; but some were shown to be so different from the true *Nautili* as to require removing from that genus. In 1803 Fichtel and Moll figured many of the spiral forms, which they included amongst the *Nautili*. In 1808 De Montfort attempted to subdivide the group into a number of separate genera, but still regarded them as *Cephalopoda*, in which view he was followed by Fleming and other more recent writers.

In 1826 the study of the *Foraminifera* received a fresh impulse from the labours of M. D'Orbigny, a French naturalist, who in that year presented his first memoir on the subject to the French Academy. This memoir embraced the classification of the whole of the Cephalopodous *Mollusca*, or animals allied to the Cuttle-Fish; with which group of organisms D'Orbigny, like his predecessors in the study, imagined the *Foraminifera* to have the closest affinities. He divided the latter into five great families, which were again subdivided into a number of genera, most of them new; the various forms being thus thrown into natural groups in a way that had not previously been attempted even by De Montfort. Though D'Orbigny retained the erroneous idea of his predecessors as to the zoological relation of the *Foraminifera*, this error did not affect the value of his subdivisions of the class, which constituted an important step in advance of all that had been done by others. Indeed the value of his classification is shown by its retention in the writings of all who have succeeded him in the study. He distributed the species into 55 genera, introducing into the catalogue an enormous number of new forms, which he discovered in sands brought to him from various parts of the globe. The views of D'Orbigny and his predecessors respecting the Molluscous character of these animals were sanctioned by Cuvier in an edition of the 'Animal Kingdom,' published in 1828.

In 1835 M. Dujardin presented a memoir to the 'Annales des Sciences Naturelles,' based upon an examination of the recent animals of the *Foraminifera*, in which he rejected the idea that they had any affinities with the *Mollusca*. He pointed out the fact that the animal which tenanted the calcareous shell was a mere animated slime, having no visible organisation, and consequently very different from the highly organised *Cephalopoda*, with which they had previously been associated. He considered their true zoological position to be near the *Amœba*, commonly known as the Proteus Animalcule, and that they constitute part of a larger group, to which he assigned the name of *Rhizopoda*. In 1834 and 1839 Professor Ehrenberg presented two memoirs to the Academy of Berlin, in which he advocated the opinion that the *Foraminifera* were polype-bearing animals, allied to the *Flustræ* and other Moss-Corals, by him termed *Bryozoa*, and of which they formed the first order, *Polythalamia*. He also assigned to them internal organs which no other observers have been able to discover: but notwithstanding these errors he did good service by the discovery that the White-Chalk Rocks were principally composed of the aggregated shells of *Foraminifera*, which by their gradual accumulation had thus produced widely-extended masses of calcareous strata, many hundreds of feet in thickness. The existence of numerous Fossil *Foraminifera* in the Chalk had been demonstrated by Mr. Lonsdale in 1835; and still later, the rich harvest of beautiful forms to be obtained from these Cretaceous strata was further demonstrated by M. D'Orbigny in his monograph 'On the Foraminifera of the White Chalk.'

In 1845 Professor Williamson published a memoir in the 'Transactions of the Literary and Philosophical Society of Manchester,' in which he further demonstrated the entire absence of any real resemblance between the *Foraminifera* and the *Cephalopoda*, and the consequent necessity of arranging the former in an inferior portion of the zoological scale. At first he adopted the idea of Ehrenberg, but in a subsequent memoir (1848), he came to the conclusion that they were not polypiferous, but that they approximated to the Sponges on the one hand, and, as had been asserted by M. Dujardin, to the *Amœba* on the other; their true position in any linear arrangement being immediately above the former of these classes of objects. In another memoir, read in 1851, describing the complicated structure of some forms of the genus *Orbiculina*, Professor Williamson says, "Looking at the structure of the shell of the *Orbiculina adunca*, and especially at the large orifices which communicate between its various cavities, we cannot fail to observe that it is a reticulated calcareous skeleton, whose proportionate relation to the size of the soft animal has differed but little from that of the siliceo-keratose network of many sponges to the slimy substance with which they are invested. The attempt to isolate the various portions of *O. adunca*, and raise each portion to the rank of an individual animal, even in the limited sense in which we should admit such a distinction in the polypes of a *Sertularia* or of a *Gorgonia*, appears to me wholly inadmissible. If the soft structures of *Orbiculina* are as devoid of visible organisation as those of our British *Foraminifera*, and I have very little doubt that such will prove to be the case, the whole animal will be very little raised above the *Polypifera*, only possessing a symmetrical calcareous skeleton, which is at once both external and internal." ('Transactions of the Microscopical Society of London.')

In 1846 M. D'Orbigny published his work 'On the Fossil Foraminifera of the Tertiary Basin of Vienna,' in which he abandoned the views advocated in his earlier writings. He now recognised the inferiority of these objects to the Cephalopods, with which he had previously arranged them. He rejected the idea that they were aggregated creatures, as held by Ehrenberg, as also the existence of the intestinal canal and organs of reproduction described by the illustrious Prussian; but he arrived at the conclusion that they held a position intermediate between the *Polypifera* and the *Echinodermata*.

M. D'Orbigny says, "After what has preceded upon the characteristics of the *Foraminifera*, the comparison demonstrates that they cannot be arranged in any of the known Zoological Classes. Much less complex than the *Echinodermata* or the *Polypifera* as to their internal organisation, they have through their filaments (pseudopodia) part of the mode of locomotion of the former, and are by their isolated, non-aggregated, free existence, more advanced in the scale than the latter. This individual existence of the *Foraminifera*, the liberty which they enjoy, and their mode of locomotion, are characters which deserve to be taken into consideration. Although less complex than many *Polypifera*, they have not a common aggregate life. A multitude does not unite to form a regular body as amongst the *Polypifera*. They are locomotive, which the others are not. Their means of locomotion are complex, and the great regularity of the testaceous envelope of their segments places them far above the *Polypifera*. On the other hand, much less perfect than the *Echinodermata*, they are very inferior to them in all respects. We believe also that, because of the radiation of their filaments the position of the *Foraminifera* is in the interval (embranchement) of the radiating animals of Cuvier, between the *Echinodermata* and the *Polypifera*, as an altogether independent class." ('Sur les Foraminifères Fossiles du Bassin Tertiaire de Vienne,' p. 19.)

There can be no doubt of their great inferiority to the *Echinodermata*, which possess a distinct alimentary canal, a nervous circulating and sexual system; and connecting with the defined digestive cavity of the polype recent discoveries respecting its reproduction by ova, through the agency of medusiform buds, we must conclude that these latter are equally removed from the structureless animals of the *Foraminifera*. In the preceding argument M. D'Orbigny forgets that the freedom, isolation, and independence, upon which he lays so much stress, are the characteristics of the fixed compound *Polypifera*, in their embryonic or larval states. Consequently this feature, which in the *Foraminifera* is normal and persistent, betokens inferiority rather than superiority to the *Polypifera*, in which aggregation and fixation indicate maturity and a higher development. The argument drawn from their symmetry is of no value. Nothing can be more symmetrical than many of the sponge spicula; and in the vegetable kingdom the symmetrical plants (*Desmideæ*) are amongst the lowest forms.

An additional memoir by Professor Williamson, in 1851 ('Quarterly Journal of Microscopical Science,' vol. i.), afforded other and still more striking evidence of the probable correctness of the views previously enunciated, as furnished by the structure of a species of *Faujasina*, and especially showed that the new growths which added to the thickness of the shell were all applied to its exterior and not to its interior, apparently indicating that the gelatinous animal had the power of extending itself over the exterior of the shell, or of retreating to its interior at will, reminding us of the movements of the gelatinous envelope in some of the less highly organised Fungiform Corals. (Rymer Jones, 'Animal Kingdom,' p. 19.) In 1845 Dr. Carpenter laid before the Geological Society of London an elaborate memoir on the structure of some interesting fossil forms belonging to the genera *Orbitoides* and *Nummulina*, which with the publication of M. D'Orbigny on the *Foraminifera* of Cuba, constitute the chief additional works that have appeared on this subject.

The following is the latest classification of the *Foraminifera* adopted by M. D'Orbigny, and though marked by some serious imperfections, it is the best that has been hitherto published. The five principal divisions are chiefly based on the variations in the arrangement of the successively added segments.

Order 1. *Monostega.*—Animal consisting of a single segment. Shell composed of a single chamber. Genera: *Gromia*, Dujardin; *Orbulina*, D'Orbigny; *Oolina*, D'Orbigny.

Order 2. *Stichostega.*—Animal consisting of segments arranged in a single line. Shell composed of chambers superimposed linearly on a single straight or curved axis. No spiral growths:—

Glandulina, D'Orbigny.
Nodosaria, Lamarck.
Orthocerina, D'Orb.
Dentalina, D'Orb.
Frondiculana, Defrance.
Lingulina, D'Orb.
Rimulina, D'Orb.
Vaginulina, D'Orb.
Marginulina, D'Orb.
Conulina, D'Orb.
Pavonina, D'Orb.
Webbina, D'Orb.

Order 3. *Helicostega.*—Animal consisting of segments arranged in a spiral. Chambers piled up or superimposed on one axis, forming a spiral volute:—

Cristellaria, D'Orb.
Flabellina, D'Orb.
Robulina, D'Orb.
Fusulina, Fischer.
Nonionina, D'Orb.
Nummulina, D'Orb.
Assilina, D'Orb.
Siderolina, Lamarck.
Hanerina, D'Orb.
Operculina, D'Orb.
Vertebralina, D'Orb.
Polystomella, Lamarck.
Peneroplis, Lamarck.
Dendritina, D'Orb.
Spirolina, Lamarck.
Cyclolina, D'Orb.
Lituola, Lamarck.
Orbiculina, Lamarck.
Alveolina, D'Orb.
Rotalina, Lamarck.
Globigerina, D'Orb.
Planorbulina, D'Orb.
Truncatulina, D'Orb.
Anomalina, D'Orb.
Rosalina, D'Orb.
Valvulina, D'Orb.
Verneuilina, D'Orb.
Bulimina, D'Orb.
Uvigerina, D'Orb.
Pyrulina, D'Orb.
Faujasina, D'Orb.
Cauderina, D'Orb.
Chrysalidina, D'Orb.
Clavulina, D'Orb.
Gaudryna, D'Orb.

Order 4. *Entomostega.*—Animal composed of alternating segments forming a spiral. Chambers piled up or superimposed upon two alternating axes, forming a spiral:—

Robertina, D'Orb.
Asterigerina, D'Orb.
Amphistegina, D'Orb.
Heterostegina, D'Orb.
Cassidulina, D'Orb.

Order 5. *Enallostega.*—Animal composed of alternately arranged segments without forming a spiral. Chambers disposed alternately along two or three distinct axes, not forming a spiral:—

Dimorphina, D'Orb.
Guttulina, D'Orb.
Polymorphina, D'Orb.
Virgulina, D'Orb.
Bigenerina, D'Orb.
Gemmulina, D'Orb.
Textilaria, Defrance.
Vulvulina, D'Orb.
Bolivina, D'Orb.
Sagrina, D'Orb.
Cuneolina, D'Orb.

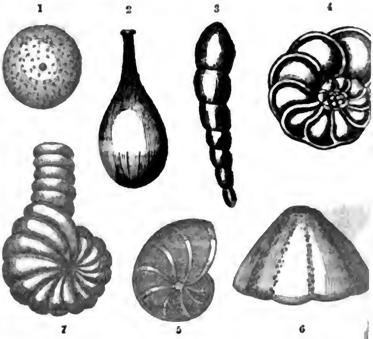
Order 6. *Agathistega.*—Animal composed of segments wound round an axis. Chambers wound round a common axis, each one investing half the entire circumference:—

Uniloculina, D'Orb.
Biloculina, D'Orb.
Fabularia, D' Orb.
Spiroloculina, D'Orb.
Triloculina, D'Orb.
Cruciloculina, D'Orb.
Articulina, D'Orb.
Sphæroidina, D'Orb.
Quinqueloculina, D'Orb.
Adelosina, D'Orb.

The simplest type of the *Foraminifera* (*Monostega*), presents but a single segment, and is illustrated by the *Orbulina universa* (*fig.* 1), which is a small spherical shell with a lateral aperture, the interior of which has been occupied by the living jelly to which the shell owes its existence. The beautiful symmetrical *Lagenæ*, or Flask Animals (*fig.* 2), the British species of which have been figured by Professor Williamson in the 'Annals of Nat. Hist.,' also belong to this type.

In the order *Stichostega*, as for example the *Nodosaria*, *Dentalina* (*fig.* 3), the shell advances beyond the simple type of the *Monostega* by a process of linear budding. The first cell is usually spherical, as in *Orbulina*, but through the orifice in this primary cell there protrudes as a growth from the contained animal segment, a second segment, usually a little larger than the first, which speedily incases itself in a shelly covering. This new growth is successively followed by others developed in the same way, until the organism attains to its maturity, when it exhibits a series of cells arranged end to end in a straight or but slightly curved line.

In the *Helicostega*, a large and conspicuous group, the gemmation takes place with a spiral bias, producing the nautiloid form of shell which misled the earlier miscroscopists. Sometimes all the convolutions are visible. (*Operculina*, *fig.* 4.) In others the outer convolution embraces those previously formed, and conceals them. (*Cristellaria*, *fig.* 5.) In a third type all the spiral convolutions are visible on one truncated half of the shell, whilst they are embracing on the others (*Faujasina*, *fig.* 6), thus combining the other two types. Some genera, like the Stichostegous and Heliostegous orders, develop on the plan of the latter, up to a certain stage of their growth, when the arrangement of the cells ceases to be spiral and becomes straight (*Spirolina*, *fig.* 7), as in the *Nodosariæ*. The orifices penetrating the septa and connecting the contiguous segments are sometimes single, and at others more numerous.



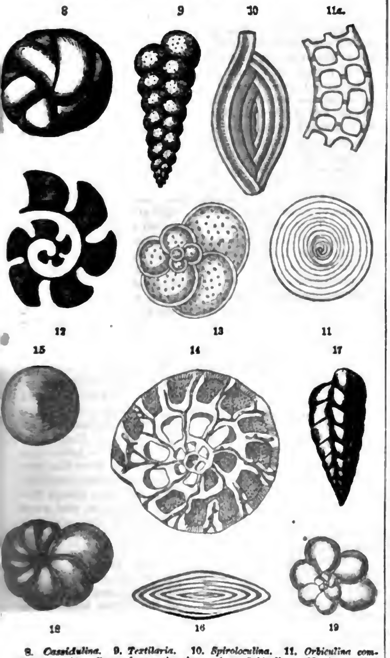
1. *Orbulina universa*. 2. *Lagena striata*, var. *perlucida*. 3. *Dentalina communis*; Chalk. 4. *Operculina*. 5. *Cristellaria Lyonsi*; Chalk. 6. *Faujasina*. 7. *Spirolina*.

In the *Entomostega* the shell is spiral as in the *Helicostega*, but instead of each chamber being equilateral, it has a larger and a smaller side, the position of which is alternately reversed as the segments are multiplied. (*Cassidulina*, *fig.* 8.)

In the *Enallostega* the new segments are arranged alternately on opposite sides of a central line, so as to form two parallel, non-spiral, alternating series (*Textilaria*, *fig.* 9), the segments being connected by a single orifice.

The *Agathistega* present an entirely different aspect, as well as structure, from the rest of the *Foraminifera*. They are much less transparent than the majority of the other orders, being composed of a material resembling white porcelain, and which presents a rich amber-brown hue when viewed by transmitted light. They are usually more or less oblong, and as each new segment is equal to the entire length of the shell, it follows that the terminal orifice presents itself alternately at its opposite extremities. Sometimes the new segments are spread out in one uniform plane (*Spiroloculina*, *fig.* 10), at other times each new segment instead of being exactly opposite its neighbour, is a little on one side of it; consequently the chain of segments is wound round the primary central one, as the thread is around a ball of worsted. (*Quinqueloculina, Triloculina.*)

In the great majority of the species the interior of each chamber is simple and undivided, but there are some forms, especially amongst the *Helicostega*, in which the newer and more external chambers are subdivided either by transverse pillars or by complete partitions perforated by one or more apertures, through which prolongations of the gelatinous substance unite the various segments of the soft animal. (*Orbiculina, fig.* 11.) Ordinarily but one such chain of communications exist (animal of *Rosalina, fig.* 12); but in the cases just referred to, there is a great increase in the number of such orifices, so that the septa become completely cribriform. The distribution of these apertures affects the gemmation or mode of growth, since it is through them that the new segments are successively formed, the gelatinous substance being extended by a process of budding or sprouting. An increase in the number of such orifices is most common where the consecutive segments present a rapid increase in their size. In the genus *Orbiculina*, this growth is sometimes so remarkable that the new segments soon form concentric circles, embracing all those previously formed. (*Orbiculina complanata, fig.* 11.) In such examples the connecting apertures are distributed round the entire periphery, and gemmation most probably takes place simultaneously through them all; so that the soft animal, if decalcified by an acid, would present a succession of rings, inclosing one another, and connected together by transverse radiating bars.



8. *Cassidulina.* 9. *Textilaria.* 10. *Spiroloculina.* 11. *Orbiculina complanata.* 11a. Part of two chambers of an *Orbiculina.* 12. Decalcified animal of a *Rosalina.* 13. *Rosalina globularis*, viewed as a transparent object showing the foramina. 14. Horizontal section of Fig. 6, showing the internal system of tubes. 15. Fossil *Nummulina.* 16. Vertical section of Fig. 15. 17. *Verneuilina tricarinata*; from the Chalk. 18. *Rosalina Lornearia*; from the Chalk. 19. *Globigerina cretacea*; from the Chalk.

The memoirs of Professor Williamson have shown that the shell inclosing each new segment is at first very thin; but as additional calcareous chambers are formed, each such addition not only encases the new gemmation of the soft animal, but extends over all the exterior of the previously-formed shell. The exact way in which this is accomplished is doubtful; but it is probable that the soft animal has the power of diffusing itself over the shell, and depositing upon its surface additional layers of calcareous matter.

The foramina in the calcareous shell present various appearances. Sometimes they are large and conspicuous (*Rosalina globularis*, fig. 13); at others they are so small that their existence is only to be demonstrated by means of high magnifying powers. Through these foramina, long delicate processes of the soft animal, termed pseudopodia, are protruded. The exact use of these, whether for tactile, prehensile, and locomotive purposes, or for the imbibition of nutritive fluid, is not very clear; but they very probably fulfil in some degree each of these functions. They may be regarded as analogous to the prolongations which the Proteus Animalcule (*Amœba*) extends in various directions; only in the *Foraminifera* these organs are more delicate as well as more uniform in thickness than in the shell-less creature referred to.

Professor Williamson has also demonstrated the existence in several species of a curious system of interspaces and branching tubes, which ramify amongst the calcareous layers forming the walls of the shells. (Horizontal section of *Faujasina*, fig. 14.) These are especially obvious in the genera *Faujasina*, *Operculina*, and *Amphistegina*. The tubes open at the exterior of the shell, especially at the peripheral margins, either by a few large or by numerous small apertures. These canals are probably designed to admit water to the interior segments of the animal, with which they communicate through the minute foramina. In some cases the pseudopodia are protruded through such of these canals as are situated in the umbilical region; but these appear to be exceptional instances.

The relations of the *Foraminifera* to Palæontology render them interesting objects to the geologist. Many of the more recent calcareous strata chiefly owe their origin to the accumulation, through successive ages, of these minute atoms. The white chalk rocks are mainly composed of them; vast ranges of Tertiary strata present the same characteristic features; and though the older limestones have been so altered by pressure and chemical agents that their origin is less clear, there are many indications that they have primarily resembled the rocks of more recent age—an inference that is rendered probable by the great extent to which sediments now accumulating in the bottom of the sea are charged with these little organisms, and in some cases entirely composed of them.

The fossil *Foraminifera* are chiefly distinguishable from recent ones in the greater prevalence of specimens of comparatively large size. Though one recent species was brought from Borneo by Sir E. Belcher measuring more than two inches in diameter, the living forms usually range from the $\frac{1}{4}$th to the $\frac{1}{100}$th of an inch. But the Tertiary strata of the earth abound in examples of the fossil genus Nummulite (*Nummulina*, fig. 15), so called from their resemblance to coins, which vary from $\frac{1}{4}$th of an inch to the size of half-a-crown. These are often so abundant as to form mountain masses, extending through the Alps, Northern Italy, Greece, Syria, Egypt, and Northern India. The Mokkadam Mountains in Egypt, where the stone used in building the pyramids was obtained, chiefly consist of these Nummulites which are known to the natives by the name of Pharoah's Pence.

The structure of the Nummulites has been investigated by Messrs. Jolie and Leymerie, and especially by Dr. Carpenter, whilst the specific forms have been studied by M. D'Archiac. The genus belongs to the group of the order *Helicostega*, in which the outer convolutions completely embrace the earlier-formed ones; hence it is only by making microscopic sections, or thin slices, that their structure can be fully seen. When such a section is carried horizontally through the centre of the shell the segments present a spiral arrangement; they as well as the convolutions being remarkable for their small size and consequent great number. In other respects they present few or no essential differences distinguishing them from more recent forms. A still more curious genus, known by the name of *Orbitoides*, occurs in America, Switzerland, and India; in the former of which countries it appears largely to represent the Nummulites of the Old World. The labours of Dr. Carpenter have revealed a remarkable structure in this genus, but one that appears to have some recent representatives.

For *Fossil Foraminifera*, see FORAMINIFERA, FOSSIL, *S.* 1.

FORBES, EDWARD, a celebrated naturalist. He was born in 1815 in the Isle of Man, where his father was a banker. Without any one to direct his taste, he became a naturalist while yet a child. Nothing delighted him so much as to pick up the products of the shore of his native island, when as yet he could hardly read. By the time he was seven years of age he had collected a small museum. His first efforts at naming these objects were made through Turton's 'Translation of the Systema Naturæ of Linnæus.' Whilst yet a boy of twelve years old he had read Buckland's 'Reliquiæ Diluvianæ,' Parkinson's 'Organic Remains,' and Conybeare's 'Geology of England.' Such was the impression produced on his mind by the perusal of these works, that he ever afterwards attributed his taste for geological research to reading them. His first attempt at original work was the production of a 'Manual of British Natural History,' which, although it was never published, was the repository of many of his notes even to the close of his life. His habit of drawing the natural history objects which interested him, led him to think of painting as a profession, and with this object in view he studied for some time in the studio of the late Mr. Sass in Charlotte-street, London. This profession did not however comply with his restless desire to study the facts of natural history, and in 1832 he repaired to the University of Edinburgh with the object of studying medicine. Here under the teaching of Professors Jameson and Graham he first became acquainted with the true principles of natural science, and the views and objects of its cultivation. This fired his ambition to become himself an observer and add to the already accumulated stores of natural history facts. It was with this feeling that he started with a fellow-student on an excursion into Norway, where he made numerous observations on the rocks, plants, and *Mollusca* of the country, and afterwards published the result of his observations in a paper in the 'Magazine of Natural History,' entitled 'Notes of a Natural History Tour in Norway.'

At this early period of his natural history career he had recognised the importance of the dredge as an instrument of his research, and in his hands this simple instrument became as powerful a means of research as the telescope to the astronomer. With it he swept the bottom of the ocean, measured its depths by the character of its inhabitants, and discovered a law for the distribution of marine plants and animals in depth, as strict as the law which regulated their distribution on the altitude of mountains. His early papers, entitled 'Records of the Results of Dredging,' were published in the eighth and ninth volumes of the 'Magazine of Natural History.' Much of his student time was spent upon the sea in the neighbourhood of Edinburgh, and scarcely ever did he make a dredging excursion, so new was the operation to the naturalist, without adding some new form or species to his increasing collection of natural objects. His attention was not at all however exclusively confined to marine zoology. Plants were always favourite objects, and no student enjoyed more or profited more largely by the botanical excursions of the late Professor Graham. This habit of excursionising he held constituted a most important element in botanical study, at once invigorating the body, and giving the student a knowledge of the relation of plants to other objects which they could not otherwise obtain. Whilst he held the chair of botany at King's College, London, he never neglected periodical excursions with his students. He was mainly instrumental in 1836 in establishing the Botanical Society of Edinburgh, of which he became the foreign secretary. In 1837 he visited Paris, attended the lectures of the Professors there, and worked in the museum and collections in the Jardin des Plantes. In the same year he visited Algiers and the coasts of the Mediterranean. In 1838 he published an account of the 'Mollusca of the Isle of Man,' and in 1839 papers on the 'Land and Freshwater Mollusca of Algiers,' and on the 'Distribution of the Pulmonifera of Europe.' In these researches he was laying the foundation for the enlarged views, which he afterwards put forth, with regard to the distribution of the genera and species of animals and plants in time and space.

His papers from this time became very numerous. The materials he accumulated in his various excursions were truly astonishing, and he lived to publish but a comparatively small proportion of them.

In 1841 he published a 'History of British Star-Fishes,' containing accounts of several new species, with charming descriptions of the habits of these animals, and incidents connected with catching them, whilst the tail-pieces from his own pencil were worthy of a disciple of Bewick. In this year he accepted the appointment of naturalist to H.M.S. Beacon, commander Captain Graves, who was commissioned to bring from Lycia the marbles discovered by Sir Charles Fellows. Here new fields were opened up to him. For the first time the resources of a ship of war were placed at the disposal of a naturalist. The result of this voyage was the discovery of the great law, that among marine animals zones of depth corresponded to parallels of latitude. This law was announced at the meeting of the British Association held at Cork in 1843. The detailed results of this voyage were never given to the world, and Forbes always looked forward to the day when a little leisure would permit him to publish in detail his researches. But he had to work for his daily bread, and, to the disgrace of his country, no position was provided for him in which the necessary leisure could be found, till it was too late.

Other results came out of his Lycian excursions. In conjunction with Lieutenant, now Captain, Spratt, he published his travels in Lycia, with numerous illustrations made from his own drawings, and notes on the natural history of the Ægean.

It was in Lycia that he contracted the same form of remittent fever which killed one of his companions, the Rev. Mr. Daniell, and from the effects of which he suffered to the day of his death.

Whilst away in the Ægean, he was appointed to the Professorship of Botany in King's College, London, vacated by the death of Mr. David Don. Although he had resolved on a visit to Egypt and a dredging excursion to the Red Sea, the offer of a chair in London was too much in accordance with his tastes to refuse. He now deliberately gave up the medical profession, and became a naturalist for the rest of his life. He gave his first lecture in May 1844, and in the same year he was appointed assistant secretary to the Zoological Society. Both situations contributed to the development of his genius, for whilst the professorship compelled him to arrange and systematise his knowledge, and developed his power of communicating its results, the secretaryship afforded him a means of extending his acquaintance with fossils, and the relations of extinct with recent forms of both animals and plants. These offices however preceded one more important still, that of palæontologist to the Geological Society of Great Britain. When the Museum of Economic Geology was removed to Jermyn-street, and the School of Mines founded, he was appointed professor of natural history. Although prevented by these appointments from publishing all he had already stored up, he added here fresh stores to his stock of knowledge; and numerous memoirs and papers in the Natural History Journals, the Proceedings of the Zoological Society, and the Transactions of the Geological Society, attest his great observing powers and unwearied industry. One of the most important of these papers is entitled 'On the connection between the distribution of the existing Fauna and Flora of the British Isles, and the geological changes which have affected their area.' This paper attempts to explain the distribution of the plants and animals of the British Islands, on the hypothesis that they were all diffused from a common centre, and that consequently they must have been disseminated when these islands were continuous with those countries where the identical species are found. He then brings forward geological evidence to support his assertions, and even goes so far as to point out the fact, that at one time, and that recently, dry ground existed between the south-western portions of the British Islands and America.

In 1854 Professor Forbes was elected president of the Geological Society. In the same year he accepted the chair of Natural History in the University of Edinburgh. He was president of the geological section of the British Association which met at Liverpool in September. He died on the 18th of November in the same year. The Edinburgh chair was the object of his highest ambition. The increasing years of Professor Jameson rendered it not improbable even when he was a student that he might one day hope to fill this honourable post. He commenced the duties of his new position with his usual ardour, laid down a course of action which would have required years of development, but he had barely time to deliver a preliminary summer course before he was seized with a disease of the kidneys which proved fatal in a few days.

Besides the works to which reference is made above, he was the associate of Mr. Hanley in a great work on the 'History of British Mollusca,' which was published in parts, and completed in 1853. This work is one of the most complete and exhaustive on the subject of our native Mollusca, and all the descriptions were written by Forbes. He contributed several valuable papers and maps on the distribution of animals and plants to the last edition of Johnston's 'Physical Atlas.' He also indulged in general literature, and the world was somewhat surprised after his decease to find that for some years he had been a contributor to the review department of the 'Literary Gazette.' His papers were collected together by the editor, and published under the title of 'Literary Papers by the late Edward Forbes.' The third volume of the 'Bibliographia Geologia et Zoologia' of Agassiz and Strickland, published by the Ray Society in 1850, contains a list of eighty-nine papers and works supplied by the author himself, and arranged in chronological order. His contributions to natural history science were perhaps more numerous during the last four years of his life than during any former period of the same length. Few men have laboured more assiduously in the path of natural science, or produced a greater impression on the current thought of those who cultivated the same branches of knowledge as himself; and the time has not yet arrived when a clear estimate can be made of the influence he has exerted upon the time in which he lived.

FORDINGBRIDGE. [Hampshire.]

FORESTALLING. This offence, long obsolete, has at length, with others of the same character, ceased to exist. (7 & 8 Vict. c. 24.)

FORGET-ME-NOT. [Myosotis, *S.* 1.]

FORMICA, a genus of Insects belonging to the family *Formicidæ*. It is distinguished by having the foot-stalk of the abdomen composed of a single joint, the mandibles triangular, and denticulated at the edge. The females are destitute of a sting. This genus comprises about a dozen British species, the largest of which is the Hill-Ant or Horse-Ant, *F. rufa*. The neuters in this species are about one-third of an inch long, of a black colour, with the thorax, abdominal scale, and a large part of the head, red. It makes its large conical nest in the open ground, in woods, &c., amassing together large quantities of sticks, straws, &c. For a description of these nests see Ant.

F. sanguinea is of a blood-red colour, with the eyes and abdomen black, and the wings dusky at the base. The neuter is similarly coloured, except that the head is darker. The male is black, with red legs. This species burrows in wood, and is one of those which steals the young of other species, rearing them to perform the duties of the nest. Two of the species subject to these marauders are *F. cunicularia* and *F. fusca*, both of which are inhabitants of this country. The latter species is of a shining black colour, with a slight ashy tinge; its form is rather long, and it is nearly smooth; the three or four basal joints of the antennæ are of a red colour, as are also the legs; the abdominal scale is large and triangular; and the ocelli are distinct. It establishes its nest under stones, moss, &c., and at the foot of trees, the nest being entirely under ground.

Among the exotic species of this genus are to be found many which are extremely injurious or annoying in their habits. Of these the Sugar-Ant of the West Indies is perhaps the most extensively prejudicial. *F. saccharivora*, as it is called, establishes its nest at the root of sugar-canes, lime-trees, and lemon-trees, where it loosens the earth so that the trees are either blown down by the violent gales, or so completely deprived of nourishment at the roots that they soon die. Some years ago the injuries committed by this insect were so great that a reward of 20,000*l.* was offered by the planters to any one who should discover an effectual mode of destroying them, yet nothing could be found to stay their ravages. The aid of fire was even resorted to in vain; the insects rushed into the flames in such myriads as to extinguish it. Heavy torrents of rain at last effected their destruction.

F. indefessa, another exotic species, is described by Colonel Sykes as being an extraordinary instance of the operations of instinct in so low a form of animal life. The fondness of these insects for sweet substances is very great, and their attacks on such things were resisted in every possible manner, yet although the table, on which the confectionary and sweets were, was placed with its legs in water and removed a short distance from the wall, they succeeded in reaching them, to the great astonishment of all, until the mode of access was discovered. Colonel Sykes says, "I observed an ant upon the wall about a foot above the level of the sweets; it fell, and instead of passing between the wall and the table and alighting upon the ground it fell upon the table." Others followed its example with similar success; and it was no longer a matter for doubt as to how they continued to swarm in such numbers about their favourite food, however carefully guarded.

FORMICIDÆ, an extensive family of Hymenopterous insects, belonging to the section *Aculeata*, and to the subsection *Heterogyna* of Latreille, comprising the Linnæan genus *Formica*, or the numerous tribes of Ants. The family is distinguished by the wingless state of their abortive females, by the great length of the basal joint of the antennæ in the females and the neuters, in which they are elbowed at the extremity of this joint, and by the first or the first and second joints of the abdomen being knotted; the upper lip of the neuters is large, horny, and perpendicular, falling between the jaws; the eyes are rounded, or oval and entire; the jaws are large in many of the species, the form of these organs varying greatly in many of the species. In their structural character the *Formicidæ* resemble the *Tiphiæ* and *Doryli* belonging to the section of the Sand-Wasps. The neuters are smaller than the males, and these are smaller than the females; the abdomen in the first and last of these sexes is composed of six segments, in the male of seven. The females and neuters are furnished with a sting in many of the species. Those species which have stings emit an irritating fluid into the wounds which they make, while the stingless species discharge a red transparent fluid on to the skin, causing painful blisters.

The various genera of this family, according to Latreille, are: — *Formica*, *Polyergus*, *Ponera*, *Myrmica*, and *Atta*. This last genus differs from *Myrmica* only in having very short palpi; the head of the workers is generally very thick. *Acephalota* is the Visiting Ant of the West Indies.

FORMYLE. [Chemistry, *S.* 2.]

FORRES. [Elginshire.]

FORSTER, FRANK, civil engineer, was born in the year 1800, near Newcastle-upon-Tyne, and at an early age was put to learn the business of a colliery viewer, or mining agent. After some years, he was intrusted with the management of mining works near Swansea; and he was afterwards similarly engaged in Lancashire. Whilst thus occupied, about the year 1830, he became acquainted with Mr. Robert Stephenson, under whom he was ultimately employed in the superintendence of some of the most difficult works on the London and Birmingham railway, inclusive of the Kilsby Tunnel and the Blisworth Cutting, and somewhat later he was resident engineer of the portion of the Chester and Holyhead railway, from near Conway to Holyhead, including the masonry of the Britannia Bridge, and difficult works in sea-walls and tunnels along the line. On the formation of the Metropolitan Commission of Sewers, Mr. Forster was appointed chief engineer, and was instructed to furnish a general scheme of London sewerage, for which many plans had been sent in to an invitation some time previously. He very soon suffered from the effects of the arduous duties thrown upon him, and which were rendered more difficult by numerous contending opinions and interests. He himself was freely animadverted upon by the press, and he was at length compelled to resign his appointment, and died suddenly a few weeks afterwards, on the 13th of April 1852, in his fifty-second year. His reports and plans, with reference to the drainage of the north of London remain, and are understood to have formed the basis of the schemes now under consideration, and in which a partial commencement of work has been made.

FORTOUL, HIPPOLYTE, late Minister of Public Instruction in France, was born in 1811. He commenced active life as a literary man by contributions to the 'National,' 'L'Artiste,' and other periodicals. In the earlier part of his career he professed republicanism and St. Simonianism, and was befriended by Béranger the poet, of whom, in 1830, he published a biography. He was a contributor to the 'Revue de Paris,' and was an unsuccessful competitor for the editorship of the 'Revue des Deux Mondes.' Meantime, by laborious private study, he step by step attained to university honours. He was made Professor of Literature in the university of Toulouse, where he distinguished himself as a lecturer, and was afterwards recompensed for his services by being appointed Dean of the Faculty of Art. He was also admitted into the French Academy in the section of Belles

Lettres. After the revolution of 1848 he was elected a member of the French National Assembly, in which he spoke frequently, and obtained the favour of the Prince President. Immediately after the coup d'état he was appointed, December 3, 1851, Ministre d'Instruction Publique et des Cultes, and was one of the six ministers who signed the decree for the confiscation of the estates of the house of Orleans. He made himself extremely unpopular with the literary classes of France by the decision and energy with which he carried out the imperial system of restriction of the press. He had gone to Ems for the benefit of his health, when he died suddenly as he was conversing with his colleague M. Magne, on the 7th of July 1856. By a decree of the Emperor he was buried at the public expense, with the firing of guns, processions, and other honours, on the 12th of July, in the church of St. Thomas d'Acquin, Paris.

FORTROSE. [Ross and Cromatry.]

FOSSORES. [Hymenoptera.]

FOSTER, JOHN, architect, was born about the year 1786 or 1787, and was the son of a builder of the same name, who carried on a large business in Liverpool where he also acted as architect and surveyor to the corporation, and as engineer to the docks. Foster junior was the second of six sons. According to one account furnished to us, he became a pupil of James Wyatt; and from other information it would seem that he was also employed under Jeffry Wyatt, afterwards Sir Jeffry Wyattville. In 1809 he went abroad; was during some time with Mr. Cockerell at Ægina and Phigaleia; and was concerned in the excavation of the Æginetan and Phigaleian marbles. The portico at Ægina—that of the temple of Jupiter Panhellenius—became a favourite model with him in his later practice as an architect. He did not return to England till 1816 or 1817, having in the meanwhile, at Smyrna, married a Greek lady of that place. However, about the time mentioned, he settled at Liverpool; and for some years afterwards carried on the building business, in partnership with a brother, under the firm of John Foster and Co.—his father having withdrawn, but retaining his professional appointments with the corporation and dock trustees. It does not appear that the numerous buildings in which Foster, senior, was concerned, were erected from his own designs; Foster, junior, however, had received better education in art; and for some time, besides his building trade, had considerable practice as an architect. St. John's Market, in Liverpool, a covered area of little short of two acres, and one of the earliest works of its character, was commenced in 1820, "from the designs of Mr. John Foster, the corporation-surveyor of the day, and was completed and opened in 1823." ('The Architectural History of Liverpool,' paper by Mr. J. A. Picton, read at the Liverpool Architectural Society; see 'The Builder,' vol. xii. p. 231.) It is probable however that such architectural design as there is in the work was due to the younger Foster, who with his partner carried on the erection of the principal Liverpool buildings. But Foster, senior, having been compelled by ill-health to resign his several appointments, Foster junior was appointed in February 1824 corporation architect and surveyor, receiving a salary of 1000*l.* per annum, conditional upon withdrawal from the building business. When the Municipal Reform Bill came into operation in June 1835, much of the influence of the Foster family was brought to an end, and John Foster retired with a compensation of 500*l.* per annum, and did not afterwards follow his profession.

Few architects have had opportunities similar to those of John Foster. It may however be questioned whether he succeeded in turning these to proper account. That he had acquired a large stock of architectural knowledge cannot be doubted; but, like many of his contemporaries, he missed the special beauty of *art* in architecture in his manner of using the Greek models; and perhaps there is no town which now so well affords illustrations of two different systems of practice, as does Liverpool in some of the works of Foster and the great work of Elmes. [Elmes, Harvey Lonsdale, *S.* 2.]

Amongst Foster's works is the church of St. Michael, Pitt-street, commenced in 1816, though not completed till 1826; it is of exceptional character, having a portico and steeple obviously adapted from the church of St. Martin's-in-the-Fields in the metropolis, but is by many considered his best work. The church for the School of the Blind first erected in Hotham-street, and since removed and re-erected in Hardman-street, is described as originally presenting a somewhat imposing effect in its Grecian Doric columns. This has been impaired by alterations in the removal. The small chapel of St. James's cemetery in the same style, has a better effect from its site near the edge of the rock,—in that particular really adopting certain good Greek principles of art. The Custom House, though a very large building, is of little merit in point of art. It has a portico, as it has been pointedly remarked, advanced from each of its sides except that on which the sun shines. "There are no indications," says Mr. Picton, "such as are stamped on every line in St. George's Hall, of careful study and creative power." The screen of the Railway Station in Lime-street, built about the year 1835, is of more florid character. It has attached Corinthian columns, and is not without merit.

Foster died on the 21st of August 1846, after a long and painful illness. He was a Fellow of the Royal Society; was undoubtedly possessed of great architectural knowledge; holds an important place in the recent history of architecture, but perhaps deserves commendation for his general good qualities, rather than for high powers as an *artist*-architect.

FOULSHAM. [Norfolk.]

FOX-TAIL-GRASS. [Alopecurus.]

FRANCE. The 86 departments into which France is divided are subdivided into 363 arrondissements, 2847 cantons, and 36,835 communes, which, except that they have a corporate form of government, do not generally differ much in extent from parishes. Each department is administered by a prefect; each arrondissement by a sub-prefect; and each commune by a mayor (maire). In each department there are also several officers connected with the arrangement and receipt of taxes, an engineer of roads and bridges, a military sub-intendant, and a company of gensdarmes. In the chief towns of departments courts of assize are held; each arrondissement has its tribunal of first instance, and each canton a judge of the peace. The more important departmental capitals are seats of high courts of justice and appeal, and head quarters of Military Divisions.

In the following table the area and population of each of the 86 departments is given as returned in the official census of 1851:—

Department.	Area in Sq. Miles.	Population in 1851.
Ain	2,242·0	372,939
Aisne	2,843·0	558,989
Allier	2,821·8	336,758
Alpes (Basses-)	2,679·9	152,070
Alpes (Hautes-)	2,136·8	132,038
Ardèche	2,133·8	386,505
Ardennes	2,021·6	331,296
Ariège	1,889·6	267,435
Aube	2,317·2	265,247
Aude	2,436·7	289,747
Aveyron	3,384·4	394,183
Bouches-du-Rhône	1,984·9	428,989
Calvados	2,131·6	491,210
Cantal	1,999·2	253,329
Charente	2,295·6	382,912
Charente-Inférieure	2,626·9	469,992
Cher	2,779·8	306,261
Corrèze	2,265·0	320,864
Corse	3,377·5	236,251
Côte-d'Or	3,382·7	400,297
Côtes-du-Nord	2,659·0	632,613
Creuse	2,150·0	287,075
Dordogne	3,536·8	505,789
Doubs	2,019·0	296,679
Drôme	2,519·2	326,846
Eure	2,689·4	415,777
Eure-et-Loir	2,208·7	294,892
Finistère	2,593·8	617,710
Gard	2,260·5	408,163
Garonne (Haute-)	2,431·0	480,794
Gers	2,424·9	307,479
Gironde	3,760·9	614,387
Hérault	2,393·1	389,286
Ille-et-Vilaine	2,597·5	574,618
Indre	2,629·7	271,938
Indre-et-Loire	2,360·6	315,641
Isère	3,201·1	603,497
Jura	1,928·3	313,299
Landes	3,599·1	302,196
Loir-et-Cher	2,452·2	261,892
Loire	1,841·8	472,588
Loire (Haute-)	1,916·0	304,615
Loire-Inférieure	2,654·3	535,664
Loiret	2,612·1	341,029
Lot	2,012·8	296,224
Lot-et-Garonne	2,067·3	341,345
Lozère	1,994·9	144,705

Department.	Area in Sq. Miles.	Population in 1851.
Maine-et-Loire	2,751·3	515,452
Manche	2,291·0	600,882
Marne	3,158·6	373,302
Marne (Haute-)	2,401·6	268,398
Mayenne	1,993·1	374,566
Meurthe	2,353·0	450,423
Meuse	2,405·9	328,657
Morbihan	2,626·8	478,172
Moselle	2,073·3	459,684
Nièvre	2,632·0	327,161
Nord	2,193·5	1,158,285
Oise	2,260·5	403,857
Orne	2,355·6	439,884
Pas-de-Calais	2,550·5	692,994
Puy-de-Dôme	3,072·8	596,897
Pyrénées (Basses-)	2,943·3	446,997
Pyrénées (Hautes-)	1,748·4	250,934
Pyrénées-Orientales	1,591·4	181,955
Rhin (Bas-)	1,756·9	587,434
Rhin (Haut-)	1,585·8	494,147
Rhône	1,077·4	574,745
Saône (Haute-)	2,064·5	347,469
Saône-et-Loire	3,306·7	534,720
Sarthe	2,396·2	473,071
Seine	183·6	1,422,065
Seine-et-Marne	2,281·7	345,076
Seine-et-Oise	2,163·5	471,882
Seine-Inférieure	2,332·7	762,039
Sèvres (Deux-)	2,316·5	323,615
Somme	2,378·4	570,641
Tarn	2,218·5	363,073
Tarn-et-Garonne	1,436·6	237,553
Var	2,790·0	357,967
Vaucluse	1,372·4	264,618
Vendée	2,596·6	383,734
Vienne	2,692·4	317,305
Vienne (Haute-)	2,130·3	319,379
Vosges	2,347·6	427,409
Yonne	2,868·0	381,133
Total	204,952·9	35,781,628

According to the census of 1851, the population of France was divided into—Roman Catholics, 34,931,032; Réformés, 280,507; Luthériens, 267,825; Jews, 73,995; other religions, 26,328. Of the rest the religion was unknown.

The population of France at the commencement of the 18th century was about 19,669,320, exclusive of Corsica and part of Lorraine, which were not then united to France. In the year 1762 the population had increased to 21,769,163, inclusive of Corsica and the whole of Lorraine. In 1784 it had further increased to 24,800,000.

The population, according to the different census returns of the present century, has been stated to be as follows:—

1801	27,349,003	1836	33,540,910
1811	29,092,734	1841	34,230,178
1821	30,461,875	1846	35,401,761
1831	32,569,223	1851	35,781,628

The population of the French colonies in 1851 was as follows:—

	Pop. 1851.
Asia.	
Pondichérie	96,712
Karikal	59,872
Yanaon	6,464
Maké	3,419
Chandernagore	31,396
Total	197,863
Africa.	
Algérie	2,880,383
(In 1857 the Europeans were 167,670.)	
Senegal and Dependencies (1857)	29,682
Gorée and Dependencies	3,197
Réunion (Île de Bourbon)	10,826
Ste. Marie	5,839
Mayotte	6,888
Nossi Bé, &c.	15,178
Total	2,951,993
America.	
Martinique	123,701
Guadaloupe, &c.	132,810
Guyane	17,896
St. Pierre and Miquelon	2,226
Total	276,563
Australasia.	
Marquises	20,000
Nouvelle Calédonie	60,000
Total	80,000

According to the budget of 1858, the total receipts of the public revenue of France amounted to 1,717,156,190 francs (about 68,686,000*l.*); the expenditure to 1,737,115,171 francs, the expenditure thus exceeding the income by 19,958,881 francs.

In 1856, the entire army of France amounted to 577,536 men, of whom 310,347 were in France, 64,235 in Africa, 197,597 not then returned from the Russian war in the East, and 5357 in Italy.

In 1857, the total number of vessels comprising the navy of France amounted to 353, of which there were 10 of 120 guns, 10 of 100 guns, 15 of 90 guns, 5 of 80 guns, 17 of 60 guns, 17 of 50 guns, 16 of 40 guns, &c.

The constitutional monarchy and representative government which had prevailed in France under King Louis Philippe, the head of the younger branch of the Bourbons, were abolished by the republican revolution of 1848. A republic in form, governed by a president and a national assembly, the members of which were elected by ballot, with a suffrage all but universal, succeeded.

On December 2, 1851, Prince Louis Napoleon Bonaparte, President of the Republic, issued a decree dissolving the Legislative Assembly, establishing universal suffrage (the assembly had considerably restricted the suffrage), proposing a president for ten years, and a second chamber, or senate. On the 20th and 21st of December, the French people, by 7,439,216 affirmative votes against 640,737 negative ones, adopted a 'plebiscite,' or decree of the people, maintaining the authority of Louis Napoleon Bonaparte, and delegating to him the powers necessary for establishing a constitution on the bases proposed in the above proclamation. The power thus conferred upon the President resulted in the important state paper issued January 15, 1852, which contains the constitution under which France has since been governed.

According to this proclamation the President, while he retained that title, assumed more than royal authority. He is responsible to the people alone who had elected him, and not to a national assembly: the command of the land and sea forces, the exclusive initiation of new laws, the right to declare the state of siege, were among his leading attributes. A Senate was appointed, whose number was not to exceed 150, the members to be named for life by the President, who may also grant them salaries. A lower chamber, called the Legislative Body, consists of 261 members, one for every 35,000 electors, and chosen for ten years by universal suffrage, but without the ballot. The sittings of both chambers to be private; official reports only of the proceedings to be published. No member of either chamber has the power to originate any law; if amendments are adopted they must be sent to the council of state, and cannot be discussed if not also adopted by this body. The President convokes, adjourns, prorogues, and dissolves the Legislative Body. In case of a dissolution a new one is to be convoked within six months. The session of the chambers to last three months.

A council of state, composed of 40 or 50 salaried members, nominated and presided over by the President, draws up the projects of all laws. The Senate is not to be transformed into a court of justice. For crimes against the chief of the state and the public safety a high court (as above explained) is appointed. Ministers cannot be members of the legislature. Petitions may be addressed to the Senate, but none to the Legislative Body. The mayors of communes are appointed by the executive.

In this draught of the constitution the name of Republic was retained, and the title of President; but on December 2, 1852, in accordance with a decree of the Senate dated November 7, 1852, and a plebiscite carried by 7,839,552 votes against 254,401, the name of the government was changed, the Empire was re-established, and Louis Napoleon Bonaparte became Emperor of the French under the title of Napoleon III., the throne being hereditary to his legitimate male descendants, failing which, the succession rests in Prince Jerome Napoleon Bonaparte and his direct legitimate descendants in the male line by order of primogeniture. Since the establishment of the Empire some modifications have been made.

FRANKLIN, REAR-ADMIRAL SIR JOHN, was born in 1786 at Spilsby in Lincolnshire. His ancestors were substantial yeomen, and his father inherited an estate in that county, which though small was sufficient to give him local rank as a landlord. Unhappily, however, the property was so embarrassed that he was obliged to sell it, and he became entirely dependent on his commercial profits for the maintenance and education of twelve children, some of whom, besides the subject of this memoir, attained considerable rank and reputation. One, Sir Willingham Franklin, became judge at Madras; and another, Major James Franklin of the Bengal service, was highly distinguished for his scientific acquirements, which procured him the Fellowship of the Royal Society.

John, the youngest son, early evinced a great predilection for a sea-life. There is a story told of him which seems to rest on more than mere traditionary evidence. When a school-boy at Louth in Lincolnshire, he availed himself of a holiday to walk to the coast, a distance of twelve miles, in order to see the ocean, on which he gazed with wonder and delight for many hours. His father, who was extremely desirous that his son should follow any other profession than that of a sailor, conceived that by sending him in a small merchant ship to Lisbon, the discomforts of the voyage would effectually cure the lad of his love for the sea, but it had a totally different effect; and accordingly perceiving that he was bent on a naval profession, he was entered as midshipman on board the Polyphemus at the age of fourteen, and was in that ship in the celebrated battle of Copenhagen, from which he escaped without a wound, whilst a brother midshipman was killed at his side.

He next joined the Investigator, under the command of Captain Flinders, his cousin by marriage, with whom he sailed on a voyage of discovery to the coasts of Australia. During this expedition, which combined investigations into natural history with geographical discovery, young Franklin had abundant opportunities—which were not neglected—of acquiring much valuable knowledge. Besides sound practical seamanship he learned the more theoretical and difficult branches of nautical surveying, and was always one of the midshipmen selected to attend the Captain whenever he made excursions in boats, or visited the shore for scientific purposes. After some time the Investigator being unfit for further service, the officers were ordered home in the Porpoise. In this ship he was wrecked on a coral reef off the Australian coast, and with 94 persons spent nearly two months on a narrow sandbank only a few feet above the sea level, whilst Captain Flinders proceeded to Port Jackson for relief.

Having fortunately escaped the fate of his chief, who on his voyage home was unjustly detained as a prisoner in Mauritius, Franklin proceeded to Canton with Captain Fowler, who had charge of the Porpoise, and embarked on board the Earl Camden, commanded by Sir Nathaniel Dance, for the purpose of returning to England. This ship and other Indiamen were attacked by the French admiral, Linois, in the Straits of Malacca, but Sir Nathaniel Dance gallantly defeated his antagonist. During the engagement Franklin acted as signal midshipman, and was of considerable service in other ways.

Shortly after his arrival in England he was appointed to the Bellerophon, Captain Laing, and had the charge on board that ship of the signals during the memorable battle of Trafalgar. It is recorded that he performed this important duty with singular coolness and intrepidity, although many of his brother officers were shot around him. Indeed, out of forty companions, only seven, of whom he was one, came out of the battle unscathed. He now served for two years with the Channel fleet and Rochefort squadron, and then joined the Bedford, in which ship he was present at the blockade of Flushing,—off the coast of Portugal,—on the Brazil station, and at the attack of New Orleans in 1814. Here he greatly distinguished himself in a gun-boat action, in the course of which he received a slight wound. For his gallant conduct on this occasion he was promoted to the rank of lieutenant.

Peace having been established, the attention of Government was turned to Arctic discovery, which had been interrupted during the long war; and in 1818 commenced the brilliant and remarkable series of Arctic expeditions with which Franklin's name is so honourably associated. The scientific knowledge he had acquired when serving under Captain Flinders, was now of great benefit to him, and Sir Joseph Banks, who at that time presided over the Royal Society, and who took great interest in Arctic matters, recommended him to the Admiralty as a proper officer to be employed in Arctic exploration. Accordingly Franklin commenced his Arctic career by commanding the Trent, which ship, with the Dorothea, commanded by Captain Buchan, formed an expedition appointed to sail from Spitzbergen across the supposed Polar Sea.

Unhappily the Dorothea in lat. 80° 34′ N. became disabled, but Lieutenant Franklin, with a gallant disregard of danger, earnestly requested to be allowed to proceed alone in the execution of the service. The nature of Captain Buchan's instructions prevented this, and the ships returned to England.

Franklin's conduct and aptitude for the peculiar service of Arctic enterprise brought him into prominent notice, and he was intrusted in 1819 with the command of his first overland expedition for the purpose of tracing the coast-line of the North American continent, at that time very imperfectly known. Descending the Coppermine River the party surveyed a large portion of the coast east of the mouth of that river, during which they underwent frightful privations and trials, the history of which, as told in Franklin's own manly and unaffected language, is undoubtedly one of the noblest pictures of heroic exertion and patient endurance ever presented for our admiration. The results of the labours of Franklin and of his distinguished associate Sir John Richardson, in this memorable journey, deserve more full and fitting recognition than can be attempted on this occasion: the party travelled 5550 miles, mostly over ground previously unknown, and large acquisitions were gained for science by the careful study of the physical geography and natural productions of the North American continent.

For his services on this occasion he was promoted to the rank of captain, having while absent risen from lieutenant to commander. In 1823 he was elected a Fellow of the Royal Society, and served on the council of that body.

Undeterred by the appalling sufferings he had already undergone, Franklin, although lately united in marriage to the youngest daughter of William Porden, Esq., again volunteered his services for Arctic exploration. These were accepted, and in 1825 he left England on his second land exploration. Descending the Mackenzie River, he traced the North American coast from the mouth of the Coppermine River to the 150th meridian. For these fresh services he received the honour of knighthood, and had the degree of D.C.L. conferred on him by the University of Oxford. He also received the Gold Medal from the French Geographical Society, and was elected a Corresponding Member of the Institute of France.

Sir John Franklin now remained at home two years, when he was appointed to the Rainbow, and served in that ship in the Mediterranean for three years. He was chiefly employed in the Greek waters, and had the good fortune to be of considerable service in the delicate adjustment of complicated diplomatic relations. It is worthy of remark, as illustrative of the amiability of Franklin's character, that the sailors who then served under him named the ship the 'Celestial Rainbow' and 'Franklin's Paradise.' During this period, as indeed on all other occasions, he eagerly availed himself of every opportunity, not only to improve his knowledge of geology, to which science he was greatly attached, but also used every exertion to add to the museum of the Geological Society, and to the private collections of scientific men.

After a brief period of rest which followed his services in the Mediterranean, he applied to Lord Glenelg for employment under the Colonial department, and his lordship in a very complimentary manner offered him the important post of Governor of Van Diemen's Land, which he held for seven years. During this time that colony received convicts, New South Wales having ceased to be a penal settlement. This rendered Sir John Franklin's position most onerous and trying, but he acquitted himself so entirely to the satisfaction of the colonists, that in grateful remembrance of his government, which was marked by the establishment of a college and a philosophical society, they, unsolicited, subscribed 1600*l.* towards the expenses of a private expedition fitted out for his rescue.

It might be supposed that, after so long a period of laborious services, Sir John Franklin would have desired repose, particularly as he had now attained high renown;

but his wishes still pointed towards active employment, and consequently, when the Arctic expedition was contemplated, which has cost him his life, he was willing to take the command, when the Admiralty were of opinion that he was the officer best fitted to act as chief. That expedition was originated by the late Sir John Barrow, secretary to the Admiralty, who submitted a plan for the discovery of the North-West Passage to government, which, after having been referred to the council of the Royal Society was adopted.

The expedition, consisting of the Erebus and Terror, which had recently returned from a voyage of discovery in the Antarctic Sea, left England in May 1845. Unhappily its history and fate are still veiled in obscurity; this however, we know, that everything was done to render it efficient; that the officers under Sir John Franklin were men of experience and zeal, and that the last accounts received from them represent their commander animated by all the ardour and spirit which characterised his early Arctic exertions.

It would have been unjust to have expected less from such a man, and as his instructions contained the usual discretionary power given in these documents, there is too much reason to fear that he fell a victim to his daring attempts to achieve success. It will ever be a matter of regret, though it cannot be of surprise, that the discovery of traces of the Erebus and Terror at the entrance of Wellington Channel caused the search for our countrymen to be directed principally to the north and west of Barrow's Straits; because, although the information brought home by Dr. Rae in 1854, to the effect that Esquimaux had seen the bodies of forty white men in the spring of 1850 on what is supposed to be Montreal Island, at the mouth of the Fish River, cannot be regarded as trustworthy; yet the relics of the expedition procured by Mr. Anderson and Dr. Rae suffice to prove that Franklin's ships must have been beset within an area comprised within the 70th and 72nd parallels of latitude and the 97th and 100th meridians.

Another expedition, and doubtless the last, has been sent out by Lady Franklin, in order, if possible, to dissipate the mystery which still shrouds the fate of the Erebus and Terror, and their crews. The expedition left Aberdeen, July 1, 1857, in the Fox, a screw yacht, under the command of the distinguished arctic explorer, Captain M'Clintock.

FRANZEN, FRANS-MICHAEL, an eminent modern Swedish poet and prosaist, was born on the 9th of February, 1772, at Uleaborg, in Finland, at that time a province of the Swedish crown. Finland, both before and since its compulsory union with Russia, has been fruitful of poets to Sweden, though possessed of a language of its own of an entirely different character. Runeberg, at present the head of Swedish poetical literature, is a Finn, and the first effort of Franzén that attracted attention was his poetical eulogy on Creutz, also a Finn, who combined the unusual characters of a poet and a diplomatist, and passed much of his life as ambassador at Paris. The 'Atis and Camilla' of Creutz had introduced an ease and elegance, before unknown, into Swedish poetry, and the eulogy on its author by Franzén produced a commotion in the literary world of Stockholm, by the originality and vigour of its tone, which was in strong contrast to that of the school of Leopold, then dominant, who was an ingenious imitator of French models. The eulogy obtained, in spite of its originality, the great prize of the Swedish Academy. This was in 1794, at which time, and for nine years previous, Franzén had been a student at the Finnish university of Abo. In the following year he set out on a tour to Denmark, Germany, France, and England, and chanced to be a witness of the great fire of Copenhagen, which destroyed a third part of the city. In Paris he ventured on a piece of composition in French verse, which was printed in a French periodical, and which he reprinted thirty years afterwards in the introduction to his Swedish poem, founded on a tale of the revolution, 'Julie de St. Julien.' During his absence he was elected librarian to the University of Abo, and afterwards professor of literary history. After the transfer of Finland to Russia by the war of 1809, he resolved to remove to Sweden, where he remained for the rest of his life. At first he officiated as pastor of Kumla, in the diocese of Strengnäs, a parish remote from the capital, but he was afterwards minister of the church of Clara at Stockholm, where the poet Choræus had preceded him; and in 1834 he was chosen Bishop of Hernosand. While still a resident in Finland, he had been chosen one of the eighteen of the Swedish Academy; a distinction of the same importance for a literary man in Sweden, as to be a member of the Royal Academy here for an artist in England. In 1824 he became its secretary, and remained so for ten years, during which it was part of his duty to write a series of biographical notices, which were much admired for their literary merits. He appears to have resigned the secretaryship on his elevation to the bishopric, which he held till his death in October, 1847. Laing in his travels in Sweden gives an account of his meeting with Bishop Franzén on board of a steam-boat, when going on a visit to his northern diocese, and speaks of the general affection and veneration with which he was regarded.

Archbishop Wallin, Bishop Tegnér, and Bishop Franzén were three of the most distinguished poets of Sweden in the present century. They were all three associated in the new Swedish version of the Psalms, to produce which a commission was appointed in 1814, and respecting the excellence of which there is but one voice, it being generally regarded as the best in Europe. It is singular that so little reference has been made to this fact, in the frequent discussions that have taken place on the expediency of obtaining a new poetical version of the Psalms in English. The poetical works of Franzén were collected in five volumes, at Örebro in 1824 and subsequent years. The most successful are decidedly the songs and shorter pieces, many of the songs enjoying a high popularity both in Sweden and Finland. Their prevailing character is sweetness. The longer narrative poems, one of which 'Sten Sture,' extends to twenty cantos and fills an octavo volume, are of a somewhat dry simplicity, both of style and incident, approaching far too nearly to the level of prose. Franzén was regarded by Swedish writers as belonging to neither of the two rival schools of poetry in his time and country, the 'Academic' or Classical, and the 'Phosphoristic' or Romantic, but as standing at the head of a third or neutral party. His sermons, of which four volumes were published, are unusually animated; he was also the author of some controversial writings against the doctrines of the Rationalists, called forth by the controversy respecting Strauss's 'Life of Jesus.' The biographical sketches from his pen already mentioned, have been collected under the title of 'Minnesteckningar.' In the introductory speech before the Swedish Academy prefixed to them, the reader remarks a tone of courtly deference in speaking of Charles XIII., and even of the Russian government, to avoid living under which he left Finland, the absence of which would perhaps have inspired a higher notion of the dignity of Franzén's character.

FRASERBURGH. [ABERDEENSHIRE, *S.* 1.]

FRATERCULA. [AUK.]

FRINGILLA, a genus of Birds belonging to the order *Fringillidæ* and the division *Insessores*. The beak is straight, longer than deep, conic, and pointed; mandibles nearly equal, cutting edges entire, forming a straight commissure; nostrils basal, lateral, oval, partly hidden by the frontal plumes. Wings with the first quill-feather longer than the fifth, but a little shorter than the second or third, which are equal, and the longest in the wing. Legs with the tarsi of moderate length; toes divided, and adapted for hopping and perching; claws curved and sharp.

F. cœlebs, the Chaffinch. [CHAFFINCH.]

F. montifringilla, the Mountain Finch, Brambling, or Bramble Finch. This bird is a visiter to this country only in winter, coming to us from the north, but at different times, according to the temperature of the country from which it emigrates. They have not been known to breed in any part of this country; those kept in confinement under the most favourable circumstances have never done so. It is not an uncommon bird in Denmark. Mr. Hewitson saw them at one place in the southern part of Norway, where they were breeding. It is described as building in fir-trees; the nest formed of moss, and lined with wool and feathers; the eggs four or five in number, white, tinged with yellow, and spotted with dark red, like those of a chaffinch. The call-note of this bird is a single monotonous chirp.

FRUIT. In botanical language, that part of the plant which in the early stages of its growth is called the Pistil, and which contains the ovules or seed-buds, becomes the Fruit, when the ovules by the presence of the embryo, are changed into seeds. The Style and Stigma, when they still remain, retain their names, but the Germen is called the Pericarp. In this sense, there are of course some plants which have no fruit, because they are not provided with a Germen; these therefore have naked Seed-Buds, or Ovules, and also naked Seeds (Semina nuda); such as *Coniferæ*, *Cycadaceæ*, and *Loranthaceæ*. But there are some plants in which the germen is easily destroyed, so that the seed-bud is developed without an envelope to the seed: these, in order to distinguish them from the former, are termed Semina denudata, as in *Leontice* and *Peliosanthes*.

Fruits may be divided, according to the analogy of the flower, into Naked and Covered (Fructus nudus et Fructus tectus), according as the germen only appears to exist, as in *Lilium*, or as this is surrounded by other floral parts, as in *Nicandra*. When one pistil is developed into a fruit it is called a Simple Fruit (Fructus simplex), as in *Nigella;* when several, a compound or Multiple Fruit (Fructus multiplex), as in *Ranunculus*.

The parts of the Fruit are the Pericarp, the Spermophore, the Funiculus, and the Pulp.

The Pericarp is the transformed germen; sometimes it is united with the other persistent parts of the pistil, style, and stigma. The latter are seldom of particular importance; and all that need be said of them is that they are sometimes retained, as in *Papaver*, or they are more developed, as in *Pulsatilla*. The forms of the pericarp are exceedingly diversified, but admit of no general definition: they frequently exhibit hairs, prickles, protuberances, and membranous expansions (alæ), prominent ribs (costæ or juga), and pits in their interspaces (valleculæ), &c. The pericarp essentially determines the varied appearances of the fruit, by its diversity of structure. The parenchyma of the germen is developed in various ways. In the simplest cases, we find in the mature pericarp only the epidermis of both surfaces, and between these a uniform layer of parenchyma, without vascular bundles, as in the lower *Araceæ*, or traversed by a few simple bundles. In other cases only the epidermis of the external surface is perceptible, whilst the entire parenchyma, with the epidermis of the inner surface, is succulent or fleshy, as in *Atropa;* or it may be, that under the epidermis of the outer surface some layers of cellular tissue are woody, whilst the underlying are fleshy; in both cases very frequently passing without determined boundary into the pulp.

In many other cases four layers are distinctly discernible, and have been named, counting from without inward, Epicarp, Mesocarp (also Sarocarp, or Flesh, 'caro'); and the two inner undistinguished coats, the Endocarp. Those varieties of structure in the fruit are most important which cause the peculiar solutions of the continuity in the fully mature condition. Hence we obtain two comprehensive classes of fruits, according as their construction causes a separation into individual parts or not. The latter may be termed the berry-like, and the former the capsular. The capsular are again divided into two groups, according as the pericarp either opens and suffers the seed to escape—Capsules with their portions called valves; or separates into individual parts, which do not again open, but firmly inclose the seed—Splitting Fruits (Schizocarps), and their parts called Mericarps. The Berry-like Fruits are also subdivided into three groups, according as the inner leaves are the more tough and solid, and the outer the more fleshy and juicy—Stone Berries (Drupes); or the reverse—True Berries (Baccæ); or, lastly, all the layers appear thin and dry, or leathery (Achænia). All these forms may, with the germen from which they arise, be superior or inferior, one or many-celled, or one or many-seeded: which only require to be noticed when deviations in the structure of the germen have arisen through abortion, being otherwise self evident.

a. The Capsular Fruits occur in the most diverse families. The mode of bursting (Dehiscence) is especially to be observed. The simplest process is an apparent wholly irregular tearing open at any place, as in *Nicandra:* usually however the form of this dehiscence is very regular, even though it may be confined to a small part of the fruit, as in *Papaver*, *Antirrhinum*, &c.

The solution of continuity is either vertical or horizontal: in the latter case, the upper part forms a kind of cover upon the under, and the capsule is termed circumscissile. In the first case, the pericarp, &c., falls away in more or fewer separate pieces, which are termed valves. In many-celled fruits the valves may separate entirely from the persistent septa, as in *Cobæa scandens* (dehiscentia septifraga); or the septa may split into two lamellæ, and each valve may bear one of these lamellæ on each of its margins (dehiscentia septicida, valvulæ margine septiferæ); or the septa may remain undivided, adherent to the middle of the valves (dehiscentia loculicida, valvulæ medio septiferæ). If in any of these kinds of dehiscence a stalk-like mass of cellular tissue remains standing in the axis of the fruit, it is called the Columella.

From what has been said, it is sufficiently evident that these solutions in the continuity are not at all dependent upon the original composition. Such a relation has been assumed; and to the line in the external circumference of the pericarp, where the edges of real or pretended carpels have become blended, the term 'dorsal suture,' has been applied, while the term 'ventral suture' designates merely the line where the margins of one and the same carpel or similar part have become blended.

In the generality of capsular fruits, the above-mentioned four layers of the pericarp may be distinguished from the other; but they are usually very thin and membranous or leathery, or more rarely woody.

b. The Schizocarps, or Splitting Fruits, are usually distinguished chiefly according to the direction in which the cleft occurs. This is either parallel with the axis of the fruit, or perpendicular to it, that is, the solution of continuity is either vertical or transverse. In both, the separate parts are usually only one-seeded. In the first case the separate parts are sometimes named Cocci or Mericarps, in the last case Joints or Articulations; and they are distinguished, according to the texture of their layers, as dry, coriaceous, and succulent. The first (the mericarps) are proper to the families *Rubiaceæ*, *Euphorbiaceæ*, *Labiatæ*, *Boraginaceæ*, *Geraniaceæ*, *Tropæolaceæ*, *Malvaceæ*, *Umbelliferæ*, &c., &c.; the last (the joints) to some of the *Leguminosæ* and *Cruciferæ*. In the first a columella is not uncommon.

c. The Stone-Berries, characteristic of the *Amygdaleæ*, but also presented in other families, owe their peculiarity to the remarkable diversity in the structure of their layers, and indeed of the parenchyma layers, the inner of which are always hard, and often woody; whilst the outer are fleshy or coriaceous: both are developed in a greater thickness than usual.

d. The True Berries, predominating in the families of *Grossulariaceæ*, *Passifloraceæ*, *Cucurbitaceæ*, and the *Araceæ*, and occurring occasionally in many other families, depend essentially on the fleshy or juicy texture of the inner layers of the pericarp: this condition often exists to the extent of a dissolution into single cells, tumid with fluid, whilst the external layers are solid, and sometimes even woody, as in *Lagenaria*.

e. The Achænia, with always thin dry layers, not usually distinguishable, characterise the families of the Grasses, *Cyperaceæ*, *Cupuliferæ*, *Compositæ*, and *Dipsaceæ*, predominate in the *Dryaceæ* and *Ranunculaceæ*, and occur singly in other cases. They are one-celled and one-seeded, generally originally, but sometimes, as in the *Cupuliferæ*, through abortion of cells and seed-buds.

With regard to the Spermophore it may be remarked, that in the dehiscence of the fruit portions of cellular tissue are separated from the valves or septa, to which the seeds remain suspended, and which have been termed Spermophores. In these separations sometimes actually independent organs become solved from their union with others, as in *Cruciferæ*, and sometimes merely pieces of independent organs become detached, as in the *Asclepiadaceæ*.

The Pulp in the fruit assumes two conditions; on the one hand it passes into the loose cellular tissue of the pericarp in the true berries, as in *Solanum;* and on the other into the subsequent products of the funiculus; namely, into the aril in its widest sense, as in *Arum*, and probably into the true aril, as in *Ribes*.

The Funiculus exhibits manifold varieties, such as hairs, warty expansions among the seeds, membranous, continuous, or lobed envelopes of the seed (arils), and so forth.

There are often parts external to the germen, which are persistent till after the maturation of the seed [SEED], and they often undergo many changes; and when they become fleshy they assume the appearance of fruits. They are called Spurious Fruits. The most remarkable example of this is seen in the case of the fruit of the Fig (*Ficus*), in which the peduncle or receptacle swells up and incloses the true fruits. The pedicel in *Hovenia dulcis* also swells up and assumes the form of a fruit. In the Pine-Apples (*Ananassa*) the bracts enlarge and become the part eaten. In the Mulberry (*Morus*) the perianth is the fleshy part; in the Bladder-Campion (*Cucubalus baccifer*) the calyx enlarges; in *Mirabilis* it is the corolla; and the hips of the Rose (*Rosa*) are the dilated disc, whilst in the Strawberry (*Fragaria*) the sweet juicy part is the receptacle.

The terms applied to the fruits of plants by botanists are very numerous. The same kind of fruit has frequently several names, whilst the same name has been applied to several different kinds of fruits. The following enumeration of some of these terms is given by Schleiden in his 'Principles of Scientific Botany,' whose remarks on this subject deserve careful attention from those interested in the further development of this subject.

Enumeration of the Various Forms of Fruit.

I. Seed naked (*Semen nudum*).
  A. Seed solitary.
    1. *Bacca.* Seed inferior. Ex. *Viscum.*
    2. *Sphalerocarpium.* Seed with a fleshy aril. Ex. *Taxus.*
  B. Fructifications.
    3. *Strobilus.* Spikes with woody spermophores. Ex. *Pinus.*
    4. *Galbulus.* Capitula with confluent fleshy bracts. Ex. *Juniperus.*
II. Simple Fruits (*Fructus simplex*).
  A. Capsule (*Capsula*).
      † Superior.
    5. *Capsula circumscissa.*
    6. *Utriculus*, Gärtner, No. 5. One-celled, originating from a carpel; few-seeded. Ex. *Chenopodium.*
    7. *Pyxidium*, No. 5. One- or many-celled, formed of several carpels; many-seeded. Ex. *Hyoscyamus.*
    8. *Folliculus.* One-celled, or many-celled, one-valved. Seeds on the two margins of the valve. Ex. *Pæonia.*
    9. *Conceptacula.* Two disunited *folliculi* with one separating spermophore. Ex. *Asclepias.*
    10. *Legumen.* One-celled, one-seeded, or many-seeded, two-valved. Seeds on the two borders of one fissure. Ex. *Pisum.*
    11. *Siliqua.* Two-celled, two-valved, separating from the persistent spermophore, forming a Septum (*Replum*). Ex. *Matthiola.*
    12. *Silicula.* A very short *Siliqua.* Ex. *Thlapsi.*
    13. *Ceratium.* A *Siliqua* in some *Fumariaceæ* and *Papaveraceæ.*
    14. *Rhegma.* Elastically two-valved (?), dehiscing from a *Columella.* Ex. *Euphorbia.*
    15. *Capsula.* One-celled or many-celled, many-seeded, dehiscing by valves or pores, *Primula, Antirrhinum.*
      †† Inferior.
    16. *Diplotegia*, Desvaux. Inferior capsule, dehiscing by pores. Ex. *Campanula.*
  B. Splitting Fruits (*Schizocarpium*).
    17. *Cremocarpium* (?). In *Umbelliferæ, Rubiaceæ.*
      a. Mericarpia. The separate parts of the *Schizocarpium.*
    18. *Carcerulus.* In *Tropæolaceæ, Malvaceæ.*
    19. *Achænium.* In *Boraginaceæ, Lamiaceæ.*
  C. Stone Fruits (*Drupa*).
    20. *Drupa.* Originally one-celled, 1-seeded, 2-seeded. The *Mesocarpium* fleshy, the *Endocarpium* woody. Ex. *Amygdalus.*
    21. *Tryma*, (imagined to be) one-celled by suppression in *Juglans.*
  D. Berry (*Bacca*).
    22. *Bacca.* Many-celled, inferior. Ex. *Ribes.*
    23. *Nuculanium.* Many-celled, superior. Ex. *Vitis.*
    24. *Pepo.* One-celled, inferior. Ex. *Pepo.*
    25. *Hesperidium.* Coriaceous portion, strictly separated from the pulp. Ex. *Citrus.*
    26. *Amphisarca.* Woody towards the exterior. Ex. *Crescentia.*
  E. Closed Fruit (*Achænium*).
    27. *Achænium* (*Auctorum*), *Cypsela* (Lindley). One-celled, one-seeded, not blended with the seed. Ex. *Compositæ.*
    28. *Glans.* Through abortion one-celled, one-seeded. Ex. *Corylus.*
    29. *Caryopsis.* One-celled, one-seeded (imagined to be) blended with the seed. Ex. the Grasses.
    30. *Samara.* Two-celled, winged. Ex. *Acer.*
    31. *Carcerulus.* Many-celled, not winged. Ex. *Tilia.*
III. Multiple Fruits (*Fructus multiplex*).
  A. Several Achænia.
    32. *Etærio.* If wholly free. Ex. *Ranunculus.*
    33. *Syncarpium.* If connected. Ex. *Magnolia.*
  B. Several Berries.
    34. *Etærio.* Connected. Ex. *Rubus.*
IV. Fructifications (*Fructus compositus*).
  A. Capitula. With a flat or cup-shaped fleshy peduncle.
    35. *Syconus.* Ex. *Ficus, Dorstenia.*
  B. Spikes with fleshy bracts and perianths.
    36. *Sorosis.* Ex. *Ananassa, Morus.*
  C. a. Spikes with woody bracts.
    37. *Strobilus.* Ex. *Betula.*
    b. Spikes with woody bracts and perianths.
    38. *Strobilus.* Ex. *Casuarina.*
V. Spurious Fruits (*Fructus spurius*).
    39. *Cynarhodon.* Free one-seeded Achænia, surrounded by a fleshy disc. Ex. *Rosa.*
    40. *Pomum.* Many-seeded Achænia in one circle, blended with the fleshy disc. Ex *Malus.*
    41. *Balausta.* Many-seeded Achænia in two circles, blended with the fleshy disc. Ex. *Punica.*
    42. *Diclesium.* Achænia enclosed in a hardened perianth or corolla. Ex. *Spinacia, Mirabilis.*
    43. *Sphalerocarpium.* Achænia inclosed in a drupaceous perianth. Ex. *Hippophäe.*

FRY, MRS. ELIZABETH, was the third daughter of John Gurney, Esq., of Earlham Hall, near Norwich, an opulent merchant and banker, and a member of the Society of Friends. Elizabeth Gurney was born May 21, 1780, at Bramerton, four miles from Norwich, where her parents had then a summer residence; in winter they occupied a large and commodious house in Norwich. They were not 'plain Friends,' that is, they did not wear the plain dress of the Quakers, nor use 'thou' and 'thee' in place of the ordinary 'you,' nor abstain from the usual amusements of social life. They of course attended the Friends' meeting-house at Norwich, and the monthly and quarterly and yearly meetings; but in other respects there was little distinction between them and the gentry who belonged to the Church of England. Mrs. Gurney died when Elizabeth was only twelve years of age, leaving seven daughters and four sons. Mr. Gurney's business-pursuits led him into intercourse with persons of all denominations; and a warm heart, social disposition, and courteous manners introduced him to many acquaintances without as well as within the pale of the Society of Friends. The daughters, as they advanced in years, especially the three eldest, dressed gaily, and sang and danced — sometimes attending concerts and balls at Norwich, and sometimes pursuing their favourite amusements at Earlham Hall, which had then become their father's country residence.

Elizabeth Gurney, from the age of fourteen to seventeen, was, as she herself states in her 'Diary,' somewhat sceptical, and her doubts greatly distressed her. While she was in this fluctuating state of mind, William Savery, an American Quaker, paid a religious visit to England, and, on the 4th of February, 1798, preached in the Friends' meeting-house at Norwich. His discourse produced a very strong effect upon her feelings, and turned the balance of her judgment in favour of religion—a change which subsequent discourses and conversations tended strongly to confirm. She had made great progress towards becoming a 'plain Friend,' and instructed about seventy poor children in her father's house at Norwich, when Joseph Fry, who, with his brother, carried on an extensive business in London, paid a visit to Mr. Gurney at Earlham Hall. While there he made an offer of marriage to Elizabeth Gurney; and on the 19th of August 1800 they were married in the Friends' meeting-house in Norwich. Joseph Fry and his family belonged to the strict section of the Quakers, and Elizabeth Fry was now prepared to adopt their usages. She resided with her husband in his house of business, Mildred's-Court, in the City of London, till the spring of 1809, when, on the death of her husband's father, she removed to Plashet House, Essex. In 1810 she became a preacher among the Friends, and ever afterwards continued to perform with great zeal the duties of her sacred office.

In the month of February 1813 she visited the prison of Newgate in London, and saw about 300 women tried and untried, with numerous children, crowded together, without classification or employment, in rags and dirt, with no bedding, and nothing but the floor to sleep on. The season was inclement, and she supplied them with some necessary covering. After several other visits, and making much improvement in their manners as well as their condition, she in 1817 succeeded in establishing a Ladies' Committee for the reformation of the female prisoners in Newgate—the sheriffs of London and the governor of the prison granting their permission, but affording no assistance. A school and a manufactory were established in the prison; and riot, intoxication and filth, were succeeded by order, sobriety, and neatness. The improvements which she had been the means of introducing into Newgate, were gradually extended to other prisons. She had interviews with the most influential of the ministers, was examined before the House of Commons, obtained the assistance of clergymen, and visited different parts of the kingdom, including Scotland and Ireland, for the purpose of carrying out her benevolent plans. She next turned her attention to the female convicts sentenced to transportation, and introduced many improvements, tending not only to ameliorate their condition, but to reform their characters. From 1833 to 1836 she paid visits to Jersey and Guernsey; and about the same time procured the introduction of libraries in the coast-guard stations and the government packets. From 1837 to 1842 she visited the principal towns in France, Belgium, Germany, and Holland, chiefly for the purpose of extending her improvements in prison-discipline. She died on the 12th of October 1845 at Ramsgate, and was buried in the Friends' burying-ground at Barking in Essex,. She bore ten children, most of whom were living at the time of her death.

(*Memoir of Elizabeth Fry, with Extracts from her Journals; edited by Two of her Daughters*, 2 vols. 8vo, London, 1847.)

FUCACEÆ, a natural order of *Algæ*, or olive-coloured inarticulate Sea-Weeds, whose spores are contained in spherical centres, immersed in the substance of the frond. The root has almost always a conical disc, rarely branching or creeping. The fronds are of an olive-brown or olive-green colour, becoming darker in drying; of a tough leathery substance, and fibrous texture, tearing lengthwise with facility; dichotomous or pinnate; rarely irregularly branched, but very variable in habit. In the simpler kinds (*Splancnidium*) there is no distinction into parts (as stem, leaves, receptacle), but the fructification is equally dispersed through all parts of the plants; in others (*Durvillæa Sarcophycus*) there is a stem ending in a phyllo-caulon or leaf-like frond, through which the fructifications are scattered; in others (*Himanthalia*) there is a simple frond of small size, and a branching receptacle of fructification resembling a frond; in others (*Fucus Cystoseira*) there is a branching or imperfectly leafy frond, some portions of whose branches finally swell and are converted into receptacles of fruit; and, finally, in the most perfect kinds (*Sargassum Marginaria*) there is a branching frond, with well-formed mostly distinct and nerved leaves and receptacles, from their origin set apart as organs of fructification (not formed by swellings of the old branches), developed either in the axils or along the edges of the leaves or branches. Air-vessels are present in almost all, either in bladdery swellings of the stem and branches, as in *Fucus*, or as distinct organs, as in *Sargassum*, stalked, and mostly springing from the same part as the fructification. Receptacles of the fruit, mostly more or less distinguishable from the barren portion of the frond, swollen, succulent, often filled with slimy mucus, either formed from the metamorphosed ends of the branches, or evolved from the axils or sides of the branches or leaves. These receptacles are pierced by minute pores, which communicate with small spherical chambers formed by an introflexion of the walls of the receptacle at the points where they occur. The little chambers (called Conceptacles by some writers, Scaphidia by others) contain sometimes spores, or reproductive bodies, analagous to the seeds of more perfect plants; sometimes antheridia, supposed to be analogous with stamens; sometimes both organs in the same chamber. The spores spring from the sides of the chamber. One of the surface-cells being fertilised, gradually enlarges, projects from the wall of the chamber, becomes more or less obovate, and finally is converted into a perispore, or membranous transparent case, in which is contained the spore or spores. These last are formed from the matter contained within the enlarged cell. At first the contents are nearly fluid, of a pale olive colour; gradually they acquire density, become darker, and at length are consolidated into a single sporule, as in *Cystoseira, Halidrys*, &c., or formed into two, four, or eight sporules, as in *Fucus, Himanthalia*, &c. The antheridia are borne on branching jointed threads, called Paranemata, which rise, like the spores, from the walls of the conceptacle, and commonly fill the greater part of its cavity. Each antheridium is an oblong cell, forming the terminal articulation of the branches of the paranemata, and is filled with minute orange-coloured bodies called Sporidia (by J. Agardh), closely resembling the zoospores of the lower *Algæ*, and like the latter endowed with spontaneous movements. The motive organs are vibratory hairs, or cilia, with two of which each little body is furnished.

The *Fucaceæ* are easily known from all other Olivaceous Sea-Weeds, by a character at once natural and easily ascertained, namely, the position of their spores within little hollows sunk in the substance of the plant, and communicating with the surface by a pore. The order is represented in most climates, from high northern and southern latitudes to the equator. Very few species vegetate in the polar regions of either hemisphere. In the north the species of *Fucus* and *Himanthalia* alone reach to the Icy Sea; and in the Antarctic Ocean the order is limited to *Durvillæa* and to *Scytothalia Jaquinotii*, a fine *Alga* allied to sub-tropical forms. The British species, excluding three doubtful natives, are but fourteen; yet from the strictly social habits of several of them, they cover more surface of tidal rocks than all the other *Algæ* put together. It is these plants which impart the deep brown colour to the belts of rocks exposed on the recess of the tide.

The following is a synopsis of the British genera of these plants:—

Sargassum.—Branches bearing ribbed leaves. Air-vessels simple.

Halidrys.—Frond linear, pinnate, leafless. Air-vessels divided into several cells by transverse partitions.

Cystoseira.—Root scutate. Frond much branched, bushy. Receptacles cellular.

Pycnophycus.—Root branching. Frond cylindrical. Receptacles cellular.

Fucus.—Root scutate. Frond dichotomous. Receptacles filled with mucus, traversed by jointed threads.

Himanthalia.—Root scutate. Frond cup-shaped. Receptacles (frond-like) very long, strap-shaped, dichotomously branched.

I. Sargassum.—Frond furnished with distinct, stalked, nerved leaves, and simple axillary stalked air-vessels. Receptacles small, linear, tuberculated, mostly in axillary clusters or racemes. Seeds in distinct cells. The generic name is from Sargazo, the Spanish term for masses of sea-weed found floating in the ocean in some latitudes.

1. *S. vulgare;* and
2. *S. bacciferum*, though both of them have been found cast on our shores, have no just claim to a place in our British Flora, being natives of the tropics, occasionally driven, with other tropical productions, by the force of the western currents on our Atlantic coasts. The species of this genus are found over a wide extent of ocean, and have been generally called Gulf-Weed. They appear like floating meadows in the midst of the ocean, sometimes for miles in extent, and probably support a larger number of living creatures than the most productive pasturage in Great Britain. Myriads of Mollusks, *Radiata*, Fishes, and *Crustacea* may be seen playing about in these masses; and the abundance of Zoophytes which find shelter in such situations can hardly be estimated. The weed is eaten in China. In the East it is used as salads, and forms a pickle.

II. Halidrys has compressed linear fronds, pinnated with distichous branches. The air-vessels are lanceolate, stalked, divided into several cells by transverse partitions. The receptacles are terminal, stalked, cellular, pierced by numerous pores, which communicate with immersed spherical conceptacles.

H. siliquosa has linear very narrow branches, compressed linear lanceolate air-vessels, slightly constricted at the septa, mucronate. It is found on rocks and stones in the sea, at and below half-tide level.

III. Cystoseira has a frond furnished with branch-like leaves, becoming more filiform upwards. The air-vessels are simple, arranged within the substance of the branch-like leaves consecutively. The receptacles are cylindrical, more or less lanceolate, tuberculated, and terminal. The seeds in distinct cells. The name is derived from two Greek words, signifying a little sac, and a chain.

C. ericoides has a thick woody short stem, cylindrical, and beset with numerous slender filiform branches, variously divided, and densely clothed with small spine-like awl-shaped ramuli (or leaves). It is found on rocks in the sea, and has the property of being irridescent when under water in a growing state. In drying it becomes nearly black, and does not adhere to paper.

The other British species of the genus are—*C. granulata*, *C. fœniculacea*, *C. barbata*, and *C. fibrosa*.

IV. Pycnophycus has a root composed of branching fibres. The frond is cylindrical and dichotomous. The air-vessels, when present, innate and simple. The receptacles terminal, cellular, pierced by numerous spores, which communicate with immersed spherical conceptacles, containing in the lower part of the receptacles parietal simple spores, and in the upper tufted antheridia. The name is from two Greek words, signifying thick sea-weed.

P. tuberculatus is found in rock-pools, on the recess of the tide, near low-water mark. It is better known by the name of ***Fucus tuberculatus***. It is very different in many respects from ***Fucus*** proper. When dry it becomes very brittle and black.

V. Fucus has a plane, compressed, or cylindrical frond, linear, dichotomous, coriaceous. The air-vessels, when present, are innate in the frond, simple and large. The receptacles terminal (except in *Fucus nodosus*), turgid, containing tubercules imbedded in mucus, and discharging their seeds by conspicnous pores.

F. vesiculosus is common on all our sea-shores. It is the Sea-Ware, Bladder-Fucus, Kelp-Ware, Black-Tang of Scotland, and sometimes Lady-Wrack. In Gothland, according to Linnæus, it is Swine-Tang, because boiling it and mixing it with a little coarse flour they give it to their hogs. In the Hebrides, cheeses are dried without salt, being covered with the ashes of this plant, which abounds with salt. In Scania it is used as thatch and fuel. The root is a hard flat disc. The fronds are from 2 to 3 feet in length. The air-vessels, as large as nuts, are in pairs; the receptacles, in pairs, and often forked, terminate in branches. There is a variety of this which is often called *Fucus Balticus*. It is found among grass and moss in marshy ground occasionally overflowed by the tide. Lightfoot mentions that during the snow-storms in the Highlands, the red deer descend from the wild mountains to feed on this sea-weed. He mentions also that the saponaceous mucus of the vesicles has been recommended to remove glandular swellings, and the calcined powder of the plant is said to be valuable as a dentifrice. The great use now made of this weed, as well as of others, is in the manufacture of kelp and iodine.

F. ceranoides is sometimes called the Horned Fucus. It resembles the preceding species, but is much thinner and more transparent, the midrib is more distinct, and the leafy part is narrower, although it is a more graceful plant than *F. vesiculosus*.

F. serratus, Serrated Sea-Weed, is very common on all our sea-shores. It is perennial. The frond differs from the preceding by being serrated. In Scotland it is called Black-Wrack, or Prickly Tang. It is not so rich in kelp and iodine as the others. It is useful as manure. In Norway it is used as food for cattle, mixed with meal. The Dutch use it to cover their crabs and lobsters, to keep them alive and moist, preferring it to any other because it is destitute of that mucus which causes them to ferment and putrefy. It is a handsome species, the fronds on both sides being dotted with pencil-like clusters of whitish capillary fibres, and the fronds being often broad.

F. nodosus, Knobbed-Wrack. The root is a large hard conical mass, from which spring several branches, from 2 to 4 or 6 feet in length. It is called in some places Yellow Wrack. In England it is often called Sea-Whistle, in consequence of the custom among children of converting the vesicles into whistles. The air-vessels are called crackers; for when thrown into the fire they make a slight explosion.

F. Mackaii is found on muddy sea-shores, usually in land-locked bays and among boulders. The frond is from 6 to 10 inches long, densely tufted; branches crowded, spreading, compressed at the base, cylindrical upwards. The vesicles wider than the frond. In substance leathery; when dry somewhat horny.

F. canaliculatus, Channelled Fucus. This is abundant on rocks on the sea-shore near high-water mark. It is perennial. Cattle are exceedingly fond of it, and never fail to browse on it in winter as soon as the tide leaves it within their reach.

VI. Himanthalia has coriaceous orbicular top-shaped fronds. Very long strap-shaped receptacles, repeatedly forked, spring from the centre of the frond, filled with mucus, traversed by jointed fibres, and pierced by numerous pores, which communicate with immersed spherical conceptacles, containing either parietal spores or antheridia.

H. lorea is common on rocky sea-shores. It seems difficult to determine as to the duration of this plant. Some regard it as annual, as the thongs are produced every year; but others say the long thongs are only receptacles, that the cup-shaped disc is perennial, and that this part is truly the plant. The cup-shaped frond which adheres firmly to the rock is more than an inch in diameter. The branches or receptacles are in Scotland about six feet long. In Cornwall they are sometimes twenty feet long. The name in English signifies Sea-Thongs. The fruit consists of tubercles immersed in the fronds, and these tubercles discharge their seeds by pores, which give the thongs a spotted appearance. This is remarkably the case when, after lying on the shore for some time, every pore is covered with a yellow dot, which is the mucus of the plant discharged in the death-struggle which goes on, when, torn from the rock and tossed out by the waves, it lies withering in the open air. Dr. Neill mentions that in the north of Scotland a kind of sauce for fish or fowl, resembling ketchup, is made from the cup-like or fungus-like fronds of this sea-weed.

(Harvey, *British Marine Algæ;* Landsborough, *British Sea-Weeds.*)

FUCHSITE, a Green Mica from the Zillerthal, containing 4 per cent. of oxide of chromium. From the crystallisation of mica, two additional species have been made out of the old species so called. The common mica has an oblique prism for its primary. Many micas when in perfect crystals have the form of a hexagonal prism, and but one axis of polarisation; this last fact proving the primary to be a regular hexagonal prism. This species is properly distinguished, and has been called Hexagonal Mica.

FULLER, SARAH MARGARET, MARCHIONESS OSSOLI, was born at Cambridge-Port, Massachusetts, United States of North America, May 23, 1810. Her father, a solicitor and a member of the Congress, perceiving her early aptitude, had her so highly educated that he was accustomed to speak of her while quite a child as "knowing more Greek and Latin than half the professors," while she herself says that she had nearly forgotten her native tongue from constantly reading other languages. The consequence was, that when she grew to womanhood she had an overwrought nervous system, was a somnambulist, very near-sighted, and withal what is called a strong-minded, loud-voiced, excessively dogmatic, and unquestionably clever, as well as cultivated person. The sudden death of her father in September 1835, threw upon her domestic duties and obligations to which she resolutely and without affectation addressed herself. She became a teacher at Boston of Latin, French, German, and Italian, then 'Lady Superior' of a school at Providence, Rhode Island, afterwards united herself for a while to that singular social or Fourieristic Society the 'Brook Farm Community,' and eventually took up her pen as a means of support. She had already become well known as a writer in the periodicals when she in 1839 published a translation of 'Eckermann's Conversations with Goethe.' Having acquired great celebrity in the literary circles of Boston, especially among the transcendentalists of that learned city, for her conversational talents as well as her critical acumen, it was proposed to turn her powers that way to account, by forming under her guidance 'conversational classes' of the ladies of Boston. The scheme, odd as it may seem, met with acceptance. Five-and-twenty "of the most agreeable and intelligent women to be found in Boston and in its neighbourhood" met at stated seasons to converse—the 'conversation' being of course mainly on the side of the learned president—on such subjects as "the genealogy of heaven and earth; the will (Jupiter); the celestial inspiration of genius, perception, and transmission of divine law (Apollo)," and such other recondite themes as might be conveyed under the symbols of Venus, Bacchus, Cupid and Psyche, and so forth; with poetry, music, the pictorial arts, the "thought that lies at the bottom of the different dances," and other more sublunary topics.

When Mr. Emerson started his 'Dial' in 1840, Miss Fuller was one of the most prominent of his band of philosophical contributors; and she wrote for it many very clever articles on the 'Fine Arts,' &c., some of which were subsequently republished in her volume of 'Papers.' She also published at Boston in 1844, under the title of 'Summer on the Lakes,' an account of a summer tour. On the discontinuance of the 'Dial' she removed to New York, and was installed directress of the literary department of the 'New York Tribune.' Here she let her studies turn more directly on political and social philosophy; and she gave utterance to her impressions of the wrongs of her sex in 'Woman in the Nineteeth Century,' a work which excited some attention in England as well as in America. She also published here the collection of her 'Papers on Literature and Art,' already referred to: both of these works were, we believe, reprinted in London.

In the spring of 1846 she put in execution a cherished scheme of a prolonged European tour. She first visited England, where she stayed some time, and obtained introductions to many of the literary notabilities, whom she describes and criticises in her letters with a most amusing air of superiority. In Paris she also remained for some time, and formed the acquaintance of Madame Dudevant, &c. But Italy was the place she had most desired to visit, and thither she next proceeded—little dreaming to what a strange conclusion all her theories of woman's rights and claims and missions would there be brought. For a brief space she revelled in the enjoyment of the scenery, the climate, and the boundless treasures of art in that sunny region; and it must be added that a portion of her time was occupied in rendering herself conspicuous by her open and resolute, though somewhat imprudent avowal of extreme democratic opinions, and intercourse with persons obnoxious to the authorities on account of their suspected liberalism. But at length she became involved in an affair of a very different though not less exciting nature. She met by accident at vespers, in St. Peter's, Rome, while separated from her friends by the crowd, a young Italian gentleman; he behaved with a courtesy that charmed her; an intimacy ensued, and, though he was many years her junior, so utterly uneducated that he had scarce ever looked into a book, and without any kind of intellectual pretensions, the strong-minded worshipper of intellect with a very little wooing gave him her hand. But the young Marquis Ossoli, though of a noble family, had a very small patrimony, and that was in the hands of trustees. Moreover his family were devoted Roman Catholics, and his elder brothers held high appointments under the papal government; they would of course be bitterly incensed at his marrying a lady not of that faith, and especially one who was an avowed liberal. He therefore urged that the marriage should be strictly concealed: and to this she submitted. They were married in December 1847, and Madame Ossoli remained in Rome, ostensibly living alone as plain Margaret Fuller; indeed it was not till more than a year after the birth of a son that even her own mother was informed of the marriage. The sudden ascendancy of liberalism in Rome however altered matters. Miss Fuller had in London met Mazzini, and undertaken, as it would seem, to bear communications from him to various Italian liberals; and she had converted her husband to her own political creed. When the revolution broke out her husband threw himself heartily into the movement; and she shrank from none of the duties which her position and her opinions seemed to have devolved upon her. During the siege of Rome she was occupied as nurse, having charge of one of the hospitals opened by the Roman Commission for the succour of the wounded, and acted with a noble disregard of toil or danger, and with much judgment as well as the greatest kindness in her self-imposed task. The fall of the republic compelled her to leave Rome; and with her husband and her child, she, after staying the winter at Florence, embarked at Leghorn in May 1850, on board the Elizabeth, for America. From the first the voyage was unpropitious; the captain died soon after the ship sailed; the weather was throughout stormy; and though the vessel reached the American coast, it was only to be wrecked there, having struck on Fire Island Beach, Long Island, July 16th, 1850. A few of the passengers and crew were saved, but Margaret Fuller, her husband, and child were among the drowned. The body of her child came ashore, but her own tomb was the ocean.

The writings of Margaret Fuller will have no permanent value in themselves, either for their literary merits, their social opinions, or their estimates of character, of art, or of literature. But they will retain a certain value, in connection with the history of their author, as illustrative of a peculiar phase of society in America during the second quarter of the 19th century. Margaret Fuller herself was undoubtedly a woman of great ability as well as of considerable attainments, but she had thoroughly studied not a single subject, and her writings are all disfigured by dogmatism, assumption, and self-reference. In them you often come upon a striking and apparently original thought; but if the thought be dwelt on for a moment, it is recognised as owing its uncommonness mainly to peculiarity of expression: and sometimes these peculiarities degenerate into grotesqueness. Had her life been spared however there can be little doubt that what was strange, and almost repulsive in her earlier works, would have disappeared, and the better and lovelier part of her character and intellect have revealed itself. The severe mental discipline she had undergone in Rome had, as she said in one or more of her letters, subdued her pride; and with humility came in all the gentler virtues and intellectual graces. Nothing could be more noble and beautiful than her conduct as a woman, a wife, and a mother under her marriage trials, and during and after the siege of Rome; and the letters which she wrote then are more graceful and eloquent than perhaps anything else which has fallen from her pen. She wrote an account of the Roman revolution, the progress and suppression of which she had watched so eagerly, but the manuscript perished with her.

(*Memoirs of Margaret Fuller Ossoli*, compiled by her friends J. F. Clarke, R. W. Emerson, and W. H. Channing, 2 vols. 8vo, Boston, 1852, and 3 vols. 8vo, London, 1852.)

FUMARAMIDE. [CHEMISTRY, *S.* 2.]

FUNGI. There is frequently considerable difficulty in distinguishing *Fungi* from the other forms of Cryptogamic Plants. They are distinguished from Lichens by their more fugitive nature, their more succulent texture, their want of a thallus or expansion independent of the part that bears the reproductive matter, but more particularly in their never containing germs distinct from the fructifying bodies of a vegetable germ so constant in Lichens.

From some forms of *Algæ* they differ very little, but the most obvious distinction is their mode of growth. The *Algæ*, like the Lichens, do not derive their nutriment from the bodies on which they grow, which is the case with all the *Fungi*. There are however certain free forms of *Fungi* which it is difficult to distinguish from *Algæ* by this character; such are the moulds which are developed in ink, milk, and other liquids.

It has been stated that *Fungi* are distinguished from *Algæ* by the absence of spontaneous movements. It is no doubt true that the condition of the protein which is the motile agent in all plants is different in *Fungi* from what it is in *Algæ*, but this is no general distinction. In those *Fungi* which are developed in water, in one instance at least, the *Achlya prolifera*, or *Saprolegnia ferax*, the movements of the spores are as active as in any of the *Algæ*.

"In the simplest form *Fungi* are little articulated filaments composed of simple cellules placed end to end. Such is the mouldiness that is found upon various substances, the mildew of the rose-bush, and in short all the tribes of *Mucor* and *Mucedo*. In some of these the joints disarticulate, and appear to be capable of reproduction; in others spores collect in the terminal joints, and are finally dispersed by the rupture of the cellule that contained them. In a higher state of composition *Fungi* are masses of cellular tissue of a determinate figure, the whole centre of which consists of spores attached, often four together, to the cellular tissue, which at length dries up, leaving a dust-like mass intermixed more or less with flocci, as in the puff-balls, or sporidia, contained in membranous tubes or asci, like the thecæ of Lichens, as in the Sphærias. In their most complete state they consist of two surfaces, one of which is even and imperforate, like the cortical layer of Lichens; the other separated into plates or cells, and called the hymenium, to whose component cells, which form a stratum resembling the pile of velvet, the spores are attached by means of little processes, and generally in fours, though occasionally the number is either less or greater." (Lindley.)

The following is Schleiden's account of the development of the organs of reproduction in the *Fungi*:—

"The most simple (*Hyphomycetes*, filamentous *Fungi*) form, at the end of the thread-like cells, narrower protuberances, in each of which a spore is developed: this at length separates, having consequently a double membrane, the cell of the spore itself and the covering (sporangium) arising from the parent cell, as, for instance, in *Penicillium* and *Botrytis*. In others the thread-like cells form a spherical swelling at the extremity, from which project a number of such prolongations, each of which contains a spore, while the whole forms a divided sporangium, as, for instance, in *Mucor* and *Penicillium*.

"In others (*Gasteromycetes*, the ventricular *Fungi*) the thread-like cells combine into pointed, or non-pointed, variously shaped sporocarps; in or upon which are spores, of the development of which we know nothing. After the scattering of the spores, the thread-like cells often remain as tender wool, as in the *Trichiaceæ*, or as a delicate network (capillitium), as, for instance, in *Stemonitis cribraria;* and the external capsule (uterus peridium) generally composed of fine filamentous cells, is then dissolved, or bursts in different regular ways, as in *Arcyria* and *Geastrum*.

"In the most highly developed *Fungi* (*Hymenomycetes*, membraneous *Fungi*), elongated pouch-like cells (probably only the ends of the interwoven filiform fungus-cells, developed into the sporocarps, or cells formed at the ends of these cells) combine by arrangement side by side so closely as to form a membrane (hymenium). Some of the cells of this membrane enlarge considerably (sporangia), and send out from one to six points at their free extremity, in each of which a spore is developed. The filiform cells of the fungus then either form round masses, closed in all round (sporocarps), with cavities in their interior, the walls of which are clothed by the hymenium, or they form definitely arranged columns in *Merisma*, tubes in *Polyporus*, or lamellæ in *Dædalea* and *Agaricus*, which are clothed by the hymenium, as in the *Hymenomycetes*. Of the latter we only know, with any amount of accuracy, the law of development relating to the Toadstools, and more especially that of the *Agaricineæ*. In these latter there are formed, at definite parts of the flocculent mycelium, small hollow heads (volvæ), at the bottom of the cavity of which there grows a corpuscle, shortly pedunculated below, and enlarged into a spherical form at the top. In the lower part of this protuberance a horizontal circular cavity is formed, to the upper surface of which are attached the tubes, lamellæ, &c., which bear the hymenium. The bottom of the cavity is only formed by a membrane (indusium), which is either separated from the pedicel on its further development, or, loosening itself from it and the upper part at the same time, remains as a membranous ring (annulus) upon the stalk. The upper part, which supports the hymenium on its lower surface, dilates subsequently, and appears as an umbrella-like expansion, called the cap (pileus). The whole then breaks through the volva, which is very soon dissolved."

During their growth the same *Fungi* assume very different forms and appearances. It thus happens that the same species has not only been described under different specific names, but even referred to different genera. Fries states that he has traced no less than eight genera of different authors to mere degenerations or imperfect states of *Thelephora sulphurea*. Nees von Esenbeck also states that the same fungoid matter which produces *Sclerotium mycetospora* in the winter, developes *Agaricus volvaceus* in the summer. Professor Henslow has also shown that some of the supposed species of *Uredo* are forms of *Puccinia*, *Aregma*, &c. Kützing, in an essay on the 'Transformations of Plants,' carries his views on this subject very far, and maintains that according to different circumstances the same species will produce *Algæ*, *Fungi*, Lichens, or Mosses.

In the article Entophyta, *S.* 2, will be found an account of the plants growing on man and living animals. Many of these are *Fungi*. Professor Balfour, in his 'Class-Book of Botany,' gives the following account of diseases in plants produced by *Fungi*:—

"The attacks of Parasitic *Fungi* cause extensive injury and disease in plants. Some think that the spores of *Fungi* coming into contact with the plant act both as the predisposing and exciting cause of disease; others, perhaps more correctly, think that some change is first produced in the cells of the plant, which enables the spores to find a nidus, and then the disease goes on rapidly, assuming a peculiar type on account of the presence of the fungus: in the same way as vegetable organisms found in diseases of the skin are not to be looked upon as the origin of the disease, but as being developed in textures previously morbid, and as giving often a peculiar character to the disease. Many of the diseases of cultivated crops are attributed to *Fungi*. The spores of *Fungi* are very minute, and are constantly floating in the air. They can easily be applied to the surfaces of plants. When they find an appropriate soil they send out extensive filiform ramifications, which spread under the epidermis of plants, raise blisters, and finally burst forth in the form of orange, brown, and black spots, constituting the fructification. They attack the stem, leaves, flowers, and fruit. Different species are restricted to different plants, and even to different parts of the same plant. The forms which the same fungus assumes seem to vary sometimes according to the plant on which it grows. The disease called Bunt, Smut-Balls, or Pepper-Brand, is occasioned by the plant called *Uredo caries* by De Candolle, and *Uredo fœtida* by Bauer. It attacks the grains of wheat, and may be detected in them in their earliest state. It consists of extremely minute globules of a dark colour, at first attached to a thread-like matter or mycelium. Bauer estimates the diameter of each of the globules at 1-1600th of an inch, and consequently a grain of wheat (reckoned at less than 1-1000th of a cubic inch) would contain four millions such spores. The spores, or powdery matter, have a disgusting odour; hence the specific name given to it. The disease is propagated by contact. Steeping the grain is recommended by some as a means of prevention, and alkaline solutions have been suggested as a remedy. *Uredo linearis*, which is met with also in this disease, is considered as being a young state of the Mildew-plant. Another disease called Smut, or Dust-Brand, is caused by a fungus called *Uredo segetum*. It resembles the Bunt fungus in colour and shape, but its spores are not half so large, and it does not possess a fetid odour. This fungus destroys the ear of corn by first causing the innermost parts of the flower to become abortive, while the pedicels on which these are seated swell and become very fleshy. The fungus then consumes the whole of this fleshy mass, and at length appears between the chaff-scales in the form of a black soot-like powder. It is said also to attack the stem and leaves. When ripe the spores burst through the epidermis, and are dispersed in the form of a black powder like charcoal. The spore is 1-2800th of an inch in diameter. Smut is rare in wheat; it is common in barley, and more so in oats. It is also seen in many grasses, such as *Arrhenatherum avenaceum*. The disease denominated Rust, Red Rag, Red Robin, and Red Gum, is caused by a fungus called *Uredo rubigo*. It forms yellow and brown oval spots and blotches upon the stem, leaves, and chaff. The spores burst through the epidermis and are dispersed as very minute grains. The disease is common in corn and in grasses. Mildew is a disease caused by a fungus denominated *Puccinia graminis*. The ripe spore-cases of this plant are small dark-brown club-shaped bodies, their thicker end being divided into two chambers, each filled with minute spores, and their lower end tapering into a fine stalk. The sori, or clusters of spore-cases, burst through the epidermis sometimes in vast numbers. The minute spores seem to enter the plant by the stomata. Some think that they, as well as other minute spores, are absorbed by the roots. The disease attacks wheat. Spring wheat is less liable to this disease than winter wheat, and heavy soils are less subject to it than light ones. Many have supposed that the Barberry is in some way connected with the production of Mildew. This idea has been proved to be erroneous by the experiments of Standinger, near Hamburg, and of Hornemann at Copenhagen. Unger entertains the idea that blight, mildew, and smut are to be considered as exanthematous diseases of plants caused by the spores of *Fungi* entering the stomata.

"Henslow has shown by experiment that, if the diseased seeds of wheat be steeped in a solution of sulphate of copper, they will not produce diseased grain, and that the sulphate of copper does no injury to their germination. The solution used is one ounce of sulphate of copper to a gallon of water for every bushel of wheat. Grain also steeped in hot water does not reproduce these fungoid diseases. In East Lothian, with the view of preventing smut, seed-wheat is often steeped in stale urine, and afterwards some newly slaked lime is sifted on it. Sometimes a solution of salt is used as a pickle. Fourcroy and Vauquelin ascertained by analyses that blighted wheat contained an acrid oil, putrid gluten, charcoal, phosphoric acid, phosphate of ammonia and magnesia, phosphate of lime, and no traces of starch. As regards Bunt or Pepper-Brand, Henslow remarks, that upon simply immersing the grain in water the infected seeds float, and on the water being poured out, nothing but the sound ones remain in the vessel. This simple process of separation is not however perfectly effective, because in thrashing the wheat many of the infected grains are crushed, and the spores are dispersed in the form of fine powder which adheres obstinately to the sound grain, by means of an oily or greasy matter found in the *Fungi*. In order to detach them thoroughly, it has been considered useful to add some alkaline ley to the water in which they are washed. The alkali unites with the oil and forms a soapy matter. Lime has been used for this purpose, common potash, substances containing ammonia, and the liquid from stable dung have also been employed; other matters, as sulphate of copper, act by destroying the vegetating powers of the *Fungi*.

"Mr. Ellis, of Barning, Kent, says that the invariable prevention of smut in wheat is accomplished by scalding the blackest wheat in boiling water, and afterwards drying it with lime. The wheat placed in a colander or in a basket is immersed in boiling water for a few seconds, just long enough to wet it completely, it is then immediately dipped in cold water, afterwards dried with lime, mixed with other wheat, and sown. By this means the wheat was always found to be cured of smut, while the vegetating principle was uninjured, great care being taken that the water was boiling, and the wheat taken out of the water as soon as completely wetted. Mr. Ellis tried an experiment on a bushel of the blackest wheat he could procure, which he divided into sixteen equal parts, sowing them all the same day, but with different treatment. The result at harvest was that the wheat sown without preparation produced 33 black ears out of every 100, while that dipped in boiling water and limed had not a black ear in several thousands which were examined. Many other species of *Uredo* as well as *Ustilago* give rise to diseases. They receive their names from the plants on which they are parasitic, and it seems probable that the same species presents various forms according to the situation in which it grows. *Ustilago Maydis*, a maize smut, is a fungus which gives rise to protuberances on different parts of the maize. The stem, upper leaves, and especially the bracts become immensely swollen when attacked by this disease, and the ovaries, ovules, and male blossoms are not exempt. The parts affected are at first white tinged with red, smooth and juicy. The cellular tissue increases in volume, and is permeated by radiating hues consisting of mycelium and spores. The spores are twice as large in linear measure as those of the oat smut. At first the small balls contain a dark strong-smelling fluid, but ultimately the masses become dry, and present a quantity of dark dust mixed with irregular threads. *Ustilago vittata* causes disease in grasses in India. The spores of *Ustilago hypodytes* also cause disease in grasses. The spores are black and round, and the disease they occasion is denominated Grass-smut. The plant is described by Tulasne. According to Leveillé, the immense quantity of black dust resulting from it in the hay-fields of France, produces injurious effects on the haymakers. A species of *Depazea* or *Septoria* sometimes produces disease in the knots of wheat. Various species of *Erysiphe*, such as *E. guttata*, *E. penicillata*, *E. graminis*, *E. adunca*, and *E. bicornis* give rise to kinds of mildew. Erysiphes are often met with in common pea crops. Some say that Oidiums are merely particular states of Erysiphes. The plant producing mildew in the vine is *Oidium Tuckeri* of Berkeley. Other species of *Oidium* probably cause mildew in the peach, rose, hop, pea, and onion. For destroying the mildew in vines sulphur is recommended to be dusted on them. Some also use a solution of hydro-sulphate of lime, made by boiling sulphur and lime in water. A fungus called *Rhizoctoma Mali* is said to grow on the roots of apples, pears, and quinces, and to cause destruction to the trees. Ergot is a monstrous state of the grain, in which the enlarged and diseased ovary protrudes in a curved form resembling a cock's spur, hence the name from the French 'ergot,' meaning a spur. The ovary is black externally, spongy internally, and contains much oily matter. Some consider it as produced by the attack of a fungus, which induces a diseased condition in the ovarian cells. The disease is usually met with in rye, and the name of spurred rye is applied to it. It sometimes occurs in wheat and in barley, and it has also been noticed in *Lolium perenne*, *L. arvense*, *Festuca pratensis*, *Phleum pratense*, *Dactylis glomerata*, *Anthoxanthum odoratum*, *Phalaris arundinacea*, and *Alopecurus agrestis*. Ergot consists of a very dense tissue formed by polygonal cells, united intimately with one another, and filled with an oily fluid. It is developed in the unimpregnated ovule of rye, for although extremely dilated by the entophyte and rendered difficult of recognition, the integuments of the ovule increase without completely losing the form which they would have assumed, if they had grown into a true grain, imitating in this respect the ovaries of wheat, in which *Tilletia caries* (Bunt) has replaced the seed. The solid mass which has been called *Sclerotium clavus* by De Candolle, and the filamentous portion called *Sphacelia* by Leveillé and Fée, and *Eryotætia* by Quekett, are only, properly speaking, organs of vegetation. The fungus destined to grow from this apparatus is an elegant *Sphæria*, probably that called by Fries *Cordyliceps purpurea*. This plant has been seen by Schumacher in diseased cereal grains, and it has been detected by Roussel in *Sclerotium clavus*, growing on *Bromus sylvaticus* and *Arundo calamagrostis*, and by Dumeril in Ergot of Rye. Tulasne has shown that this *Cordyliceps* is produced from the Ergot when it is allowed to vegetate. Ergot of Grasses and Ergot of *Cyperaceæ*, according to Tulasne, do not belong to the same vegetable species. Rye affected with this disease, when used as bread, is very prejudicial. The Abbé Tessier showed that Ergot caused gangrene in animals that fed on it, and many instances are recorded of gangrene of the extremities occurring in persons who had lived on diseased rye. Ergot is said to prevail in rye grown on wet and stiff land.

"The disease which has recently attacked the Potato in various parts of the world is by many attributed to the attack of *Fungi*. This view has been strongly advocated by Berkeley, who describes the fungus as *Botrytis infestans*. The spores are supposed to enter the stomata and to cause disease in the leaves in the first instance, which afterwards extends to the tubers. The effects produced on the leaves resembled much those caused by poisonous gasses, such as hydrochloric, sulphuric, and nitric acids.

"Berkeley attributes the Potato disease entirely to *Fungi*. He states that the disease commenced in the leaves. They were attacked by the mould, which ran its course in a few hours; and from the rapidity of the action, the period for examination of the leaves has often passed over. The fungus generated does not live on decayed or decaying matter, but is one which produces decay, and renders the plants unhealthy. The fungus acts by feeding on the juices of plants, preventing the elaboration of the sap in the leaves, obstructing the admission of air and the emission of transpired fluids. The stem is thus overcharged with moisture, and ultimately rots, while every source of nutriment is cut off from the half-ripe tubers. The atmospheric conditions during the late disease made the fungus spread rapidly.

"While there is no doubt that the *Botrytis* is developed in the progress of the Potato disease, the question arises whether or not it is the originating cause. The view which seems to be most consonant with the phenomena is, that changes are induced in the cells of the potato by cultivation which render the leaves liable to disease. Atmospheric influences are thus enabled to act upon them, so as to cause alterations in their cells; and the attack of a fungus, such as the *Botrytis*, accelerates the morbid action, and causes it to assume a peculiar form. In this way high cultivation, atmospheric influences, and *Fungi*, all contribute to cause disease. In the Potato disease of 1845, Harting says that brown granular matter was deposited in the cells, first in those near the epidermis, then the cellular walls lost their transparency, and the cellules could no longer be isolated by boiling water; next the cell-wall was destroyed, and small cavities were formed in the midst of the tissue, in which were agglomerated grains of starch, and finally parasitic organisms appeared in the cavities. The vegetable parasites developed were *Polyactis alba*, *Fusisporium Solani*, *F. didymum*, *F. candidum*, and *Oidium violaceum*. When the disease had advanced insects were also present.

"Crum attributed the disease of the tubers of the Potato to rupture of the starch cells, and mixture of their contents with nitrogenous matter, thus causing fermentation, as in the apple and grape. Solly objects to the fungus theory of the Potato disease. He says that decaying organic matter is necessary for the growth of *Fungi*. He thinks that the disease is caused by the presence of putrefying azotised matter in the stem, just below the surface of the soil; that this is carried to all parts of the plant, causes a struggle between vital and chemical forces, and induces decomposition by a process of fermentation. The azotised matter, in a condition to act as ferment, is produced by the state of the season, by deficiency of light, and by other meteorological causes. Analyses show that the constituents of the diseased potato undergo a rapid and important change. Dr. Lyon Playfair and Mr. Phillips found that the amount of albumen and gluten decreased from 2·34 in the sound potato to ·32 in the diseased; and when the disease advanced they finally disappeared.

"Mitscherlich says that the change which cellulose undergoes by the action of a peculiar ferment is characteristic of the substance. This fermenting agent is obtained when half putrid potatoes cut up into pieces are placed in water with portions of fresh potatoes, and allowed to stand till the cells of the fresh portions begin to be easily separable. It is also formed, though more slowly, when fresh potatoes cut up are set aside covered with water; the liquid is filtered, and fresh potatoes, cut in slices, added to it; when these are decomposed, a portion of the liquid may be treated with water, and more slices of potato added, which soon become decomposed, and in this manner increase the activity of the liquid. Hence, just as in the fementation of an infusion of malt, the yeast, the fermentative fungus, becomes augmented, so does the ferment increase. It only acts upon the cellulose, which forms the walls of the starch-cells of the Potato; first the cells separate from each other, so that it furnishes us with a convenient means of obtaining the cells with their contents in an isolated state, and facilitating their examination; the walls of the cells are subsequently also dissolved, and the starch-particles fall out: in this manner, in 24 hours, a slice of potato is rendered so soft to a depth of two lines, that this portion can be removed by a pair of forceps, the hard mass of the potato lying beneath the softened layer, so that this process takes place successively from the outside towards the interior, not by the whole of the potato being simultaneously permeated by the ferment to the innermost portion. Exactly the same process as that which we can produce spontaneously, he says, occurs in the Potato disease, which during late years has done so much mischief. In this also the cellulose, and not the starch, is decomposed; and the liquid, which the author had kept for a long time in contact with one of the diseased potatoes, immediately produced the decomposition of a sound one. This decomposition is, therefore, he says, not the disease itself, but merely the result of it. Its cause undoubtedly depends upon the dying or the previous death of the entire plant, and just as it is well known in the case of other plants that they die when the apices of their roots are too strongly cooled, so may a sudden cold rain following a long warm winter produce a similar condition of the potato plant. It is only after decay has commenced that *Fungi* and insects attack the plant.

"Liebig attributed the Potato disease to diminished or suppressed transpiration, depending upon the hygrometric state of the atmosphere. He refers to Hale's accurate researches in regard to the Hop blight, in which the disease is traced to the want of correspondence between absorption and transpiration, and a consequent stagnation and decomposition of the juices. The same thing, he thinks, takes place in the potato in consequence of cold and an atmosphere loaded with moisture; and he shows that in 1845 and 1846, when the disease overran Europe, damp, cold, and rainy weather followed heat and drought just at the period of the most luxuriant growth of the potato. The vessels and cells became charged with fluids; and, owing to the checked transpiration, there was stagnation of the sap and death.

"*Fungi* and putrefaction are, according to him, the consequences of the death of the plant. Klotzsch proposes to check the Potato disease by pinching off the extreme points of the branches and twigs to the extent of half an inch downwards when the plants have attained the height of six or nine inches above the soil, and to repeat this on every branch or twig on the tenth or the eleventh week. This check to the stem and branches, he thinks, will direct the nutrient matters in the direction of the increase and multiplication of subterranean as well as aërial branches. This leads to increased development of tuber, and strengthens the leaves and stalks. Tombelle Lomba, of Namur, says that he has saved potatoes from disease by cutting off the stems after flowering with a very sharp sickle, and then covering the ground with earth to the depth of not less than an inch and a half. The top dressing thus applied was not disturbed till the potatoes were ripe. The haulm was removed after being cut. It is said that the tubers acquired a good size and were of excellent quality. If these facts are true, it would appear that, while leaves are necessary to the development of tubers, the latter on acquiring a certain size can continue their growth by their own proper and unassisted vitality. The general conclusions to be drawn from all that has been said relative to the Potato disease are, that changes are induced in the cells and vessels of the potato by certain obscure meteorological and epidemic causes; that an alteration takes place in the cellulose and in the contents of the cells, which speedily leads to decay; that parasitic *Fungi* find a nidus in the decaying organic matter, so as to accelerate and give a character to the disease; and that, as yet, no remedy has been devised."

For an account of the *Fungi* supposed to produce Dry-Rot in timber see the article DRY-ROT.

In many parts of the world the *Fungi* afford a supply of food to the inhabitants, although not more than half a dozen species are to be found in the markets of London, and only the common Mushroom, Truffle, and Morel are eaten in Paris; in Italy and other parts of Europe, a large number of species are consumed. [AGARICUS.]

Dr. Badham, in his work on the 'Esculent Funguses of England,' gives descriptions and drawings of the following species of British *Fungi* as those which may be used as food:—

Agaricus acris minor, *A. alutaceus*, *A. atramentarius*, *A. campestris*, *A. castaneus*, *A. caudicinus*, *A. comatus*, *A. deliciosus*, *A emeticus*, *A. exquisitus*, *A. fusipes*, *A. heterophyllus*, *A. melleus*, *A. nebularis*, *A. orcella*, *A. oreades*, *A. ostreatus*, *A. personatus*, *A. piperatus*, *A. procerus*, *A. prunulus*, *A. ruber*, *A. rubescens*, *A. sanguineus*, *A. vaginatus*, *A. violaceus*, *A virescens*, *A. virgineus*, *A. ulmarius*. *A. Cæsarea*, *Boletus edulis*, *B. luridus*, *B. scaber*, *Cantharellus cibarius*, *Clavaria coralloides*, *Fistulina hepatica*, *Helvella crispa*, *H. lacunosa*, *Hydnum repandum*, *Lycoperdon Bovista*, *L. plumbeum*, *Morchella semilibera*. *Peziza acetabula*, *Polyporus corylinus*, *P. frondosus*, *P. tuberaster*, *Verpa digitaliformis*.

Too great caution however cannot be employed in distinguishing the edible from the poisonous species. In the markets of Rome an inspector of Funguses is appointed, whose duty it is to examine all *Fungi* exposed for sale, and none are allowed to be sold but with his express sanction. But it would appear, from a case quoted in Lindley's 'Vegetable Kingdom,' that *Fungi* which are usually innocuous may, under certain circumstances, become poisonous. The fungus consumed in this instance by a family in Cambridgeshire was the *Agaricus personatus*, a species sold in Covent Garden under the name of Blewitts, and which all writers agree in regarding as perfectly free from danger.

The poisonous principles produced in the *Fungi* have sometimes been employed in medicine, an instance of which is given above in the Ergot. The action of a species of *Bovista* has been found similar to that of chloroform. [BOVISTA, *S.* 1.] The *Amanita muscaria* possesses an intoxicating property, and is employed by northern nations as an inebriant. The following is the account of Langsdorf, as given by Dr. Greville:—

"This variety of *Amanita muscaria* is used by the inhabitants of the north-eastern parts of Asia in the same manner as wine, brandy, arrack, opium, &c., are by other nations. Such *Fungi* are found most plentifully about Wischna, Kamtchatka, and Willowa Derecona, and are very abundant in some seasons and scarce in others. They are collected in the hottest months, and hung up by a string to dry in the air; some dry of themselves on the ground, and are said to be far more narcotic than those artificially preserved. Small deep-coloured specimens thickly covered with warts are also said to be more powerful than those of a larger size and paler colour. The usual mode of taking the fungus is to roll it up like a bolus and swallow it without chewing, which the Kamtchatkadales say would disorder the stomach. It is sometimes eaten fresh in soups and sauces, and then loses much of its intoxicating property. When steeped in the juice of the berries of *Vaccinum uliginosum* its effects are those of a strong wine. One large or two small *Fungi* are a common dose to produce a pleasant intoxication for a whole day, particularly if water be drunk after it, which augments the narcotic principle. The desired effect comes on from one to two hours after taking the fungus. Giddiness and drunkenness result in the same manner as from wine or spirits: cheerful emotions of the mind are first produced, the countenance becomes flushed, involuntary words and actions follow, and sometimes at last an entire loss of consciousness. It renders some remarkably active, and proves highly stimulating to muscular exertion. By too large a dose violent spasmodic effects are produced. So very exciting to the nervous system in many individuals is this fungus that the effects are often very ludicrous. If a person under its influence wishes to step over a straw or a small stick, he takes a stride or a jump sufficient to clear the trunk of a tree. A talkative person cannot keep silence or secrets, and one fond of music is perpetually singing. The most singular effect of the *Amanita* is the influence it possesses over the urine. It is said that from time immemorial the inhabitants have known that the fungus imparts an intoxicating quality to that secretion, which continues for a considerable time after taking it. For instance, a man moderately intoxicated to-day will by the next morning have slept himself sober, but (as is the custom) by taking a tea-cup of his urine he will be more powerfully intoxicated than he was the preceding day. It is therefore not uncommon for confirmed drunkards to preserve their urine as a precious liquor against a scarcity of the fungus. The intoxicating property of the urine is capable of being propagated, for every one who partakes of it, has his urine similarly effected. Thus, with a very few *Amanitæ* a party of drunkards may keep up their debauch for a week. Dr. Langsdurf mentions that, by means of the second person taking the urine of the first, the third of the second, and so on, the intoxication may be propagated through five individuals."

Fungi are often phosphorescent. The light given out by species of *Rhizomorpha* in the coal-mines of Dresden is described as giving them the appearance of an enchanted castle. *Agaricus Gardneri*, which grows on a sort of palm called Britada in Brazil, is highly luminous. The same phenomenon has been observed in *A. olearius* in the south of Europe, and in two species of *Fungi* at Swan River. Dr. Hooker describes a luminous fungus as growing upon decaying wood in the forests of the Sikkim Himalaya.

It is generally stated that *Fungi* differ from the rest of the vegetable kingdom, in the absorption of oxygen and the disengagement of carbonic acid gas. In experiments which have been performed, this has been the result; but it is well known that the tissues of *Fungi* are easily decomposable, and it is more probable that the absorption of oxygen, and the giving out of carbonic acid gas is the result of decay, rather than of the true growth of the plant. The following substances were found by Payen in his analysis of *Fungi*:—1. Water; 2. Cellulose; 3. Nitrogenised Substances; 4. Fatty Matters; 5. Sugar; 6. Volatile Matter; 7. Sulphur; 8. Salts, containing Silex and Potash. These substances are analogous to the ordinary products of the decomposition of water, ammonia, and carbonic acid gas by deoxidation, and must either be formed by that process in the fungus itself, or taken directly up from the substances on which they grow, by absorption.

A curious fact connected with the development of *Fungi* is the occurrence of vegetable cells, referred to this order, in liquids undergoing fermentation. During the conversion of malt into beer, plant-cells are constantly observed to be present, and these have been described as a plant, under the name of *Saccharomyces Cerevisiæ*. During the preparation of flax, as now carried on at Belfast, Professor Allman has observed present cells resembling those of *Saccharomyces*. Whether these are true plant-cells or not, is still a question; and it is still more a question as to whether they have anything to do with the changes going on in the solutions in which they occur. They are probably a result, and not the cause, of fermentation. These cells have not escaped the observation of Schleiden, and the following is his account of them:—

"In the last place, I must mention a highly interesting analogy, which, when more accurately examined, may perhaps one day lead to the most satisfactory explanation of the process of cell-formation—I mean vinous fermentation. We have here a fluid in which sugar and dextrin, and a nitrogenous matter, as a cytoblast, are present. At a certain temperature, which is perhaps necessary to the chemical activity of the mucus, there originates, without, as it appears, the influence of a living plant, a process of cell-formation (the origin of the so-called fermentation-fungus), and it appears that it is only the vegetation of these cells which produces the peculiar changes that occur in the fluid. Whether this organism is really a fungus, is a matter of indifference; but whether it alone, through the activity of its vital processes, determines the process of fermentation, deserves to be accurately determined.

"I will here add my own observations on these fermentation-cells. I bruised some currants with sugar, and having pressed the juice through a cloth diluted it with water and filtered through folded paper. The fluid was bright red, quite clear and transparent, and, under the microscope, showed no trace of granules, but presented a number of little drops of a pure clear oil. At the end of twenty-four hours the whole fluid was opalescent, and presented, under the microscope, a number of granules suspended in it. On the second day these granules had greatly increased, and there appeared amongst them perfectly-formed ferment-cells. There also appeared, now and then, vesicles of carbonic acid gas. On the fourth day fermentation was very active. At the bottom of the vessel and on the surface of the fluid, yeast had formed; but these yeasts consisted of single cells, or several attached one to another. In the solitary cells could be observed the way in which one cell was formed from another. The ferment-cells do not in this state permit of a distinction between the contents and the membrane of the cell. In the midst of the cell there is a transparent spot; but whether hollow, or a solid nucleus, I could not decide. The remaining parts appeared entirely homogeneous, yellowish like a nitrogenous substance, sometimes mixed with small solitary granules. In a similar way, a solution of sugar with elder-flowers was examined, and gave similar results. Other results were obtained in the following way:—Pure white protein (albumen) from the white of an egg, was dried, and rubbed down with sugar, and left to ferment: the fluid at first was perfectly clear. On the third day, the small portions of protein, which at the commencement exhibited a sharply angular aspect, assumed partly a granular aspect, and some a more or less rounded form. These globules showed an active molecular movement, and some appeared strung together. On the fourth day there was seen between these granules round or elongated cells, which were either solitary, or arranged together in a line with a tendency to the formation of branched fibres. These cells were not more than one-third of the diameter of ordinary ferment-cells. An active fermentation went on, and gas-bubbles were given out from the protein-granules and the linear cells. Proper ferment-cells did not make their appearance. Fluid albumen, mixed with sugar, and filtered, became thickened on the second day, and contained little granules of albumen (coagulated ?). The further phenomena were similar to those exhibited by the preceding, except that there were developed a few true ferment-cells. Protein moistened with water displayed the same appearances as when mixed with sugar and water; ultimately putrefaction came on, and the development of *Infusoria*, but the vegetable formation preceded. There appears to be two very different types of ferment-cells, according as the fluid contains organic acids and essential oils or not. From the phenomena exhibited by the ferment-cells, one might be inclined to regard them as similar to animal-cells, which are formed through a cavity in the cytoblast, and which afford indications of the nucleoli in their highest development. But this analogy is not tenable, and the above observations must be regarded as imperfect. If we take fully developed ferment-cells, and treat them with ether, alcohol, or caustic alkalies, there will be found in the fluid a number of globular delicate cells, with thin but clearly distinguishable walls, which contain a clear fluid, with here and there very small granules, which, alone or in groups, are attached to the inner surface of the cell-wall, and (almost ?) always a large round flat body (a cytoblast ?)."

The following arrangement of the *Fungi* is given in Lindley's 'Vegetable Kingdom':—

Spores generally quaternate, on distinct Sporophores. Hymenium naked.	*Hymenomycetes*, or *Agaricaceæ*.
Spores generally quaternate, on disdinct Sporophores. Hymenium inclosed in a Peridium.	*Gasteromycetes*, or *Lycoperdaceæ*.
Spores single, often septate, on more or less distinct Sporophores. Flocci of the fruit obsolete, or mere peduncles.	*Coniomycetes*, or *Uredinaceæ*.
Spores naked, often septate. Thallus floccose.	*Hyphomycetes*, or *Bothylaceæ*.
Sporidia contained (generally eight together) in Asci.	*Ascomycetes*, or *Helvellaceæ*.
Spores surrounded by a vesicular veil or Sporangium. Thallus floccose.	*Physomycetes*, or *Mucoraceæ*.

(Fries, *Systema Mycologicum*; Greville, *Cryptogamic Flora*; *Neues System der Pilze*; Corda, *Icones*; Endlicher, *Genera Plantarum*; Hooker, *British Flora*; Sowerby, *Fungi*; Bulliard, *Figures of Fungi*; Lindley, *Vegetable Kingdom*; Berkeley, *Papers in Annals of Natural History*.)

FUSEL OIL. [Chemistry, *S.* 2.]

G

GADOLINITE. [Yttrium.]

GADWALL. [Ducks.]

GAERTNER, or GÄRTNER, FRIEDRICH VON, architect, was born at Coblenz in 1792, and was the son of Johann Andreas Gaertner. Brought to Munich at an early age, he received a general scientific education, and in 1809 entered the Academy of Arts in order to devote himself specially to architecture. After three years he went to Paris, to enter the Academy there; and here he enlarged his knowledge under the guidance of Percier. France had been during many years regarded as the school of Germany in art—for German art was then only about to re-assert independent character, such as under Gärtner and other artists it soon acquired. In 1814 Gärtner went to Italy, where he remained four years. He visited Rome, Naples, and other places of general interest, but would appear to have devoted himself to the antique monuments as much as to later works, although it is the character of the Byzantine and early Italian styles to which the designs in his own buildings are nearest allied. He especially studied the ruins in Sicily, including those at Girgenti, Segesta, and Taoromina, which he drew and published in lithography, in 1819, in a work entitled 'Views of the best-preserved Greek Monuments of Sicily, with Explanatory Text.' In 1819 also he came to England, and was induced to think of residing here; but in 1820, being made professor of architecture in the Munich Academy, he was from that time engaged in Bavaria. Well qualified by his studies and taste to co-operate in the grand revival fostered by the Crown Prince (afterwards Louis of Bavaria), Gärtner became connected with several important branches of manufacture. The superiority in forms and character attained in the works of the porcelain factory, of which he became director in 1822, was due to him, as also in great part was the revival of glass-painting. In 1829 the sphere of his influence was enlarged. King Louis, appreciating his talent, instructed him to design the Ludwigs-Kirche, which eventually was magnificently decorated internally with the aid of the painter Cornelius. Near the church is the great library and record-office, by the same architect. In 1833 he commenced the Blinden-Institut. Amongst his other buildings about the same time, or subsequently, were the University, the Erziehungs-Institut, the Damenstift, the Priester-Seminar, the Salzamt, the Ludwigs-thor, and the Feldhernnshalle, all at Munich. Besides these he built the palace at Wittelsbach, the pump-room at Kissingen, and the Befreiungshalle at Kelheim—a great monument in the form of a rotunda, designed to commemorate the liberation of Germany.

In 1836 Gärtner accompanied the king to Athens to study the Greek monuments, and there he was directed to design a new Residenz, or palace, for King Otho. At Athens he re-opened the quarries of Pentelic marble, said to have been forgotten since the time of Hadrian. On his return he was appointed oberbaurath, or architect to the court, and received the order of Civil Merit of the Crown of Bavaria; and on the departure of Cornelius for Berlin in 1841, he was made Director of the Academy of Arts. In addition to the works above mentioned, Gärtner was architect of the Pompeian House at Aschaffenburg—one of those efforts to collect a series of examples of *styles*, through which, in consequence of that aim, the value of King Louis's still great services to art is reduced. Gärtner also restored the Isar-thor, and portions of the cathedrals at Regensburg and Bamberg. He died on the 21st of April 1847, aged fifty-five years.

Gärtner's style, as described by Raczynski ('Histoire de l'Art Moderne en Allemagne'), is one which "recalls" the idea of the Byzantine; which, as a general statement, is correct. The University and the Bibliothek have however a marked Florentine character. The architect constantly uses the arch-headed window, divided into two lights by a centre-column, and avoids the characteristics of the late Italian styles,—whilst ornament of original character is freely introduced. Much of the fame of Munich for interior decoration in buildings, and the influence of which has spread even to this country, is due to Gärtner. A publication of his designs was commenced about 1844 or 1845.

GAGERN, HANS CHRISTOPH ERNST, FREIHERR (Baron) VON, was born January 25, 1766, at Klein-Neidesheim, near Worms, in the German duchy of Hesse-Darmstadt. He completed his studies at the universities of Leipzig and Göttingen. At an early age he entered the service of the Prince of Orange-Nassau, and was employed as a minister, and sent as an ambassador to Paris. When the Prince of Orange in 1814 became the sovereign of Holland, Baron von Gagern became his prime-minister, and in 1815 was his ambassador to the Congress of Vienna. The Prince of Orange having become king of the Netherlands, Baron von Gagern continued to be his principal minister, and was employed on important occasions as his ambassador. In 1820 the King of the Netherlands rewarded his services by a pension, and he then retired to reside upon his estate at Hornau in the duchy of Hesse-Darmstadt, where he died Oct. 22, 1852, at the age of 86. He was the author of several valuable works on subjects of history, politics, and national law.

When the German parliament was assembled at Frankfürt for the purpose of forming a confederation of the smaller states under a central government, Heinrich von Gagern (son of the above Baron) was appointed president, May 19, 1848; and on the 30th of June, when his first term of office expired, he was re-elected. On the 18th of December he resigned the presidency of the assembly, and Eduard Simson of Königsberg was elected as his successor, the Baron Von Gagern being nominated by the Regent of the Empire to the offices of Minister of Foreign Affairs and President of the Council of Ministers. After many discussions it was resolved, March 28, 1849, that the German states should be constituted an Empire, and that the imperial dignity should be offered to the King of Prussia. The offer was accordingly made, and negociations between the parliament and the king continued for some time; but the king ultimately refused to accept the dignity, under the conditions proposed, and the assembly was dissolved without producing any result.

GALBA. [Elateridæ.]

GALE, SWEET. [Myrica, *S.* 1.]

GALEOCERDO. [Squalidæ.]

GALEUS. [Squalidæ.]

GALLAUDET, REV. THOMAS HOPKINS, to whom America is indebted for the introduction of instruction for the deaf and dumb, was born at Philadelphia, December 10, 1787. Having passed through Yale College, he commenced the study of the law; but being forced to abandon it, in consequence of ill-health, he engaged for a while in commercial pursuits; then, in 1814, he entered the theological seminary at Andover, and upon being licensed to preach, was chosen pastor of a congregational church at Portsmouth, New Hampshire. While thus occupied he became much interested in a little deaf and dumb girl, Alice Cogswell, the daughter of a friend, and he was induced to attempt to instruct her. In this he was by great patience very successful, and her father, Dr. Cogswell of Hartford, was incited by the great benefit which his child had derived, to earnest efforts to extend the blessings of education to other children suffering under similar deprivation. An association was formed, and funds being provided, a requisition was made to Mr. Gallaudet to resign his ministry, and proceed to Europe for the purpose of learning the system and organisation of the existing deaf and dumb institutions.

After some hesitation, caused by a reluctance to separate from his flock, he accepted the offer, and in May 1815 embarked on his mission. He first addressed himself to the London Deaf and Dumb Asylum, but after considerable correspondence he was refused admission to the asylum, except as ordinary junior assistant, and to perform the usual drudgery of that class of assistants. As this he found would have obliged him to spend at least three years in the school without any corresponding gain, he proceeded to Edinburgh, where there was an asylum in considerable reputation. But there, while the committee and master showed every sympathy with him, and would have been glad to assist him in his excellent object, there was an obstacle which it was found impossible to surmount. The teacher had learnt his system from the Messrs. Braidwood [Braidwood, Thomas], and had been compelled by them to sign an engagement not to impart the method to any one person intending to become a teacher.

Thus baffled, Gallaudet was compelled to try Paris. Here he met from the Abbé Sicard a warm welcome. Everything was laid freely open to him, and every means that could be devised was used to accelerate his acquisition of the desired knowledge. He was able to return to America before the close of 1816, and the Abbé Sicard cheerfully consented to Lawrence le Clerc, himself a deaf-mute, who had been one of the pupils, and was then one of the most valued teachers of the institution (he had indeed already been designated its 'glory and support'), accompanying him to America. During his absence in Europe, the society had been incorporated; Mr. Gallaudet was now appointed its principal, Le Clerc being his head assistant, and on the 15th of April, 1817, 'The American Asylum for the Deaf and Dumb,' at Hartford, Connecticut, was formally opened.

Mr. Gallaudet remained the active head of the asylum until 1830, when he resigned from failing health. His devotion to his duties had been most exemplary, and his success as a teacher, we are told, was "uniform and pre-eminent." The system which he in conjunction with M. le Clerc ultimately established, and which has been adopted in the other asylums (of which there are now fourteen) in the United States, was founded on that of the Abbé Sicard, but with very considerable modifications. It is known as the American system. The main principle with Mr. Gallaudet was to call out the intelligence of the pupil as much as possible, by exercising him in describing things for himself, and to discourage the mere learning by rote; and the result was to stimulate the mind of the teacher, as well as of the pupil, in no ordinary degree.

Mr. Gallaudet's exertions were by no means confined to the deaf and dumb asylum. He took an ardent and active interest in the improvement and extension of common schools, and in the raising up of a superior body of teachers, and wrote several pamphlets on the subject. He also zealously advocated the adoption of means of imparting moral and religious training to prisoners; and he was an earnest promoter of the movement for improving the management of the insane. So strongly did he feel on this matter that, though in but feeble health, he accepted in 1838 the office of chaplain of the State 'Retreat for the Insane,' at Hartford; where it is stated, "the experience of each successive year furnished accumulating evidence of the usefulness of his labours, and the efficacy of kind moral treatment, and a wise religious influence in the melioration and care of the insane."

He died on the 10th of September, 1851. About twelve months before his death, the good old man, and his colleague M. le Clerc, had the gratification of receiving from the deaf-mutes in America, as a testimonial of their gratitude, a service of plate each; and on the death of Gallaudet, his fellow-citizens proposed to erect a monument to his memory, as a mark of their sense of his services; but as soon as their intention became known, the deaf and dumb urged their superior claim to the performance of that duty, and accordingly a handsome and costly monument was erected to his memory at Hartford, at the "sole expense of the deaf-mutes of the United States;" the designer and the architect of the monument being both deaf and dumb persons.

The publications of Mr. Gallaudet are numerous, but chiefly pamphlets on the education of the deaf and dumb, and on other educational matters; lesson books; and articles in educational journals. But he also published a volume of sermons, and some books for the young, one of which, 'The Child's Book of the Soul,' had an extended popularity both in America and in England, and was translated into French, Spanish, Italian, and German.

(Barnard, *Tribute to Gallaudet*, 8vo, Hartford, U. S., 1852.)

GALLE, POINT DE, a town, fort, and harbour on the south coast of the island of Ceylon, 72 miles S. by E. from Colombo, is situated in 6° 1′ N. lat., 80° 16′ E. long. The town and fort are built on a low rocky promontory named the Point de Galle. The harbour is formed between the point, which extends towards the east, and a piece of land sloping inwards from the west, thus forming a small bay. The entrance to the bay is about a mile wide, but as there are many rocks in it, a pilot is required to take the vessel to the anchorage, which is abreast the town in 5 fathoms depth of water. There is a pier; a jetty was constructed in 1847, and a new wharf in 1853. The increase in the number of steam-vessels calling at the port chiefly to take in coals has caused various proposals to be made for improving the harbour, but funds are wanting. The fort, built by the Dutch, is upwards of a mile in circumference, and contains several large and commodious houses inhabited by Europeans. The town, or pettah, inhabited by natives, is extensive, contains many neat houses, and has a large population. There are schools here maintained by the government for the education of the natives. An iron lighthouse, constructed in London, was erected in 1848; the total height of the light above the sea is 103 feet. The mail-steamers stop at Point de Galle, and the letters, &c., are forwarded immediately to Colombo, whence they are transmitted to all parts of Ceylon. Letters taken by steamers from Point de Galle reach Madras in three days and Calcutta in nine days. Bombay is reached by steam-vessel in six days.

GALLIONELLA. [Melosireæ, *S.* 2.]

GAMBIA COLONY, the British settlements on the Gambia, a river in Western Africa. The source of the Gambia has not been definitely ascertained. According to the most reliable accounts it rises in the country of the Fouta-Jalon, very near and a little to the south of the source of the Rio-Grande, in 10° 36′ N. lat., 11° 18′ W. long., in a valley surrounded by mountains. The river flows first east and then north till it reaches 13° 22′ N. lat., whence it turns and flows south to 11° 18′ N. lat., where, after having flowed upwards of 400 miles, it is less than 50 miles from its source. Its course is then generally north-west as far as 14° 30′ N. lat., 13° 15′ W. long., whence it flows westward with many bends to the sea, which it enters in 13° 30′ N. lat., 16° 40′ W. long. The Gambia has many affluents, especially in the upper part of its course. The most remarkable on the right bank are the Ba Creek, the Neolacaba, the Nyarico, the Nicolico, and the Nanijar. On the left bank it receives the Poré, the Jelata, and the Eropina, 45 miles below which the Gambia throws off a considerable branch named the Casamansa, which by numerous channels flows into the St. Domingo. The width between Cape Ste. Marie and the island of Sanguomar is about 20 miles. The width gradually diminishes. For nearly 400 miles the Gambia presents a fair water-road into the interior. Early in 1851 Governor Macdonnell, at the close of a tour of inspection on the river Gambia, proceeded up the river as far as about 160 miles above the Rock of Barraconda, which has generally been considered to be 450 miles above Bathurst. The governor's party included Mr. Bage, the colonial engineer, Staff-Surgeon Kehoe, and Lieutenant Mostyn; they proceeded in open boats, accompanied by a canoe. In their progress they observed few signs of cultivation or of inhabitants along the banks. Near the junction of the Nyarico the inhabitants of a town called Jallacoota waited upon the governor, soliciting the visits of traders to their district. The influence of the British has been beneficially exercised in abating the violence of intestine strife among the native tribes in the interior, and cultivating commercial intercourse, thereby promoting agricultural in-industry, and fostering conciliatory feelings amongst the tribes. By the exertions of Governor Macdonnell and Staff-Surgeon Kehoe vaccination has been brought into very extensive adoption among the native tribes on the Gambia.

The English have trading establishments at intervals along both banks of this river for many miles into the interior. The whole of the establishments are included under the title of the Gambia Colony. The colonial revenue for 1851 was 8414*l.* The exports from the Gambia are African teak, ship-timber, ground-nuts, ivory, hides, gold, palm-oil, gum-arabic, and bees'-wax. The value of the exports in 1851 amounted to 186,404*l.*, of the imports to 107,011*l.* In 1852 the exports amounted to 217,856*l.*, the imports to 110,174*l.* The number of vessels arriving at the colony during 1852 was 258, tonnage 29,274, of which 31 ships of 5307 tons were British. The number and tonnage of ships cleared outwards during 1852 were:—Ships 260, tonnage 30,188, of which 30 ships of 4994 tons were British. The number and tonnage of vessels registered as belonging to the port of Bathurst on December 31st 1853 were:—Under 50 tons 49 vessels, tonnage 923; above 50 tons 14 vessels, tonnage 1270. Of the amount of exports for 1851 (186,404*l.*) the article of ground-nuts alone furnished 133,133*l.* value. The quantity of ground-nuts raised by agricultural labour in the countries immediately bordering on the Gambia River and exported from Bathurst has risen from 47 tons in 1835, to 11,094 tons in 1851. The ground-nuts are chiefly exported to France. The increased demand for this produce has tended to encourage settled and industrious habits among the native African population, many of whom travel hundreds of miles from the interior, and hire from the chiefs whose lands lie on the banks of the Gambia, such small portions of ground as their circumstances allow them to cultivate. After the produce of two or three years has enabled them to purchase supplies of European goods, they usually make up parties of from 20 to 100 strong and return to their homes in the interior. These migratory labourers are called 'tilliebunkas,' or men from the east. The principal establishments of the Gambia Colony are at *Bathurst*, on the island of St. Mary, at the mouth of the river, whence the produce of the country is shipped for England, and at Mac Carthy's Island. A colonial steamer has been stationed at Bathurst for some years, and has been of considerable benefit in facilitating communication with Mac Carthy's Island, and with trading stations on the banks of the Gambia. The land and sea breezes blow regularly over St. Mary Island for a considerable part of the year. The surface is a low plain with a slight descent on the north and east towards the centre, which during the rainy season is much inundated. The soil is sandy, with a very small admixture of loam. In the shade the thermometer does not rise above 90°. Water is scarce and not of good quality. Bathurst town does not stand more than 12 or 14 feet above high-water mark. Many good and substantial government and public buildings have been erected, as well as numerous handsome and convenient warehouses and dwellings; the remainder of the houses are rude African huts. The European residents average only about 50, but the number of European and American sailors and others visiting Bathurst every year is little short of 1200. There is a Roman Catholic chapel, capable of accommodating 600 persons, but no suitable place of worship for Protestants. The circumstances of the colony having been somewhat prosperous of late years, several improvements are being effected. Among these may be mentioned—the placing of a light-ship at the mouth of the river; the sinking of wells in Bathurst for the use of the shipping; the erection of a public hospital, a market, a wharf, a church, a court-house, and public-offices at Bathurst; and the construction of roads in the neighbourhood. About the close of 1850 a piece of ground in a very healthy spot, about 8 miles from Bathurst, was obtained from the King of Combo. The ground is about 2½ miles in length, and stretches along the shore of the Atlantic, with an elevation above the sea varying from 50 to 90 feet. It is situated near Cape St. Mary, and being intended to be built upon by merchants and others, residents of Bathurst, it has been called Clifton.

The population of Gambia Colony, according to the census taken March 31st 1851 was 5693, as follows, namely:—

	Whites.		Coloured population.	
	Males.	Females.	Males.	Females.
Island of St. Mary . .	167	13	2192	1890
Mac Carthy's Island .	8	0	637	526
Barra Point	1	0	131	74
Cape St. Mary . . .	1	1	36	16
Total . . .	177	14	2996	2506

Of the total population 82 were returned as engaged in agriculture, 330 in manufactures, and 278 in commerce.

Mac Carthy's Island, the Janjan Bure of the natives, has an area of about 3 square miles, and is 180 miles from the mouth of the river, following its windings, in a populous district, 60 miles below the falls of Barracunda, up to which spot the river is navigable for vessels of 50 tons burden. Fort George, on the island, is in 13° 33′ N. lat., 14° 45′ W. long. Like St. Mary Island, it is but little raised above the level of the sea, and both are in a great measure covered with water during the rainy season. Tropical remittent fever occurs at both places, but with most intensity at Mac Carthy's Island. Mac Carthy's Island has a rich alluvial soil, which in the dry season becomes a mass of burnt clay. The thermometer frequently rises to 106° or 108° in the shade.

The Wesleyan Methodists have schools at Bathurst, at Mac Carthy's Island, and at Barra opposite Bathurst; the total number of scholars is about 600. The Roman Catholics have a school at Bathurst under the care of several Sisters of Charity.

GAME LAWS. *Hares* are no longer game, in the sense of its being necessary to take out a certificate to kill them (11 & 12 Vict. c. 29).

GAMING. The numerous alterations which have been made in the law relating to contracts by way of gaming, to gambling-houses, and to betting-offices, call for some repetition of what has been already stated on this subject. [Gaming.] Playing at cards, dice, or other games of chance, merely for recreation, and without any view to inordinate gain, is by the common law considered perfectly innocent. Not so the offence of *gaming;* which the law looks upon as "a tacit confession that the company engaged therein do, in general, exceed the bounds of their respective fortunes; and therefore they cast lots to determine upon whom the ruin shall at present fall, that the rest may be saved a little longer." In this light, "it is an offence of the most alarming nature; tending by necessary consequence to promote public idleness, theft, and debauchery, among those of a lower class: and among persons of a superior rank, it has frequently been attended with the sudden ruin and desolation of ancient and opulent families, an abandoned prostitution of every principle of honour and virtue, and too often has ended in self-murder." To restrain this pernicious vice among the inferior sort of people, the statute of 33 Hen. VIII. c. 9, was made; which prohibited to all but gentlemen the games of tennis, tables, cards, dice, bowls, and other unlawful diversions, such as logetting in the fields, slide-thrift, or shove-groat, cloysh-cayls, half-bowl, and coyting, unless in the time of Christmas, under pecuniary pains and imprisonment. By the statute 16 Car. II. c. 7, it was next enacted, that if any person by playing or betting lost more than 100*l.* at one time, he was not compelled to pay the same; and the winner forfeited treble the value, one moiety to the king, the other to the informer. The statute 9 Anne, c. 14, further provided, that all bonds and other securities, given for money won at play, or money lent at the time to play withal, should be utterly void; that all mortgages upon the same consideration, should enure to the use of the heir of the mortgagor; that, if any person at any time lost 10*l.* at play, he might sue the winner, and recover it back by action; and in case the loser did not, any other person might sue the winner for treble the sum so lost; and the plaintiff might by bill in equity examine the defendant himself upon oath; and that in any of these suits no privilege of parliament should be allowed. The statute further enacted, that if any person by cheating at play should win any money or valuable thing, or should at any one time win more than 10*l.*, he might be indicted thereupon, and should forfeit five times the value to any person who sued for it, and (in case of cheating) should be deemed infamous, and suffer such corporal punishment as in case of wilful perjury.

The effect of these and of various other statutory provisions, which need not be enumerated, was that all gambling securities, even when transferred to purchasers for a valuable consideration, and without notice of their illegal origin, were altogether void; a result under such circumstances often attended with great hardship and injustice. The law was therefore altered by statute 5 & 6 Will. IV. c. 41, by which securities given for considerations arising out of illegal transactions are declared not to be void; but to be deemed as having been given for an illegal consideration only, the object and effect of this enactment being to protect innocent holders of such securities. Finally, by the statute 8 & 9 Vict. c. 109, repealing the Act of Hen. VIII. (so far as relates to the prohibition of the games of skill therein mentioned, together with the statutes of Charles II. and Anne, and several others), every person who by any fraud, unlawful device, or ill practice, in playing at or with cards, dice, tables, or other game, or in bearing a part in the stakes, wagers, or adventures, or in betting on the sides or hands of those that play, or in wagering on the event of any game, sport, pastime, or exercise, shall win from any other person any sum of money or valuable thing, is guilty of obtaining it by a false pretence, with intent to cheat or defraud; and being convicted thereof, is punishable accordingly. By the same statute all contracts or agreements, by way of gaming or wagering, are declared to be null and void, and no suit is to be maintainable for recovering any money or valuable thing alleged to have been won upon any wager, or deposited in the hands of a stakeholder. This provision, however, does not apply to any subscription, contribution, or agreement to subscribe or contribute for or toward any plate, prize, or sum of money to be awarded to the winner of any lawful game (such as a *foot-race* or *dominoes*), sport, pastime, or exercise.

For the suppression of *gaming-houses*, many statutes have been passed from time to time. The Act 33 Hen. VIII. c. 9, first prohibited the keeping of any gaming-house for profit, under a penalty of 40*s.* a-day; and subjected any person haunting and using such gaming-houses to a penalty of 6*s.* 8*d.* The same statute, and also the statute 30 Geo. II. c. 24, inflicted penalties as well upon the master of a public-house, wherein servants were permitted to game, as upon the servants themselves, who were found to be gaming there. Special provisions for the prevention of this offence were afterwards made by the statute 3 Geo. IV. c. 79; and now, by the statute 9 Geo. IV. c. 61, the unlawfully and knowingly permitting of any unlawful game, or any gaming whatever, in a public-house, may involve a forfeiture of the licence as well as the imposition of a penalty. A licence is now also required, under a penalty, to be obtained annually, at the general annual licensing meeting of the justices of the peace, by such persons as keep public billiard-tables and bagatelle-boards, or instruments used in any game of a like kind.

By several statutes of the reign of King George II., all private *lotteries* by tickets, cards, or dice (and particularly the games of faro, basset, ace of hearts, hazard, passage, rolly-polly, and all other games with dice, except back-gammon), are prohibited under a penalty of 200*l.* for him that shall erect such lotteries, and 50*l.* a time for the players; and by the statute 42 Geo. III. c. 119, games called *little-goes* are declared to be common and public nuisances, and a penalty of 500*l.* is imposed on persons keeping any office or place for that game, or for any other lottery whatsoever, not authorised by parliament. *Public lotteries*, unless by authority of Parliament, and all manner of ingenious devices, under the denomination of sales or otherwise, which in the end were equivalent to lotteries, had been before prohibited by a great variety of statutes under heavy pecuniary penalties.

The effect of these statutes being to render all lotteries illegal, whatever might be the object, it was found necessary to pass a special Act for the protection of those laudable associations, generally called *Art-Unions*, having for their object the promotion of a taste for the fine arts; and accordingly, by the 9 & 10 Vict. c. 48, any voluntary association constituted for the distribution of works of art by lot, is to be deemed legal; provided it be incorporated by charter or that the deed constituting the association and its rules be submitted to and approved of by a committee of the Privy Council.

The statute 13 Geo. II. c. 19, to prevent the multiplicity of *horse-races*, another fund of gaming, directed that no plates or matches under 50*l.* value should be run, upon penalty of 200*l.* to be paid by the owner of each horse running, and 100*l.* by such as advertised the plate. But in consequence of a number of vexatious actions having been brought under this statute, it was, so far as it related to horse-racing, repealed by the statute 3 Vict. c. 5. The effect of the repeal of the provisions of the statutes 33 Hen. VIII. c. 9, and 13 Geo. II. c. 19, and of the exception before mentioned in the statutes 8 & 9 Vict. c. 109, is to place all bargains relating to horse-racing on the same footing as other contracts.

"But," as observed by Blackstone, "particular descriptions will ever be lame and deficient, unless all games of mere chance are at once prohibited; the inventions of sharpers being swifter than the punishment of the law, which only hunts them from one device to another." No sooner were contracts as to horse-racing legalised, than an immense number of petty gaming-houses sprung up, under the name of *betting-offices.* The demoralisation which was found to be the immediate result called for the interference of the legislature, and the statute 16 & 17 Vict. c. 119, was accordingly passed, expressly for the suppression of these haunts of vice. Under this Act, the owner or occupier, or any person using such places, may be summarily convicted, and either punished by a fine not exceeding 100*l.*, or by imprisonment with or without hard labour, for any period not exceeding six months. Persons receiving deposits on bets in such houses incur a penalty of 50*l.*, or three months' imprisonment with or without hard labour; the exhibition of placards or hand-bills, or the advertising of betting lists, is prohibited, under a penalty of 30*l.*, or two months' imprisonment; and summary powers are conferred on magistrates and constables to enter and search suspected houses.

It may be added here that a bankrupt is not entitled to a certificate, or the certificate if granted is void, if he has lost 20*l.* in one day or 200*l.* a-year by any sort of gaming or wagering.

Common gaming-houses are *public nuisances*, and the keeper thereof may be indicted at common law. To encourage the prosecution of such pernicious establishments, the statute 25 Geo. II. c. 36, as amended by 58 Geo. III. c. 70, imposes on the overseers of the parish, or the constable, the duty of prosecuting, whenever two rated inhabitants depose before a magistrate to their belief of the fact of the house being a gaming-house, and enter into recognizances to give material evidence thereof. The costs of the prosecution are, in this case, allowed out of the rates; and on conviction, the two inhabitants who originated the proceedings are entitled to 10*l.* each. To facilitate such prosecutions, it is expressly provided that the person appearing or acting as master, or as having the care and management of any gaming-house, shall be deemed the keeper thereof and liable as such. The offence is punishable by a fine, to which, by the statute 3 Geo. IV. c. 114, imprisonment and hard labour may be added.

The more recent enactments of the statute 8 & 9 Vict. c. 109, and 17 & 18 Vict. c. 38, have still farther facilitated the prosecution of this offence. The owner, occupier, or keeper, and every person in any manner conducting the business of any common gaming-house, or advancing or furnishing money for the purpose of gaming, may now be convicted on the oath of one witness, before two justices of the peace; and in addition to the penalties of the Act of Henry the Eighth, be fined in any sum not exceeding 500*l.*, or in the discretion of the justices, be committed to the house of correction, with or without hard labour, for any period not exceeding twelve months. No proceeding under these statutes is a bar to an indictment being preferred; but no person summarily convicted under them can afterwards be proceeded against by indictment for the same offence. To remove any difficulty in obtaining the necessary evidence, the first-mentioned statute expressly provides that any person examined as a witness, either before the justices or on the trial of any indictment or information touching any unlawful gaming, and who shall receive from the court a certificate of his having made true discovery thereof, shall be free from all criminal prosecutions, forfeitures, and disabilities in respect of such unlawful gaming, while the second statute expressly enables the justices to require persons apprehended in gaming-houses to give evidence.

Facilities are given by these statutes for entering forcibly houses and rooms suspected to be used as places for gaming; and for the arrest of persons found there; heavy penalties being imposed on persons obstructing the entry of constables, and the fact of such obstruction being itself made evidence of the house being a common gaming-house. To prevent persons evading punishment by pretending that the house was only open for the use of subscribers, it is sufficient to prove, in default of other evidence, that the house was used for playing at any unlawful game, and that a bank was kept there by one or more of the players, or that the chances of any game played in the house were not alike favourable to all the players. Thus careful has the legislature been to prevent this destructive vice; which may show that our laws against gaming are not so deficient, as ourselves and our magistrates in putting those laws in execution.

(Blackstone's 'Commentaries;' Mr. Kerr's edition, vol. iv. p. 188.)

GAMPSONYX. [FALCONIDÆ.]

GARAY, JA'NOS, a popular modern Hungarian poet, was born in 1812, at Szegszard, in the county of Tolna. He first attracted attention in 1834 by his heroic poem of 'Csatar,' written in imitation of Vörösmarty's epics; and continued rising in reputation for some years, during which he was one of the favourite contributors to three or four of the Hungarian annuals, and gained several prizes from the societies which offer premiums for successful contributions to the Magyar drama. He gained a scanty subsistence by literary labours of less ambition—by a 'Handbook of Hungarian and German Dialogues,' and by editing a sort of almanac, and at one time a newspaper. In his later years, when his health was bad and he had almost lost his eyesight, he and his family were preserved from positive want by his appointment to a subordinate place in the university library of Pesth, where he died after a long illness, on the 5th of November, 1853. He was a member of the Hungarian Academy. His last productions are 'Elizabeth Batori,' a play in 5 acts; 'Christina Frangepán,' a poetical tale; a series of historical legends entitled 'The Arpads;' a collection of poems called 'The Pearls of the Balaton Lake;' and 'Saint Ladislaus,' an historical poem. He was enthusiastically patriotic, and took a warm interest in the progress of Hungary during what is now almost looked back upon as its golden age, from 1840 to 1848. In his lyric poems he takes by preference national subjects, and those connected with modern improvement, such as the power of steam, and the wonders of railways.

GARNISHEE. Where the debts owing to a judgment debtor are attached to answer the claim of the judgment creditor [Attachment; Attachment of Debts, *S.* 2], the judgment debtor is called the Garnishee, a designation derived from the process of foreign attachment peculiar to the Lord Mayor's Court of London, the Tolsey Court of Bristol, and the Borough Court of Exeter. The garnishee may be examined as to his indebtedness, he may dispute his liability, or he may pay the debts to the judgment creditor, who can effectually discharge him if he does so. ('Common Law Procedure Act,' 1854.)

GARSTANG. [Lancashire.]

GASES, LIQUIFICATION OF. [Chemistry, *S.* 1.]

GAULT. [Cretaceous Group.]

GAULTHERIA, a genus of Plants belonging to the natural order *Ericaceæ*. It has a 5-cleft or 5-toothed calyx, bibracteate at the base, after flowering becoming large and succulent, and covering the capsule with a baccate coating. The corolla is ovate, ventricose, with a 5-cleft revolute border, transparent at the base. There are 10 stamens, inclosed, with flat filaments; anthers bifid at the apex; lobes biaristate. The hypogynous scales 10, usually united at the base. The ovarium half inferior. The capsule 5-celled, with a loculicidal dehiscence.

G. procumbens, Partridge-Berry, Chequer-Berry, Bosberry, Mountain-Tea, is found on sterile sand and gravel in mountainous forests in the driest situations in North America. It has a horizontal woody rhizoma, often a quarter of an inch in thickness. The branches are ascending, but a few inches high, round and somewhat downy. The leaves are scattered near the extremities of the branches, evergreen, coriaceous, shining, oval, or obovate, acute at both ends, revolute at the edge, and furnished with a few small serratures, each terminating in a bristle. The flowers are axillary, drooping, on round downy stalks. There are two concave heart-shaped bracts. The calyx is white, cleft into 5 roundish acute segments. The corolla is white, urceolate, 5-angled, contracted at the mouth, the limb divided into 5 short reflexed segments. The filaments white, hairy, bent in a semicircular manner to accommodate themselves to the cavity between the corolla and ovary. The anthers oblong, orange-coloured, ending in two double horns, bursting outwardly for their whole length. Above the filaments the pollen white. The ovary is roundish, depressed, 5-angled, resting on a reddish 10-toothed glandular disc; the style erect, straight; the stigma simple. The fruit is a small 5-celled many-seeded capsule, invested with the calyx, which becomes large, round, and fleshy, having the appearance of a bright scarlet berry. The fruit contains an aromatic sweet highly pungent volatile oil, which is antispasmodic and diuretic. A tincture has been useful in diarrhœa. Cox states that the infusion is useful in asthma. It is used in North America as tea, and brandy in which the fruit has been steeped is taken in small quantities, in the same way as common bitters. The oil is known under the name of Oil of Wintergreen, and is used by druggists to flavour syrups, and also by perfumers.

G. Shallon is a native of North America on the falls of the Columbia, and near the Western Ocean. It has a procumbent hairy stem, ovate subcordate serrated leaves, glabrous on both surfaces, the racemes secund bracteate, clothed with rusty down. The corolla is white tinged with red, downy, urceolate, with a closed limb. The berries are globose, acute, fleshy, and purple. This plant grows in the shade of close pine-forests where hardly anything else will grow, which makes it a very desirable shrub for plantations. The berries are much esteemed by the natives on account of their agreeable flavour.

G. hispida, Wax-Cluster, is a native of Van Diemen's Land; it has long lanceolate serrulated leaves, pilose beneath as well as on the petioles; the branchlets hispid; racemes axillary and terminal, shorter than the leaves; the rachis and pedicels downy; the calyxes baccate, fruit and ovaries glabrous, the stem erect. It bears snow-white berries, with a flavour by no means unpleasant; in taste it is said to resemble the gooseberry, but is somewhat bitter. According to some *G. antipoda* is said to have more merit as a fruit.

The species are all ornamental, and grow best in a peat soil. (Lindley, *Flora Medica;* Lindley, *Vegetable Kingdom;* Don, *Dichlamydeous Plants*.)

GAUSS, CARL FRIEDRICH, one of the most celebrated mathematicians of his day, was born at Brunswick, April 23, 1777. He displayed early such marked talent for the abstract sciences, that the Duke of Brunswick, Charles Ferdinand, undertook the charges of his education. In the thesis which he maintained in 1799, before obtaining his degree of Doctor, he evinced his talent by analysing the previous methods for proving the truth of the fundamental axioms in algebra, giving one of his own still more exact. In the same year he published his 'Demonstratio nova theorematis omnem functionem algebraicam rationalem integram unius variabilis in factores reales primi vel secundi gradus resolvi posse:' and in 1801 this was followed by his 'Disquisitiones Arithmeticæ,' published at Leipzig, in 8vo. The last-mentioned work showed his rapid advance in the mathematical sciences. There was so much of novel speculation in this treatise as to excite some merriment among the French scientific men; but their ridicule failed to affect his reputation. In 1807 he was appointed Professor of Astronomy in the University of Göttingen; and in 1816 was named a privy-councillor. In the beginning of the present century the new planets were discovered, and he propounded a method for calculating their courses, in his 'Theoria motûs corporum cœlestium,' published at Hamburg, in 4to, in 1809; to which Professor Paucker added, in a separate pamphlet, a geometrical formula, more definitely proving the truth of the principle of the curvilinear triangulation upon which Gauss's comparisons depended. Gauss's work greatly contributed to the succeeding more exact and useful application of the astronomical observations to which, about this time, the attention of the scientific world began to be directed. His 'Theoria combinationis observationum erroribus minimis obnoxiæ,' published at Göttingen in 1823, in 4to, with the supplement, issued in 1828 from the same place, was a great addition to scientific knowledge.

On the completion of the Göttingen Observatory, Gauss devoted himself to astronomical observations. On the appointment of the government commission for extending the Danish admeasurement of an arc of the meridian to the kingdom of Hanover, he invented the means of making distant stations visible, by reflected sun-light, by an instrument known as the heliotrope. Afterwards he was zealously occupied with investigations as to terrestrial or telluric magnetism, for which purpose the government caused a building to be erected for his experiments, near the observatory. By the labours of himself and W. Weber, the science of telluric magnetism assumed a new and important phase. The theory was explained by them in conjunction in the Transactions of the Magnetic Union, under the title of 'Resultate aus dem Beobachtungen des Magnetischen Vereins in Jahre 1836, herausgegeben von C. F. Gauss und Wilhelm Weber,' published at Göttingen in 1837, with another volume for 1839, published at Leipzig in 1840, with an 'Atlas des Erdmagnetismus, nach den Elementen des Theorie entwarfen.' In 1841 he published at Göttingen his 'Dioptrische Untersuchungen' ('Dioptrical Investigations'). His latest labours were directed to the theory of geodesy, the first essay of a series upon which he published at Göttingen in 1844, under the title of 'Untersuchungen über Gegenstände der höhern Geodesie.' In this, with a modest pride, he speaks of the trigonometrical admeasurement as "partly executed by myself, and partly under my guidance." This was contributed to the 'Transactions' of the Royal Scientific Society at Göttingen, and appeared in the second volume. He died on February 23, 1855.

We do not attempt to give a complete list of Gauss's works: he contributed many papers to scientific publications, but the following are among the more interesting that have appeared separately, in addition to those already mentioned:—'Methodum peculiarem elevationem poli determinandi explicat,' Göttingen, 1808, 4to; 'Disquisitiones generales circa superficies curvus,' Göttingen, 1828, 4to; 'Theoria residuorum biquadraticorum Commentatio prima,' Göttingen, 1828, 4to; 'Intensitas vis magneticæ terrestris ad mensuram absolutam revocata,' Göttingen, 1833, 4to.

GAY-LUSSAC, NICOLAS-FRANÇOIS, was born at St. Leonard, in the department of Haute-Vienne, on December 6th, 1778. He was educated at the Polytechnic School, where his assiduity and talents gained him the friendship of Berthollet. On leaving the school he entered into the scientific department of Les Ponts et Chaussées. The expansibility of the gases was at that time a subject exciting much attention; and Gay-Lussac gave the law of dilatation, and showed its constant uniformity. His application to the subject led M. Charles, a scientific physician, to recommend him the use of the balloon, just previously invented, as an excellent means of testing some of his theories, of making fresh experiments, and of at least exciting public attention by his boldness and the novelty of the attempt. In conjunction with M. Biot, he made the proposal to the government; Laplace and Berthollet supported it; and M. Chaptal, then Minister of the Interior, gave them the balloon which had been constructed for the use of the war department, having had it refitted at the public expense. Furnished with chronometers, thermometers, barometers, hygrometers, electrometers, compasses, and papers and pencils, Messrs. Gay-Lussac and Biot ascended from the garden of the Conservatoire des Arts et Métiers, on August 23, 1804. Their highest elevation attained was 3977 metres (4335 yards) above the Seine. M. Biot was affected with giddiness; but Gay-Lussac, by his experiments, ascertained that the influence of terrestrial magnetism on the compass was nearly as great as on earth; that the atmospheric electricity increased as they rose, and was always negative; that the hygrometer showed increased dryness; and the thermometer, which marked 14° Réaumur (63½° Fahrenheit) on earth, sank to 8⅓ (51°). The bold adventurers at last descended safely about 54 miles from Paris. On September 5, in the same year, M. Gay-Lussac made a second ascent alone, when he reached a height of 4½ miles; at which height he experienced a difficulty of breathing and an excessive cold, the thermometer being 6 degrees below 0 of Réaumur (20° Fahr.). He calculated that the air lost 1 degree of heat for each additional height of 174 metres (180 yards). On this occasion he brought down, in bottles carefully prepared for the purpose, some air from the highest point reached, which on analysis was found to be composed precisely the same as at the surface. After a voyage of six hours he descended at a village about 21 miles from Rouen.

M. Charles had been correct in supposing these experiments would draw attention to his friend. They introduced him to honour, titles, and illustrious friends. Of the society of Arcueil, instituted by Laplace and Berthollet in 1804, consisting at first of only nine members, Gay-Lussac was one. Here he met Alexander von Humboldt, with whom he joined in the investigation of the polarisation of light, several memoirs on which were furnished to the society. In conjunction also with Von Humboldt he endeavoured to determine the position of the magnetic equator, and its intersection with the terrestrial equator. Gay-Lussac's chief attention however was directed to the Voltaic pile, and the decomposition of acids and alkalies. Napoleon I. had instituted a magnificent prize for the most important discovery made by means of the pile, hoping that it would be gained by some one connected with the École Polytechnique, but Sir H. Davy, by his discovery of the metallic bases of soda and potassium, was the successful competitor in 1810. Bonaparte was dissatisfied; he inquired why the members of the institute had suffered the prize to be taken by a stranger, and he was told there was no pile in France powerful enough to obtain any grand results. He ordered a colossal one to be constructed immediately, and with it Gay-Lussac and M. Thénard commenced their experiments in 1808. The result was a work in 2 vols. published in 1811, 'Recherches physico-chimiques sur la pile, sur les alcalis, sur les acides, l'analyse végétale et animale,' &c. Their discoveries, and the improvements on methods of Davy, detailed in this work, were of great importance. In 1816 he was created Professor of Chemistry in the Polytechnic School.

Gay-Lussac's life was one of constant activity. Though he only published two works, and those little more than pamphlets, 'Mémoire sur l'Iode,' and 'Mémoire sur le Cyanogène,' both highly esteemed, he wrote more than a hundred papers on various subjects, and all of great ability. Besides the subjects already mentioned, he wrote on hygrometry, on capillary attraction, on the distinction between oxides and hydratides; and to him is due the discovery of the hydro-sulphuric and oxy-chloride acids. A course of chemical lectures delivered by him at the Sorbonne, taken down in short-hand, has been published in two volumes.

The merits of Gay-Lussac were not unrewarded by his country. After 1830, he was repeatedly chosen a member of the Chamber of Deputies; and in 1839 he was created a peer of France. He was a member of the Academy of Sciences, honorary professor of natural philosophy at the Sorbonne, professor of chemistry at the Jardin du Roi, verificator at the mint of works in gold and silver, editor (with M. Arago) of the 'Annales de Physique et de Chimie,' with several other official employments connected with the manufacturing industry of France. After a long life of useful labours, and in the enjoyment of excellent health till within a short period of his decease, he died May 9, 1850, at Paris, in the mansion provided for him in the Jardin du Roi.

GAYAL. [Ox.]

GEDRITE. [MINERALOGY, *S.* 1.]

GEIJER, ERIK GUSTAF, said by a Swedish critic to be equally eminent as a poet, a thinker, and an historian, was born at the iron-foundry of Ränsater, in Ränsater chapelry, province of Wermeland, Sweden, on the 12th of January, 1783. His father, the proprietor of the foundry, was the descendant of a family which had emigrated to Sweden from Austria in the time of Gustavus Adolphus, and by establishing foundries had peopled the district. Geijer, in his 'Minnen,' or 'Reminiscences,' has given a vivid description of the wild country of his birth and the hearty patriarchal manners which prevailed in it, to both of which he was strongly attached. At twelve years old he was sent to the school at Carlstad, five Swedish miles south of his birth-place, and at sixteen to the University at Upsal; during his residence at which, however, he enjoyed nothing so much as his frequent visits home, where he used to declare his conviction that the solemn academical disputations of Upsal would be the laughing-stock of future ages. At the age of twenty he was still without a degree, and when his friends, who were anxious to see some fruits of his studies, applied to a family of consideration to secure him the place of tutor, they received for answer that inquiries had been made at the university as to his character, and that he was found to be a "youth without steadiness." The rejection, and the motive assigned for it, stung Geijer to the soul. He resolved to do something to raise his reputation from so low a point, and without informing any one of his design, went to the parsonage, begged to look over a file of old newspapers, and ascertained that the subject of the great prize offered that year by the Swedish Academy was the 'Äreminnet,' or eulogy of Sten Sture, the administrator of the kingdom before the time of Gustavus Vasa. There was an imperfect copy of Dalin's 'History of Sweden,' at the foundry-house; this he studied in secret, found means to possess himself of some paper, which was scarce in those quarters, and as fast as he wrote his essay, concealed the sheets in the unsuspected hiding-place of an old clock-case. It needed some contrivance to get the essay sent off by post without taking any one into his confidence, but this too was done. Some months after his sister asked him what made him turn so red on a sudden as he was reading the newspaper. He had come on an advertisement requesting the author of the essay on Sture, with a certain motto—the same which he had selected—to make himself known to the Academy. He had won the prize, and from that day was looked on in a different light by his family and all his friends. In the next year, when he visited Stockholm, he was introduced to many of the leading literary men, and universally regarded as a youth of high promise. In the same year (1804), on a visit to his native Wermeland, he became acquainted, on a hunting excursion, with another young Wermelander, a student of the University of Lund, and they took a ramble together, sleeping occasionally in barns, and keeping up a continual disputation. This student, who became a friend for life, was Esaias Tegnér, afterwards Bishop of Wexio, now universally regarded as the greatest poet whom Sweden has produced. "We never talked together, then or afterwards," Geijer said in later life in his eulogy on Tegnér, "without disputing; and as we never came to agree, perhaps the solution may be, that we never understood one another. How this might be with Tegnér I know not, but I at least believed that I understood him."

In 1806 Geijer took his degree, and soon after obtained a post in the National Archives; but he was anxious to travel in foreign countries, and in 1809 obtained his wish by visiting England as travelling tutor to a youth of the name of Von Schinkel. He stayed about a twelvemonth in this country, two months of which were spent in studying English at Stoke Newington. Several of Geijer's letters from England were printed by himself in his 'Minnen,' in 1834; others have appeared since his death in the collected edition of his writings now publishing. In one of them, dated from Bath in 1810, and first printed in 1855, he says, "I came to England with strong prejudices against the people. It is a nation, I thought to myself, in which a love for gain and a narrow selfishness has quenched all that is beautiful and noble. Mine was a Swedish notion of selfishness, drawn from an imperfect state of society, where the connection between the public and private advantage is often far from obvious. Here every man knows that connection; and there is no honester man in the world than the selfish industrious Englishman, from the merchant to the day-labourer. This result may be owing to prudence as well as to principle, but such is the case. No foreigner can come here without admiring the honour and the mutual confidence that prevail in commerce and in life." On his return to Sweden, Geijer was soon engaged in the editorship of a magazine having the name of 'Iduna,' set up by a society of twelve, of whom he was one, and his brother another, who christened themselves 'the Goths.' The main idea of their union was that of reviving the manners and spirit of their Gothic ancestors, and some of their rules and ceremonies were sufficiently childish; but for these the founder, one of their friends, named Adlerbeth, was chiefly responsible. The 'Iduna' contained in its earliest numbers poems by Geijer—'The Viking,' 'The Last Champion,' &c.—which were full of vigour and spirit, which became immediately popular, were translated into Danish and German, and still retain their place in all selections of Swedish poetry. In subsequent numbers the early cantos of Tegnér's 'Frithiof' appeared for the first time. As in the case of many other Swedish periodicals, there seems to have been no intention of continuing the 'Iduna,' however successful, for an indefinite space of time: it was brought to an end after ten numbers, and the society of the Goths, which was painfully kept up by the exertions of Adlerbeth for many years after the other members had grown tired of it, was finally buried in his grave on his death in 1844. Geijer put forth, in 1813, a translation of 'Macbeth;' and between 1814 and 1816 was associated with Afzelius in the publication of a collection of Swedish popular ballads, 'Svenska Folkvisor,' in 3 vols., to which however Geijer contributed little more than introductory matter. He had held from 1810, when he was elected during his absence in England, a subordinate post in the University of Upsal, and for some years was in search of a position that would enable him to marry. In 1816 he was appointed adjunct or assistant to Fant, the professor of history at the University of Upsal, on his retirement; he then married a lady to whom he had been engaged before his journey to England, and in the next year, on the death of Fant, he succeeded to the full professorship. His first lectures had an unexampled popularity, and the lecture-room was crowded, not only with students, but with the best society of Upsal, including ladies. These early lectures were different both in matter and manner from those which his more matured knowledge and taste afterwards approved: as he grew more profound he became less popular, but he still continued the pride of the university and the favourite of the students. His success with the eulogy of Sten Sture had proved his genius, but had not proved the steadiness he was charged with wanting, and as a professor he was not remarkable for regularity in the discharge of his duties. His musical tastes interfered a good deal with his other pursuits, and it was remarked that when he had once got to a pianoforte, it was not easy to get him away from it. He had also frequent leave of absence for the purpose of prosecuting historical researches. One of the most prominent incidents in his academical life was an academical trial to which he was subjected on account of his theological opinions. In an edition which he published about 1820, of the works of Thorild, a Swedish philosophical speculator, some passages in the introduction by Geijer, which was entitled, 'A Philosophical or Unphilosophical Confession of Faith,' were regarded by some of his colleagues as hostile to the doctrine of the Trinity, and the author was denounced to the university authorities; but a long examination terminated in an acquittal, which was celebrated as an important triumph of liberty of thought and liberty of the press in Sweden. Geijer says, in a passage in one of his writings, "I am not a Church-Christian, I am not a Bible-Christian; I am, so to speak, a Christian on my own account;" and he concludes a statement of his way of thinking in theology with the declaration, "If this is Christianity, I am a Christian." The trial to which he had been subjected did not prevent his being twice offered a bishopric, that on the second occasion being in his native diocese of Carlstad, a distinction the more flattering that in Sweden a bishop must in the first instance be nominated by the clergy. He declined on both occasions. "Perhaps if I accepted," he wrote to a friend, "they might have a blameless middling bishop, but there would be an end to Erik Gustaf Geijer. It is not pride that speaks, but humility and conscience. I am afraid of this dignity, this new path, these new duties. Better keep on working in the circle where I am at home, and know that I work to some purpose. For the University of Upsal I am somebody. That would lose more than Wermeland gained." Geijer was in fact for many years in a distinguished position as the head of Swedish historical literature. He planned a great history of the country, to supersede that of Dalin and Lagerbring, who have been for Sweden what Hume and Smollett have been for England; and it was universally acknowledged that his introduction to the great work, the first volume of 'Svea Rikes Häfder,' or 'Records of Sweden,' promised a masterpiece. Unfortunately, the great work was never carried further. Before proceeding with it the author undertook another history of Sweden on a smaller scale, the 'Svenska Folkets Historia,' for the general collection of the histories of Europe, set on foot by Leo and Uckert; and this was carried before 1843, in three volumes, to the death of Queen Christina, but there it stopped. The professor, in place of continuing it, was occupied in examining the papers of Gustavus III., which the king had bequeathed to the University of Upsal, in a chest not to be opened till fifty years after his death. The work founded on these, 'Konung Gustaf III.'s efterlemnade Papper Öfversikt, Utdrag och Jemnförelse af E. G. Geijer' (2 vols., 8vo, Upsal, 1843), disappointed the public expectation, but more owing to the insignificance of the royal legacy than to any deficiency on the part of the editor.

Geijer was also occupied with speculations in politics and political economy. Twice he was the representative of the University of Upsal at the diet, and while on the first occasion he was a warm defender of monarchical power, in the second (in 1838) he saw cause to modify his views, and lost the approbation of several of his former supporters by a change of opinion in favour of progress and liberalism, which he avowed and defended in a periodical called 'Litteraturbladet,' written by himself. His views of pauperism were developed in 'The Poor Laws and their bearing on Society, a Series of Political and Historical Essays,' which were published in English (Stockholm, 1840) as well as Swedish, and of which the English version, as it bears no translator's name, and has marks of a foreign hand, may possibly be from his own pen. A dissertation on the history of Sweden during the 'Frihetstiden,' or 'Freedom-Time,' as it is called, which extended from the death of Charles XII. to the revolution in favour of regal power which was forcibly effected by Gustavus III., is the last of Geijer's works of much importance. His opinions of the superiority of regal to aristocratical government did not pass unquestioned, and were the subject of a controversy with Fryxell. During about thirty years Geijer continued one of the literary magnates of Sweden, in constant intercourse with all that was distinguished. He was the intimate friend of Tegnér and Atterbom, had a correspondence with Frederika Bremer, and wrote both verses and music for Jenny Lind. In 1846 his health began to break, he was obliged to pay a visit to the Schlangenbad of Nassau, and resigned his professorship. He died at Stockholm on the 23rd of April, 1847—a year which was fatal to many of the literary celebrities of Sweden.

A collected edition of Geijer's works was commenced soon after his death, but is still incomplete, though advanced (in 1856) to thirteen octavo volumes. A life by his son, Knut Geijer, is prefixed to the first volume, but before the second sheet had been printed the writer suddenly died. Most of the works of Geijer have been already mentioned. The most important is undoubtedly his 'Svenska Folkets Historia,' of which an English translation by J. H. Turner was published in London, and the first volume of a continuation of which by Carlson was issued in German, in Leo and Uckert's collection in 1855. Many of the volumes of his works are occupied with shorter pieces, articles in periodicals and papers read before the Swedish Academy, of which Geijer, became 'One of the Eighteen' in 1824, and was afterwards for some years President. The academical dissertations of which he was the author are as yet not reprinted, but several of them—one in particular on the Swedish colonies in America—are of considerable interest. His letters and his minutes of conversations with Bernadotte, with whom he seems to have been a favourite, were first printed in this collection, and embrace much that is worthy of notice and preservation, especially when taken in conjunction with his 'Minnen,' or 'Reminiscences,' perhaps his most attractive production, but one which like so many others was left unfinished. It should be observed that Geijer had not only a taste but a talent for music, and enjoyed some reputation as a musical composer, a volume of music having been published in conjunction by himself and Lindblad.

GEINE. [CHEMISTRY, *S.* 2.]

GELATIN. [TISSUES, ORGANIC, *S.* 1.]

GENERATIONS, ALTERNATION OF. During the course of the development of many of the lower animals from the ovum to their adult condition, they not only pass through various forms, as is seen in the Insect tribes [INSECTA], but at certain stages of their growth they possess the power of multiplying themselves. The individuals which exhibit this phenomenon have been called 'nurses,' and the whole series of phenomena connected with this mode of reproduction have been called by its first expounder, Professor Steenstrup, an 'alternation of generations.' This phenomenon has been particularly observed in the *Acalephæ*, *Entozoa*, *Polypiferæ*, *Salpæ*, and *Vorticellæ*. In the various articles on these families of animals, their mode of development is described. As however this subject is one of general interest, and very imperfectly understood, we take the opportunity of reproducing here Professor Steenstrup's general remarks on this subject, from a translation of his work published by the Ray Society:—

"The mode of development by means of 'nurses,' or intermediate generations, is thus seen to be no longer an isolated phenomenon in nature. The circumstance of an animal giving birth to a progeny permanently dissimilar to its parent, but which itself produces a new generation, which either itself or in its offspring returns to the form of the parent animal, is a phenomenon not confined to a single class or series of animals; the vertebrate class is the only one in which it has not been observed. It would consequently appear that there is something intrinsic in this mode of development, and that it occurs as it were with a certain necessity; on which account it will undoubtedly soon be recognised to a greater extent and more generally. It should no longer be considered as something paradoxical or anomalous (as we have hitherto been too much inclined to deem both it and the phenomena in which it is exhibited), it must be in harmony with the rest of development in nature, in which the fundamental principle of this course of development must also be elsewhere expressed, although it may be displayed in a form under which we shall less readily perceive and recognise it. This is seen when we trace the mode of development in question more widely through nature; and whilst contemplating it through the phenomena in which it is manifested, we comprehend it in its true light.

"If we collect and regard in one view the whole system of development by means of 'nursing' generations, as it is exhibited in the Bell-Shaped *Polypes* (*Campanularia*), the Claviform *Polypes* (*Coryne*), *Medusæ*, *Salpæ*, *Vorticellæ*, and *Entozoa*, it appears as a peculiar and consequently as an essential feature in this course of development, that the species (that is, the species in its development) is not wholly represented in the solitary, full-grown fertile individuals of both sexes, nor in their development; but that to complete this representation, supplementary individuals, as it were, of one or of several precedent generations are requisite. Thus, the distinction between this course of development and that which is generally recognised in nature, in which the species is represented by the individual (of both sexes) and its development, is the want on the part of the individuals of a complete individuality as representatives of the species, or of a specific individuality, if I may so express it. If now we agree to regard such an incompleteness in the individual as the essence of this development, we shall comprehend its significance in nature when we thoroughly consider this course of development in its various periods, throughout the above-mentioned families, how it begins and advances, so that at last we discover to what it tends. I believe, also, that we might trace even now this development by means of precedent preparatory generations of 'nurses' in its peculiar course and advance, notwithstanding the paucity of instances adduced in the foregoing pages, and the many gaps in the series of observations. Thus we see the greatest incompleteness and the highest degree of mutual dependence in the *Campanulariæ* and similar *Polypes*, in which the generations representing the unity of the species are very unlike each other, and in which all the individuals are fused, as it were, into an outward unity, or into a set of *Polypes*. They exist, organically connected with each other, and are normally free only in their first generation, and indeed only in their earliest stage of development, and only for a short time, since the free-swimming ciliated embryo swims about in the water at most for some hours, in order to find a suitable place for the foundation of a new polype stem. In the *Corynæ*, or claviform *Polypes*, the organic connection between the individuals and generations is rather more lax; the perfect gemmiparous or ovigerous individuals are usually quite free, often even at an early age (*Coryne fritillaria*, *Corymorpha*), so that they do not attain their full development until after their separation from the 'nursing' generation. In the *Medusæ* and *Salpæ*, the generations which are connected together into one whole, become more like each other; the first generation of the *Medusæ* is still fixed but more active and mobile in its parts; the individuals of the perfect generation leave the 'nursing' animal while still very small, and undergo remarkable changes after they have become free and are swimming freely about; both generations of the *Salpæ*, finally, are free, and free swimmers, only the individuals of one of them are organically connected with each other; they have however no common organs (in the full-grown state), and if my explanation of the alternate generation of the compound Ascidians is correct, we have in that instance precisely the development of the *Salpæ* at a somewhat lower stage; the individuals of the one generation are organically connected, without having a common organ; but both generations are fixed.

"In the class of *Entozoa* a similar progressive attempt at becoming free and accomplishing a perfect growth appears evident to me.

"In the *Cestoidea* the generation of perfect individuals constitutes externally a unity; they are only successively detached from each other as the term of their existence approaches, and their whole existence is throughout connected with the 'nursing' animal. In some of the *Trematoda*, the later generations remain within the earlier until they have attained their full development; in others they forsake them in an earlier condition, are free, and free swimming, and undergo a complete metamorphosis; in some of these latter, the earlier generations are transformed into motionless, and, as it were, lifeless cysts, whilst in others they remain free and active (the 'nurses' and 'parent nurses' of *Cercaria ephemera* and *C. echinata*), but retain during their whole life a form which, at most, resembles the larvæ of the more perfect generation. In this way an advance in a certain direction may indisputably be observed. At first all the generations constitute a unity, not merely as regards the interior, but also with respect to the exterior: they form a stationary colony; after which the generations are detached more and more from each other, and become at the same time more free; and, finally, all the individuals constituting the generation are separate from each other, and acquire the power of free locomotion. In this latter stage, or that of freedom and perfection, we found the development of animals which are certainly no longer attached to inanimate objects at the bottom of the sea, but live buried in other animal organisms, and belong not to the sea but to fresh water. In a still higher and more free stage than this we observe the development of animals which do not belong to the water, but to the air, as in that which occurs in the *Aphides*. The propagation of these creatures through a series of generations has been already long known. In the spring, for instance, a generation is produced from the ova, which grows and is metamorphosed, and without previous fertilisation gives birth to a new generation, and this again to a third, and so on, for ten or twelve weeks; so that in certain species even as many as nine such preliminary generations will have been observed; but at last there always occurs a generation consisting of males and females, the former of which, after their metamorphosis, are usually winged; fertilisation and the depositing of eggs take place, and the long series of generations recommences in the next year, and in the same order. All the individuals are free, and enjoy the power of free locomotion, and undergo a metamorphosis. Here, however, we have before us aërial animals, and which are no longer parasites inhabiting other organisms; at most they are only externally parasitic, and on plants alone; the phenomena of this mode of development are no longer exhibited by *Entozoa*, but by *Epiphyta*. Nevertheless, the course of development is in itself similar; but in the external, more free, and nobler form in which it is now exhibited, the endeavour to attain something higher is manifest. Each link or generation certainly brings its offspring nearer to the perfection aimed at; but this approachment towards perfection is effected only by means of the 'nursing' by special animals, and is committed to the still and quiet activity of an organ, without the nursing animals themselves being conscious of it; it is a function merely, and not an expression of the will. In all parts of the animal kingdom we see the instances of the still, quiet, and unconscious activity of the animal being developed into voluntary actions, which are undertaken by it from an internal, obscure, and irresistible impulse (or artificial impulse), as is the case in this instance. The development and mode of feeding or nourishing the young, exhibited in its course, of Bees, Wasps, Ants, and *Termites*, affords a direct example of the mode in which the care of the young is provided for, by the voluntary action of numerous individuals devoted to that object. Those of the young which are to be developed into the more perfect fertile individuals are not protected in the body of the foster-parents, nor is their nourishment secreted by one of the organs; both protection and food are afforded them by means which are brought about by the conscious activity of the 'feeders.' The Wasp, for instance, or the Wild Humble-Bee, which has been impregnated in the autumn, and has afterwards sought a shelter to protect itself against the cold of winter, prepares a solitary habitation in which it builds cells and deposits its eggs. From the eggs proceed larvæ, but the insects into which these larvæ are metamorphosed, are not fertile; they are barren, and all their faculties are directed to the assisting of the parent animal in the better nourishing of the future brood, to which end some of their external organs are transformed, and to the erection of a better habitation and cells, into which they convey the eggs of the female, and the food of the larvæ to be developed from them. Other cells, which contain a better sort of food, are erected for a later and less numerous progeny of eggs; and again in others, which are more roomy and provided with the best kind of food, but of which there are only a few, is the last brood of the female deposited. From the first kind of cells proceed the barren individuals, from the second the males, and from the third the females; after undergoing a metamorphosis, the males and females fly away, impregnation takes place, and the males die; the females however return, and the whole multitude of barren individuals, which at the same time perform the duty of feeding the young, build cells for their various progeny of eggs, and nourish the three forms of larvæ which proceed from them. In this way the inhabitants of the colony become very numerous: nevertheless they all die off in the winter: the fertile females alone remain alive, and propagate the species the year following, under the same development of alternating broods, the earlier of which is always by far the most numerous, and assists in the development of the latter. In the colonies of Bees, Ants, and *Termites*, the same thing occurs; the many thousand individuals which constitute one of these colonies are principally 'feeders,' or individuals which have originated in the precedent divisions of the eggs of the females, and in these is exhibited, even with greater precision, a more marked division of labour in the feeding of the progeny; so that, out of the various precedent divisions, individuals apparently arise which assist in the development of the more perfect progeny in various ways. Thus there are in a hive of bees, individuals which are employed almost wholly in the feeding of the larvæ (foragers), whilst others do scarcely anything else than collect wax and build cells (workers). In ant-hills, one set of the feeders is constantly employed in conveying the larvæ from one place to another, according as they require a greater or less degree of warmth, &c., whilst others are engaged in building the passages or earth-cells, and in making excavations around the habitation. Among the *Termites* also we are acquainted with several forms of 'feeders,' constituting particular tribes or classes; the description of labour, however, which each of these classes performs, is unknown. It is known, however, that a form with a large head and strong jaws is always posted at the entrance of the artificially constructed dwelling, and keeps guard there as soon as any disturbance is remarked, and thus constitutes the safeguard not only of the young but of the whole community.

"Now in the cases in which the more perfect development of the progeny is promoted, either by means of 'nurses' or of 'feeders' (under which latter term we understand special individuals devoted to the actual care or nourishing of the young, which office they fulfil by a conscious activity), we see that nature always has in view the production of a multitude of individuals to whose life or care is then committed the perfecting of a later generation or progeny, consisting of less numerous individuals. This previous or preparatory multitude seems to consist invariably of females, the males being apparently excluded from any participation in the office, on which account the males of all the animals among which the system of 'nursing' or of 'feeding' obtains, constitute a very subordinate number. That the 'nursing' should be committed to females alone appears to us very natural, since we are acquainted with an organ in them whose natural function would be to perform that office. The generative organs are, indeed, in perfect (female) individuals divided, as it were, into two parts of very distinct natures; the ovarium for the preparation of the germ and the production of the egg, and the oviduct and uterus, in which the ova are, as it were, incubated, and the germ and embryo sufficiently developed to allow of its being born. Now, it is actually the case that no true ovary has been discovered in the 'nursing' generations; on the contrary, the germs, as soon as they are perceptible, are situated in organs which must be regarded as oviducts and uteri, as, for instance, in the most perfect 'nurses' we are acquainted with, the *Aphides*. In the 'nurses' of the the trematode larva, the *Cercaria echinata*, I have remarked that the germs in their earliest condition are collected into an organ at the root of the tail, which may probably be regarded as a uterus, and that they appear to distend this organ gradually to the size of the whole body. The accurate anatomical researches of Professor Eschricht on the *Salpæ* also show in the most precise way that the associated brood of the *Salpæ* does not originate from ova, but that, as germs which are arranged in a definite manner between the walls of a hollow organ, it is contained in what can in no case be an ovary, and which the author has termed a 'germ-tube.' This organ lies in a cavity which may probably be considered very nearly a uterus, which is however always, as it were, a secondary receptacle for the germs; but in the present instance it cannot be shown that they have occupied any previous receptacle or place of formation.

"From what we at present know, we may probably assume with some degree of certainty that the 'nursing' individuals are never themselves gemmiparous, but that they are born with germs in the organs in which the embryos are afterwards nourished; and from all this it appears as if the female generative organism were always divided in those cases in which development by means of 'nurses' occurs, so that as in the more perfect females an ovary especially is formed, so in the 'nursing' individuals a much-developed uterus is presented, in consequence of which, they, as individualised uteri, have assigned to them, as the object of their existence, the performance of the functions of a uterus, and their complete formation must thus necessarily precede that of the germs which are committed to their fostering care. We cannot readily perceive the reason, that because all 'nursing' individuals must be of the female sex, it should follow that all those individuals which feed the young should also be of that sex, and yet this seems to be the law. Anatomy shows us that the 'feeders' among bees, wasps, &c., and probably those of all insects living in regular societies, are females, whose sexual organs remain in an undeveloped state. They present scarcely the vestige of an ovary; the uterus is rudimentary, and all propagation consequently in the material way, so to say, is rendered impossible; the imperfection of the organ does not even allow of their acting as 'nurses,' and the propagative instinct in a physical corporeal sense passes into a will for the propagation of the species, into a *nisus* impelling to the feeding or nourishing of the young; and the fulfilment of these impulsive duties is favoured by the peculiar transformation which some of the organs undergo at the expense of those intended for propagation, in order that they may become adapted to the bringing up of the young. Whence it follows that the development of the species, in this case does not take place by means of several generations, but through several broods of the same generation. The reason of the great number of 'feeders,' and for the common good of 'workers,' so that they often constitute thousands, whilst the fertile individuals scarcely amount to hundreds, may be readily understood when we consider more closely the regular societies of bees and ants, and witness the labour required for the nourishment of the young. But, on the other hand, how the development of the species is promoted by the multitude of 'nursing' animals of which we often see thousands for each single fertile one, appears to us difficult of explanation, since, even all of them can only be regarded as animated organs, which do not appear to act for or with each other. It does not however seem to me improbable that even the *Aphides*, trematode nurses, and other parasites, which are so immediately injurious to the organisms upon which they live, are not destined merely to promote the extension of the species, but that they also induce in the organisms themselves conditions necessarily more and more favourable to a later generation; plants also and animals afford us many instances that to a certain abundance of parasites there usually succeeds a complete overflow of them.

"I conclude with the remark that, inasmuch as in the system of 'nursing' the whole advancement of the welfare of the young is effected only by a still and peaceful organic activity, is only a function of the vegetative life of the individual, so also all those forms of animals in whose development the 'nursing' system obtains, actually remind us of the propagation and vital cycle of plants. For it is peculiar to plants, and, as it were, their special characteristic, that the germ, the primordial individual in the vegetation or seed, is competent to produce individuals which are again capable of producing seeds or individuals of the primary form or that to which the plant owed its origin, only by the intervention of a whole series of generations. It is certainly the great triumph of Morphology, that it is able to show how the plant or tree (that colony of individuals arranged in accordance with a simple vegetative principle or fundamental law) unfolds itself, through a frequently long succession of generations, into individuals, becoming constantly more and more perfect, until, after the immediately precedent generation, it appears as calyx and corolla, with perfect male and female individuals, stamens, and pistils (so that even in the vegetable kingdom the grosser hermaphroditism does not obtain, which is still supposed to take place in the animal); and after, the fructification brings forth seed, which again goes through the same course. It is this great and significant resemblance to the vegetable kingdom, which in my opinion is presented by the *Entozoa* and all 'nurse' generations, and to which I have alluded in the preceding Essay: I might almost say that the condition of continued dependence incidental to the animal life, is to a certain extent one of less perfection than that which is presented in the progressive elevation in development effected by the agency of the vegetative life."

GENTIANINE. [CHEMISTRY, *S.* 2.]

GEOKRONITE. [MINERALOGY, *S.* 1.]

GERARD, MAURICE-ÉTIENNE, COMTE, Marshal of France, was a native of Danvilliers, in the department of the Meuse, and was born April 4, 1773. He entered the army as a volunteer in 1791, and first saw fire under Jourdan, at Fleurus. He was already a captain in 1793, and Bernadotte, who was for many years his steadfast friend, appointed him soon after one of his aides-de-camp. After the treaty of Campo Formio, he attended that general in his embassy to Vienna, and having saved his life during a riot stimulated by the Austrian police, a lasting friendship was established between them. In 1799 he became a chef-d'escadron; and at the battle of Austerlitz (Dec. 2, 1805) his good conduct was so conspicuous that he received the Cross of the Legion of Honour on the field.

In 1806 Gérard was appointed to a brigade; and in 1809, at the battle of Wagram, Bernadotte gave him the command of the Saxon cavalry. He next went to serve in Spain, where he continued until October 1811, having been present at the battle of Albuera and several others.

Called to take part in the expedition against Russia in 1812, he contributed to the capture of Smolensko; and during the disastrous retreat which followed the burning of Moscow he was placed as second in command, under Marshal Ney, in the rear of the army. General Gérard distinguished himself by many proofs of valour at the passage of the Bérésina, where, with a few regiments greatly reduced in numbers, and consisting of half-famished men, he repeatedly sustained the shock of an entire army. In 1813 he commanded one of the divisions of the 11th corps, under Marshal Macdonald: he was present at the battle of Bautzen, and his exertions, which were made on the impulse of the moment and without orders, accelerated the victory. He charged the enemy again without (or rather contrary to) orders at Goldsberg, and routed the Prussians with great slaughter, for which feat of arms the emperor gave him the command of the 11th corps. General Gérard was several times wounded, and very grievously at the battle of Leipzic, October 18, 1813. During the defence of the French territory in 1814, his zeal and intrepidity were frequently commended by Napoleon, especially at the victory of Montereau. After his return from Elba, in 1815, the Emperor gave him the command of the army of the Moselle. On the 18th of June he was under the orders of Marshal Grouchy at Wavres, and when the report of the cannon was heard proceeding from the forest of the Soignies, Gérard recommended an immediate advance of Grouchy's army of reserve in that direction.

On the return of Louis XVIII., Gérard retired to Belgium, where in 1816 he married the daughter of General Valence. The following year he was permitted to return to France. In 1830 Louis Philippe created him marshal of France, and appointed him minister of war, but his health compelled him to resign this office a few months later. In 1832 he was sent to besiege the fortress of Antwerp, defended by the Dutch general Chasse, when, having compelled the garrison to capitulate after a gallant defence, he returned to France and was made a peer. In 1834 the citizen king made him president of the council, or prime minister; but his declining health obliged him to resign this office on the 29th of October, after which he withdrew into private life. The provisional government of February 24, 1848, raised Marshal Gérard to the function of Grand Chancellor of the Legion of Honour. The Marshal lived to see the restoration of the Bonaparte dynasty. He died at Paris, August 17, 1852, and was interred in the chapel of the Invalides.

GERARD, JEAN-IGNACE-ISIDORE, but best known by his pseudonym, GRANDVILLE, one of the most eminent French caricaturists and designers of illustrations for books, was born at Nancy in 1803. He went to Paris young, an adventurer without money, and without friends; after a while got admission to the atelier of Lecomte; managed to subsist by designing costumes, &c.; then advanced to making lithographic drawings; and continued improving his artistic powers and increasing his stores of observation till 1828, when he brought out his 'Metamorphoses du Jour,' by Grandville, a series of genial, piquant, and mirthful crayon commentaries and criticisms on passing follies. These sketches had a prodigious success; Grandville's position was secured; and his pencil found abundant employment. The revolution of 1830 interfered for a time with his occupation; but when familiarity had brought its inseparable attendant, and the citizen king had come to be regarded by the citizens as a fair mark for the shafts of ridicule, Grandville made himself abundantly merry with the face and person of his sovereign and the royal advisers. Grandville was the very soul of 'La Caricature' as long as his pencil was permitted its free exercise; but on the promulgation of the law re-establishing the 'censure préalable' for designs, he abandoned politics, and threw all his energy into the making of drawings on wood for illustrated editions of classic authors, &c. Here he found a new field of triumph. His drawings were in their way almost the perfection of designs for engraving on wood. Not merely were they admirably conceived, and excellent as exemplifications of the passages they were intended to illustrate, but clear, correct, and vigorous in drawing, and brilliant in effect, they exhibited remarkable aptitude for that particular kind of engraving. As illustrations—full of fancy, ingenuity, quaint and genuine humour, and singularly suggestive—they not only pleased the eye, but really added a new charm to the text. Among the works he illustrated were 'Gulliver's Travels,' 'Robinson Crusoe,' 'La Fontaine's Fables,' 'Beranger,' 'Jerome Paturot,' &c. Indefatigable in labour, he produced an almost infinite number of designs, and yet his active fancy showed no symptoms of exhaustion or even fatigue.

But in the midst of his success, and in the prime of his powers, his labours were brought to a sad and sudden termination. A man of domestic habits, and devotedly fond of his family, he had already had the misfortune to lose two children within a brief space of time by some of the ordinary maladies of childhood, when his third child in attempting to swallow a piece of meat got it so firmly fixed in its throat that all attempts to remove it proved unavailing. An incision was proposed as the only remaining though dangerous remedy; and while Grandville hesitated whether to consent to the operation, the child died in his arms. The shock was more than the unhappy father could sustain: his intellect gave way, and he survived his child but a short period. He died on the 17th of March 1847, aged forty-three.

GEYSERS. This name is applied to a series of intermittent hot-springs, situated in the south-western division of Iceland, where nearly one hundred of them are said to break out within a circle of two miles. These springs are evidently connected with the volcanic phenomena which so remarkably characterise the whole district of Iceland. A recent investigator of the eruptive phenomena of Iceland thus describes its more prominent physical features:—

"The surface of Iceland slopes gradually from the coast towards the centre, where the general level is about 2000 feet above the surface of the sea. On this, as a pedestal, are planted the Jökull, or Icy Mountains of the region, which extend both ways in a north-easterly direction. Along this chain the active volcanoes of the island are encountered, and in the same general direction the thermal springs occur, thus suggesting a common origin for them and the volcanoes. From the ridges and chasms which diverge from the mountains mighty masses of steam are observed to issue at intervals, hissing and roaring, and where the escape takes place at the mouth of a cavern, and the resonance of the cave lends its aid, the sound is like that of thunder. Lower down in the more porous strata we have smoking mud pools, where a repulsive blue-black aluminous paste is boiled, rising at times into huge bladders, which on bursting scatter their slimy spray to a height of 15 or 20 feet. From the base of the hills upwards extend the glaciers, and on their shoulders are placed the immense snow-fields which crown the summits. From the arches and fissures of the glaciers vast masses of water issue, falling at times in cascades over walls of ice, and spreading for miles and miles over the country before they find definite outlet. Extensive morasses are thus formed, which lend their comfortless monotony to the dismal scene already before the traveller's eye. Intercepted by the cracks and fissures of the land a portion of these waters is conducted to the hot rocks underneath; here, meeting with the volcanic gases which traverse these underground regions, both travel together, to issue at the first convenient opportunity either as an eruption of steam or as a boiling spring.

"The origin of the water which feeds the springs is here hinted at. That origin is atmospheric. The summits of the Jökull arrest and mix the clouds, and thus cause an extraordinary deposition of snow and rain. This snow and rain constitute the source from which the springs are fed. The nitrogen and ammonia which occur without exception in every spring, exactly as we find them in rain water, furnish the proof of this; for the known deportment of these substances preclude them from being regarded as real volcanic products."

The springs which feed the Geysers, and which are poured out from them again boiling hot, probably take their rise in Mount Hecla, the summit of which is not more than 30 miles from the Geyser district. It is here that the rushing water is sometimes heard in chasms beneath the surface, and it has more than once happened that after earthquakes some of the boiling fountains have increased or diminished in violence and volume, or entirely ceased, or that new ones have made their appearance.

The phenomena of the Geysers of Iceland have for a length of time arrested the attention of naturalists, and many explanations of them have been given. No one has however so successfully investigated the subject as Professor Bunsen, of Giessen. A summary of these views, with experimental illustrations, were presented to the Royal Institution by Professor Tyndall in June 1853. After referring to the general eruptive phenomena of Iceland, he described the Great Geyser.

"We have here," he says, "a tube 10 feet wide and 70 feet deep; it expands at its summit into a basin, which from north to south measures 52 feet across, and in the perpendicular direction 60 feet. The interior of the tube and basin is coated with a beautiful smooth plaster, so hard as to resist the blows of a hammer. The first question that presents itself is, how was this wonderful tube constructed? How was this perfect plaster laid on? A glance at the constitution of the geyser water will perhaps furnish the first surmise. In 1000 parts of the water the following constituents are found:—

Silica	0.5097
Carbonate of Soda	0.1939
Carbonate of Ammonia	0.0083
Sulphate of Soda	0.1070
Sulphate of Potash	0.0475
Sulphate of Magnesia	0.0042
Chloride of Sodium	0.2521
Sulphide of Sodium	0.0088
Carbonic acid	0.0557

"The lining of the tube is silica, evidently derived from the water; and hence the conjecture may arise that the water deposited the substance against the sides of the tube and basin. But the water deposits no sediment, even when cooled down to the freezing point. It may be bottled up and kept for years as clear as crystal, and without the slightest precipitate. A specimen brought from Iceland and analysed in this institution was found perfectly free from sediment. Further, an attempt to answer the question in this way would imply that we took it for granted that the shaft was made by some foreign agency, and that the spring merely lined it. A painting of the Geyser, the property of Sir Henry Holland—himself an eye-witness of these wonderful phenomena—was exhibited. The painting, from a sketch taken on the spot, might be relied on. We find here that the basin rests on the summit of a mound; this mound is about 40 feet in height, and a glance at it is sufficient to show that it has been deposited by the Geyser. But in building the mound the spring must also have formed the tube which perforates the mound; and thus we learn that the Geyser is the architect of its own tube. If we place a quantity of the geyser water in an evaporating basin the following takes place:—In the centre the fluid deposits nothing, but at the edges where it is drawn up the sides of the basin by capillary attraction, and thus subjected to a quick evaporation, we find silica deposited; round the edge we find a ring of silica thus laid on, and not until the evaporation is continued for a considerable time do we find the slightest turbidity in the central portions of the water. This experiment is the microscopic representant, if the term be permitted, of nature's operations in Iceland. Imagine the case of a simple thermal spring whose waters trickle over its side down a gentle incline; the water thus exposed evaporates speedily, and silica is deposited. This deposit gradually elevates the side over which the water passes, until finally the latter has to choose another course; the same takes place here, the ground becomes elevated by the deposit as before, and the spring has to go forward—thus it is compelled to travel round and round, discharging its silica and deepening the shaft in which it dwells, until finally, in the course of centuries, the simple spring has produced that wonderful apparatus which has so long puzzled and astonished both the traveller and the philosopher.

"Before an eruption the water fills both the tube and basin, detonations are heard at intervals, and after the detonation a violent ebullition in the basin is observed; the column of water in the pipe appears to be lifted up, thus forming a conical eminence in the centre of the basin, and causing the water to flow over its rim. The detonations are evidently due to the production of steam in the subterranean depths, which, rising into the cooler water of the tube, becomes condensed and produces explosions similar to those produced on a small scale when a flask of water is heated to boiling. Between the interval of two eruptions the temperature of the water in the tube towards the centre and bottom gradually increases. Bunsen succeeded in determining its temperature a few minutes before a great eruption took place; and these observations furnished to his clear intellect the key of the entire enigma. A little below the centre the water was within two degrees of its boiling point, that is, within two degrees of the point at which water boils under a pressure equal to that of an atmosphere, plus the pressure of the superincumbent column of water. The actual temperature at 30 feet above the bottom was 122° centigrade, its boiling point here is 124°. We have just alluded to the detonations and the lifting of the geyser column by the entrance of steam from beneath. These detonations and the accompanying elevation of the column are, as before stated, heard and observed at various intervals before an eruption. During these intervals the temperature of the water is gradually rising. Let us see what must take place when its temperature is near the boiling point. Imagine the section of water at 30 feet above the bottom to be raised six feet by the generation of a mass of vapour below. The liquid spreads out in the basin, overflows its rim, and thus the elevated section has six feet less of water pressure upon it; its boiling point under this diminished pressure is 121°; hence in its new position its actual temperature (122°) is a degree above the boiling point. This excess is at once applied to the generation of steam; the column is lifted higher, and its pressure further lessened; more steam is developed underneath; and thus, after a few convulsive efforts, the water is ejected with immense velocity, and we have the geyser eruption in all its grandeur. By its contact with the atmosphere the water is cooled, falls back into the basin, sinks into the tube through which it gradually rises again, and finally fills the basin. The detonations are heard at intervals, and ebullitions are observed; but not until the temperature of the water in the tube has once more nearly attained its boiling point is the lifting of the column able to produce an eruption.

"In the regularly-formed tube the water nowhere quite attains the boiling point. In the canals which feed the tube, the steam which causes the detonation and lifting of the column must therefore be formed. These canals are in fact nothing more than the irregular continuation of the tube itself. The tube is therefore the sole and sufficient cause of the eruptions. Its sufficiency was experimentally shown during the lecture. A tube of galvanised iron six feet long was surmounted by a basin; a fire was placed underneath and one near its centre to imitate the lateral heating of the geyser tube. At intervals of five or six minutes throughout the lecture eruptions took place; the water was discharged into the atmosphere, fell back into the basin, filled the tube, became heated again, and was discharged as before.

"Sir George Mackenzie, it is well known, was the first to introduce the idea of a subterranean cavern to account for the phenomena of the Geyser. His hypothesis met with general acceptance, and was even adopted undoubtingly by some of those who accompanied Bunsen to Iceland. It is unnecessary to introduce the solid objections which might be urged against this hypothesis, for the tube being proved sufficient, the hypothetical cavern disappears with the necessity which gave it birth.

"From the central portions of the geyser tube downwards, the water has stored up an amount of heat capable, when liberated, of exerting an immense mechanical force. By an easy calculation it might be shown that the heat thus stored up could generate, under ordinary atmospheric pressure, a column of steam having a section equal to that of the tube and a height of nearly 1300 yards. This enormous force is brought into action by the lifting of the column and the lessening of the pressure described above.

"A moment's reflection will suggest to us that there must be a limit to the operations of the Geyser. When the tube has reached such an altitude that the water in the depths below, owing to the increased pressure, cannot attain its boiling point, the eruptions of necessity cease. The spring however continues to deposit its silica and forms a 'lang,' or cistern. Some of these in Iceland are of a depth of 30 or 40 feet. Their beauty is indescribable; over the surface a light vapour curls, in the depths the water is of the purest azure, and tints with its own hue the fantastic incrustations on the cistern walls; while at the bottom is observed the mouth of the once mighty Geyser. There are in Iceland traces of vast, but now extinct, geyser operations. Mounds are observed whose shafts are filled with rubbish, the water having forced a way underneath, and retired to other scenes of action. We have in fact the Geyser in its youth, manhood, old age, and death, here presented to us:—in its youth as a simple thermal spring, in its manhood as the eruptive spring, in its old age as the tranquil laug, while its death is recorded by the ruined shaft and mound, which testify the fact of its once active existence.

"Next to the Great Geyser the Strokkur is the most famous eruptive spring of Iceland. The depth of its tube is 44 feet. It is not however cylindrical like that of the Geyser, but funnel-shaped. At the mouth it is 8 feet in diameter, but it diminishes gradually, until near the centre the diameter is only 10 inches. By casting stones and peat into the tube and thus stopping it, eruptions can be forced which in point of height often exceed those of the Great Geyser. Its action was illustrated experimentally in the lecture, by stopping the galvanised iron tube before alluded to loosely with a cork. After some time the cork was forced up and the pent-up heat converting itself suddenly into steam, the water was ejected to a considerable height—thus demonstrating that in this case the tube alone is the sufficient cause of the phenomenon." ('Proceedings of Royal Institution.')

The results of the researches of Professor Bunsen on the Geysers of Iceland seem to throw great and unexpected light on the phenomena of volcanoes. Sir Charles Lyell closes his account of Bunsen's researches with the following remarks:—

"In speculating therefore on the mechanism of an ordinary volcanic eruption, we may suppose that large subterranean cavities exist at the depth of some miles below the surface of the earth, in which melted lava accumulates, and when water containing the usual mixture of air penetrates into these, the steam thus generated may press upon the lava and force it up the duct of a volcano, in the same manner as a column of water is driven up the pipe of a Geyser. In other cases we may suppose a continuous column of liquid lava, mixed with red-hot water (for water may exist in that state, as Professor Bunsen reminds us, under pressure), and this column may have a temperature regularly increasing downwards. A disturbance of equilibrium may first bring on an eruption near the surface, by the expansion and conversion into gas of entangled water and other constituents of what we call lava, so as to occasion a diminution of pressure. More steam would then be liberated, carrying up with it jets of melted rock, which being hurled up into the air may fall in showers of ashes on the surrounding country, and at length, by the arrival of lava and water more and more heated at the orifice of the duct or the crater of the volcano, expansive power may be acquired sufficient to expel a massive current of lava. After the eruption has ceased a period of tranquillity succeeds, during which fresh accessions of heat are communicated from below, and additional masses of rock fused by degrees, while at the same time atmospheric or sea-water is descending from the surface. At length the conditions required for a new outburst are obtained, and another cycle of similar changes is renewed." ('Principles of Geology,' p. 558.)

GIGANTHOLITE. [Mineralogy, *S.* 1.]

GILBERTITE. [Mineralogy, *S.* 1.]

GILT-HEAD. [Chrysophrys; Crenilabrus.]

GIOBERTI, VINCENZO, was born on the 5th of April 1801, in the city of Torino (Turin), the capital of the kingdom of Sardinia. He studied with a view to the ecclesiastical profession, and having completed his education in the University of Turin, received the degree of Doctor of Theology, and became one of the teachers in the theological college. Soon after the accession, in 1831, of Charles-Albert to the throne of Sardinia, Gioberti was appointed chaplain to the court, and continued to perform the duties of this office till 1833, when, on some accusation or suspicion of being implicated in the political agitations then prevailing in various parts of Italy, he was suddenly seized in the apartments which he occupied in the palace, and imprisoned in the citadel. There he was detained some weeks, but was at length set at liberty on the condition that he quitted the country as an exile. He went to Paris, where he resided till the end of 1834, when he removed to Brussels, having accepted the offer of a situation as teacher in one of the public schools of that city.

Gioberti wrote at Brussels, during his long abode there as an exile, nearly all those works which not only extended his literary reputation throughout the whole of Europe, but produced that enthusiasm of admiration which was displayed by the Italians after his return to his native country. The first of these works was the 'Teorica del Sovranaturale, osia Discorso sulle Convenienze della Religione Rivelata colla Mente Umana e col Progresso Civile delle Nazioni,' 8vo, 1837. His next work was the 'Introduzione allo Studio della Filosofia,' 8vo, 1840, which was followed by the 'Lettere intorno agli Errori Filosofici di Antonio Rosmini,' 3 vols. 8vo, 1841-42; and the two treatises 'Del Bello,' 8vo, 1841, and 'Del Buono,' 8vo, 1843. His 'Primato Morale e Civile degli Italiani,' 8vo, 1843, was read with eagerness in every part of Italy, and excited expectations of the regeneration of that unfortunate country, which, with the sole exception of the Sardinian kingdom, have not hitherto been realised. There was to be a confederation of the Italian states, in which the kings and princes, the pope and the priests, the citizens, and even the monks and Jesuits, were all to bear a part. The states were to be reformed, and popular rights and privileges gradually established. The pope was to be the religious head of the confederation, and Rome the capital city; the King of Sardinia was to be the military chief, and Turin the grand citadel. The Jesuits alone were dissatisfied, and Gioberti attacked them in his 'Prolegomeni,' 8vo, 1845. Pius IX., on his accession to the papal chair in 1846, adopted the views of Gioberti, and began to carry out the reforms recommended in 'Il Primato;' and as the opposition of the Jesuits still continued, Gioberti produced his great attack on their principles and practice, under the title of 'Il Gesuita Moderno,' 5 vols. 8vo, Lausanne, 1847.

When the French revolution of February 1848, occurred, Gioberti was at Paris occupied with his plans for the renovation of Italy. On the 25th of April he quitted Paris, after an exile of fifteen years, to return to his native city of Turin, where his arrival was welcomed by a display of banners by day, and illuminations and fireworks at night, accompanied with music and dancing and patriotic songs; and afterwards when he passed through Milan, Genoa, Florence, Rome, and other places, he was everywhere received with the greatest enthusiasm, so that his journey resembled a triumphal procession. On his return to Turin he was elected a member of the chamber of deputies, of which he was unanimously chosen president. He was opposed to all violent reforms, but the tide of political excitement in the year 1848 threw him into the ranks of the opposition, and on the 16th of December the king appointed him the prime minister of a democratic cabinet. He soon found himself to be in a false position, and the differences of opinion between himself and his colleagues led to a dissolution of the ministry on the 18th of February 1849. He was succeeded by Pinelli, and soon afterwards was sent to Paris to solicit aid from the French government in the approaching contest with Austria. His mission was of no avail. Milan was reconquered by Radetzky, Charles-Albert defeated at Novara, and Victor-Emmanuel II. has alone, of all the rulers of Italy, preserved for his subjects a constitutional government, a free press, and a just administration of the laws. Gioberti remained in Paris, and the fruit of his renewed studies was his work 'Del Rinnovamento Civile d'Italia,' 2 vols. 8vo, 1851. He died October 26, 1852, in Paris.

GIRARDIN, MADAME DELPHINE DE, the wife of Emile Girardin, and daughter of Sophie Gay, a literary lady of considerable talents, was born in 1805, at Aix-la-Chapelle. She was what is called a precocious genius, and at the age of fourteen was noted for her remarkable beauty. In 1822 a poetical eulogy of hers, containing all the illustrious names of the day, was honourably mentioned by the French Academy. On the 26th of April 1827, she was received with great pomp in the Capitol of Rome by the Académie du Tibre, as one of their members. She received a more flattering ovation in Paris, on her return. The artist Legros, who had recently completed the new frescoes of the Pantheon, conducted Madlle. Delphine Gay to a place of honour beneath the dome, whence she recited some of her own poems in the presence of a brilliant assembly. As soon as she finished a shower of wreaths and bouquets were thrown at her feet. King Charles X. awarded her a pension of 1500 francs from his privy purse. Shortly after, she met with M. Émile de Girardin, to whom she was married in 1831.

Immediately after this union Madame de Girardin engaged in a variety of literary undertakings, producing novels, romances, and fugitive poems for the booksellers; tragedies, comedies, and vaudevilles for the theatres; and feuilletons for the newspapers. Her charming 'Lettres Parisiennes' appeared in the journal 'La Presse,' under the name of Vicomte C. de Launay. The small hotel she occupied with her husband at Chaillot was the resort of all the *célébrités* in art and literature, as well as of the *élite* of the Beau Monde. Every intelligent foreigner desirous of seeing the eminent and distinguished persons, whom he already knew by name, hastened to this house, built on the model of the Greek temples.

This clever authoress died on the 29th of June 1855, and on the 2nd of July she was followed to the grave by an immense crowd. The chief funeral oration was delivered by Jules Janin.

The catalogue of her works is very long; but the following are her most esteemed productions:—'La Pélérine,' published in 1828; 'Le Lorgnon,' a romance, 1832; 'Qu'on est heureux d'etre Curé,' a pastoral, 1833; 'Contes d'une Vieille Fille,' 1834; 'La Canne de M. de Balzac,' 1836; 'L'École des Journalistes,' a five-act comedy, 1840; 'Judith,' a tragedy, 1843; 'Cléopatre,' a tragedy, 1847; 'Lady Tartuffe,' a comedy which produced much sensation, 1852; and 'La Joie fait Peur,' 1854.

GLADIOLUS, Corn-Flag (from 'gladius,' a sword, referring to the shape of the leaves), a genus of plants belonging to the natural order *Iridaceæ*. It has a tubular 2-lipped corolla; segments undulate and unequal; stigma trifid; seeds with an arillus; root a coated bulb; leaves ensiform, sheathing. The species in the gardens are bulbous, and are chiefly brought from the Cape of Good Hope.

G. segetum has about 10 flowers in two rows. The upper division of the corolla is divaricate, the lower segment nearly equal and lanceolate; anthers longer than the filaments; capsules with 3 furrows. It has been supposed to be an aphrodisiac, a reputation obtained from its acrid qualities, which are however common to the whole of the order. The Hottentots eat the tubers or corms of several species of this genus, the starch they contain rendering them nutritious.

G. triphyllus has about 3 flowers in one row; the anthers much shorter than the filaments. It is found in the mountains of Carrara.

G. palustris has 3 or 4 flowers, secund; the tube twice as long as the seed-vessel; the claw of the middle division curved and remote; the lobes of the stigma papilloso-ciliate almost from the base; anthers shorter than the filaments; auricles at the base obtuse, parallel; capsules oblong, obovate, rounded at the top, marked with six equal furrows. It is found in Germany.

G. communis has secund flowers; the filaments half as long again as the anthers; auricles at the base obtuse and parallel; the tube half as long again as the germen; lobes of the stigma gradually broader upwards, papilloso-ciliate almost from the base; capsules 3-edged, obovate, impressed at the top; the seeds broadly winged. It is found near Stettin and Frankfurt-on-Oder.

G. Illyricus has secund flowers; the tube three times as long as the germen; division of stigma linear from the base to the middle, and with a smooth margin suddenly enlarged at the top with a papilloso-ciliate margin; the capsules obovate, 3-edged. A native of Illyria.

G. imbricatus has secund approximate flowers; the tube nearly three times as long as the germen; the division of stigma gradually broader upwards, papilloso-ciliate almost from the base; the capsules with 3 rounded angles. Found in Bohemia and Silesia.

G. infestus has a lax spike; flowers 4 to 14, obliquely alternate; division of corolla alternately pink and purple, uppermost very broad, covering the 2 lateral ones, the 3 lower unequal; anthers about as long as the filaments; seeds globose, prolonged downwards. It is a native of Sicily.

G. Byzantinus has numerous flowers in two rows; the upper segment of the corolla covered by the lateral ones; the lower division lanceolate, the middle largest; the anthers longer than the filaments; seeds winged; leaves long, ensiform, and linear. Found in Sicily.

GLAND, a term applied to cells and collections of cells in the animal body, which have the power of absorbing or separating the various substances which pass into or are separated from the circulating fluid. In one sense all the cells of the animal act as glands, for they separate from the blood the peculiar substances of which they are composed. The term gland however is only strictly applied to special forms of tissue which separate peculiar matters. "A true gland," says Dr. Carpenter, "may be said to consist of a closely packed collection of follicles, all of which open into a common channel, by which the product of the glandular action is collected and delivered. The follicles contain the secreting cells in their cavities, whilst their exterior is in contact with a network of bloodvessels from which the cells draw the materials of their growth and development."

In a wider sense however the term gland has been applied to those parts of the body which are engaged in absorbing the food or carrying to the blood the materials of used-up tissues. [ABSORPTION.] In all cases the cell is an active agent whether of absorption or separation. The agency of the cell in absorption is seen in the way in which the chyle is taken from the intestines and carried into the lacteals.

For further investigations on the structure of Glands, see TISSUES, ORGANIC, *S.* 1, pp. 642, 643, 644. After describing the development of glandular tissue, Professor Goodsir concludes his paper on this subject with the following remarks:—

"It appears to be highly probable therefore that a gland is originally a mass of nucleated cells, the progeny of one or more parent cells; that the membrane in connection with the embryo gland may or may not, according to the case, send a portion of the membrane in the form of a hollow cone into the mass; but whether this happens or not, the extremities of the ducts are formed as closed vesicles, and then nucleated cells are formed within them, and are the parents of the epithelium cells of the perfect organ. Dr. Allen Thomson has ascertained that the follicles of the stomach and large intestines are originally closed vesicles. This would appear to show that a nucleated cell is the original form of a follicle, and the source of the germinal spot, which plays so important a part in its future actions. The ducts of glands are therefore intercellular passages. This is an important consideration, inasmuch as it ranges them in the same category with the intercellular passages and secreting receptacles of vegetables.

"Since the publication of my paper on the secreting structures, in the 'Transactions of the Royal Society of Edinburgh,' in 1842, I have satisfied myself that I was in error in attributing to the cell-wall the important function of separating and preparing the secretion contained in the cell-cavity. The nucleus is the part which effects this. The secretion contained in the cavity of the cell appears to be the product of the solution of successive developments of the nucleus, which in some instances contains in its component vesicles the peculiar secretion, as in the bile-cells of certain *Mollusca;* and in others becomes developed into the secretion itself, as in seminal cells. In every instance the nucleus is directed towards the source of nutritive matter; the cell-wall is opposed to the cavity into which the secretion is cast. This accords with that most important observation of Dr. Martin Barry on the function of the nucleus in cellular development. I have also had an opportunity of verifying—and to an extent which I did not at the time fully anticipate—the remarkable vital properties of the third order of secretion referred to in the memoir to which I have just alluded. The distinctive character of secretions of the third order is, that when thrown into the cavity of the gland they consist of entire cells, instead of being the result of partial or entire dissolution of the secreting cells. It is the most remarkable peculiarity of this order of secretions, that, after the secreting cells have been separated from the gland and cast into the duct, or cavity, and therefore no longer a component part of the organism, they retain so much individuality of life as to proceed in their development to a greater or less extent in their course along the canal or duct before they arrive at their full extent of elimination. The most remarkable instance of this peculiarity of secretions of this order is that discovered by my brother. He has observed that the seminal secretion of the decapodous crustaceans undergoes successive developments in its progress down the duct of the testis, but that it only becomes developed into spermatozoa after coitus, and in the spermatheca of the female. He has also ascertained that, apparently for the nourishment of the component cells of a secretion of this kind, a quantity of albuminous matter floats among them, by absorbing which they derive materials for development after separation from the walls of the gland. This albuminous matter he compares to the substance which, according to Dr. Martin Barry's researches, results from the solution of certain cells of a brood, and affords nourishment to their survivors. It is one of other instances in which cells do not derive their nourishment from the blood but from parts in their neighbourhood which have undergone solution, and it involves a principle which serves to explain many processes in health and disease.

"I conclude therefore, from the observations which I have made, 1st, that all the true secretions are formed or secreted by a vital action of the nucleated cell, and that they are first contained in the cavity of that cell; 2nd, that growth and secretion are identical—the same vital process under different circumstances."

Having thus examined the nature of the process by which the cell secretes, we may now refer to some of the more prominent modifications of the organs called glands. The simplest condition of a Gland is the simple inversion of a secreting membrane called a follicle. These occur in the skin, as in the sebaceous follicles, and also in the mucous membrane of the stomach, where they are called gastric follicles. In these cases we have simply a pit in the membrane covered with secreting cells. In the early stages of the development of all glands we have this simple condition, and in the permanent condition of the more complicated glands, when occurring in the lower animals, we have the same simple development. Thus the liver in some of the Polypes and lower *Mollusca* consists merely of a series of separate follicles placed in the walls of the stomach. The chick whilst in the egg presents the same condition of this organ. The same simplicity is seen in the commencement of the development of a mammary gland in the *Mammalia.* In the *Ornithorhynchus* this organ consists of a mere cluster of blind sacs. In the same way in many fishes the pancreas begins its existence as a mere group of blind follicles. The next stage in the complexity of a gland is where a number of follicles open into a single tube. Such a condition of the gland is seen in what are called the Meibomian glands of the eye. The larger glands of the body, as the pancreas, liver, and parotid gland, are but mere complicated stages of this process. Innumerable follicles empty themselves into tubes which again empty themselves into other tubes until the whole contents of the gland are thrown out from some common outlet.

GLANFORD BRIGG. [Lincolnshire.]

GLAPHYRIA, a genus of plants belonging to the natural order *Myrtaceæ.* The limb of the calyx is 5-lobed, petals 5, berry 5-celled, many seeded; seeds fixed to the axis, 2 rows in each cell. The species are small Indian trees, with alternate minutely-stipitate leaves, and few-flowered axillary peduncles.

G. nitida is called by the Malays 'the Tree of Long Life,' probably from its maintaining itself at elevations where the other denizens of the forest have ceased to exist. It affords at Bencoolen a substitute for tea, and is known by the name of the Tea Plant. Various species of *Leptospermum* and *Melalena* bear the same name in the Australian colonies.

G. sericea has lanceolate acuminated leaves. It is a native of Pulo Penang and on the west coast of Sumatra. The calyx, peduncles, bracts, and young leaves are silky; the petals and cells of ovarium 5 or 6 in number.

GLAUCINE. [Chemistry, *S.* 2.]

GLEAD (*Milvus*). [Falconidæ.]

GLECHOMA. [Nepeta, *S.* 1.]

GLIADINE. [Chemistry, *S.* 1.]

GLOBE-FISH. [Tetrodon.]

GLOBE-FLOWER. [Trollius.]

GLOBULIN. [Tissues, Organic, *S.* 1.]

GLOIOCLADIEÆ, a sub-order of Sea-Weeds belonging to the natural order *Cryptonemiaceæ.* The fronds are loosely gelatinous, the filaments of which they are composed lying apart from one another, surrounded by a copious gelatine. The favellidia are immersed among the filaments of the periphery. It embraces the following genera:—

Cruoria.—Frond crustaceous, skin-like.

Naccaria.—Frond filiform, solid, cellular; the ramuli only composed of radiating free filaments.

Gloiosiphonia.—Frond tubular, hollow, the walls of the tube composed of radiating filaments.

Nemaleon.—Frond filiform, solid, elastic, filamentous; the axis composed of closely packed filaments, the periphery of moniliform free filaments.

Dudresnaia.—Frond filiform, solid, gelatinous, filamentous, the axis composed of a net-work of anastomosing filaments; the periphery of moniliform free filaments.

Crouania.—Frond filiform, consisting of a pointed filament, whorled at the points, with minute multifid gelatinous ramuli.

(Harvey, *British Sea-Weeds.*)

GLOSSOP, Derbyshire, a manufacturing town and the seat of a Poor-Law Union in the parish of Glossop, is situated on elevated ground rising from a deep valley near the north-western boundary of the county, in 53° 26′ N. lat., 1° 55′ W. long.; distant 49 miles N.W. by N. from Derby, 176 miles N.W. by N. from London by road, and 193 miles by the Great Northern and Manchester Sheffield and Lincolnshire railways. The population of the township of Glossop in 1851 was 5467; that of the entire parish, which contains 49,960 acres, and is the most extensive in the county, and one of the most extensive in England, was 28,625. The living is a vicarage in the archdeaconry of Derby and diocese of Lichfield. Glossop Poor-Law Union contains 10 townships and hamlets, forming a part of Glossop parish, with an area of 20,807 acres and a population in 1851 of 19,580.

The cotton manufacture, which is carried on more extensively in Glossop than in any other Derbyshire town, gives employment to many of the inhabitants. About 50 cotton-mills are in the town and neighbourhood; there are also woollen-mills, paper-mills, iron-foundries, dye-works, and bleach-fields. Besides the parish church, there are chapels for Independents and other Dissenters. A charity for clothing 24 poor men and women was founded by Joseph Hague, Esq. There is a savings bank. Melandra Castle, situated on an eminence near the town, is the site of a Roman station; the works appear to have been nearly square, 366 feet by 336 feet; the ramparts, parts of the ditch, and other portions may be distinguished. A Roman road called the Doctor's Gate runs from Melandra Castle to Brough.

GLOSSOPORIS, a genus of Animals belonging to the order *Annelida*, and placed commonly near the Leeches. It has a posterior disc, but it is not suctorial.

GLOTTALITE. [Mineralogy, *S.* 1.]

GLYCERIN. [Chemistry, *S.* 1; Tissues, Organic, *S.* 1.]

GLYCERIS, a genus of Dorsibranchiate Annelids. It is distinguished by the form of its head, which terminates in a conical fleshy horn-like point, which is divided at the top into four very small tentacles.

GLYCERYLE. [Chemistry, *S.* 2.]

GLYCOEINE. [Chemistry, *S.* 2.]

GLYPHISODON, a genus of Acanthopterygious Fishes belonging to the family *Sciænidæ*. The gill-covers are entire, and they have a single row of trenchant and sometimes notched teeth. The species are found in the Atlantic, but are more abundant in the Indian Seas.

GLYPTODON (Owen, so named from the fluted character of its teeth), a genus of extinct Fossil Animals belonging to the order *Edentata*, and allied in form and structure to the modern Armadillos. The first notice of the discovery of the remains of the skeleton of a large edentate animal, with fragments of a tesselated bony armour, similar to that of the Armadillo, appears in the note appended to the end of Cuvier's chapter on the *Megatherium*, in the 4th edition of the 'Ossemens Fossiles,' published in 1823. This notice occurs in an extract from a letter addressed by D. Daniasio Larranaga, curé of Monte Video, to M. Auguste St.-Hilaire. The facts stated in this letter are as follows:—A femur was discovered in the Rio del Lance, branche du Saulis Grande, which weighed 7lbs.; it was short, but might be from 6 to 8 inches in width; it resembled in every respect the femur of an Armadillo; with it was found a portion of tesselated bony armour, of which the curé promises to send one of the component pieces to M. Auguste Geoffroi. The tail was very short and very stout; it had in like manner a bony armour, but this was not verticillate or disposed in rings. These fossils were stated to have been met with near the surface of the earth, in alluvium or strata of transport, indicative of a very recent epoch. Similar fossils are said to occur in analogous strata near the Lake Nirum, on the frontier of the Portuguese colonies.

These remains were supposed to belong to the *Megatherium*, and Cuvier does not appear to suspect that they belonged to anything else, as he merely remarks that the *Megatherium* had pushed its analogies with the Armadillos so far as to be covered like them with a scaly cuirass.

Subsequently remains of this kind were sent to England, and in the meantime M. Laurillaud and Mr. Pentland, on comparing these with those originally sent to England, came to the conclusion that they belonged to the genus *Dasypus*. This however was doubted by Mr. Clift and Professor Owen, seeing that the conformation of the alveoli of the jaw indicated a dentition differing more widely from that of the existing sub-genera of Armadillos than their respective dental characters differ from one another. "It was at this conjuncture," says Professor Owen, "that Sir Woodbine Parish received the intelligence of the discovery of an entire skeleton, covered with its tesselated coat of mail, about 5 feet below the surface, in the bank of a rivulet near the Rio Matanza, about 20 miles south of the city of Buenos Ayres; and with the account of this remarkable discovery there was at the same time transmitted a drawing or sketch of the whole animal, which has since been lithographed, and one of the teeth of the fossil itself. This tooth Sir Woodbine Parish obligingly submitted to my examination. Its general structure proved it to belong to an animal referrible to the *Edentata* of Cuvier; but its character was so peculiar that I had no hesitation in pronouncing it to differ from that of any known edentate animal, recent or fossil, and from its intimate texture, to be indicative of a new sub-genus of the Armadillo family, for which I proposed the name of *Glyptodon*, in reference to the plated or sculptured character of the tooth."

The *Glyptodon* differs from the *Megatherium* not only in the form and structure but in the number of its teeth, which appear to be eight on each side of each jaw, as in the section of Armadillos called *Cabassous* by Cuvier. It differs from the Armadillos in the form of the lower jaw, and in the presence of a long process descending from the zygoma, in both which respects it resembles, and evidently indicates a transition to the *Megatherium*.

Numerous remains of this curious and interesting animal have been found in various parts of the country, and a very fine specimen, with the coat of mail almost entire, is to be seen in the museum of the College of Surgeons. Portions of this animal are also to be seen in the collection of the British Museum.

Although, when the remains of the *Glyptodon* were first brought to Europe, it was not thought improbable that the *Megatherium* also was enclosed in a gigantic suit of armour, no remains that could be regarded as the tesseræ of such a covering have yet been discovered. It is always difficult however to establish a negative, but the following arguments have been adduced by Professor Owen against this supposition, and will be probably regarded by most naturalists as conclusive:—

"1. The opinion of Cuvier and Weiss, in favour of the *Megatherium* being so armed, rests on no better ground than the mere fact of bony armour of some gigantic quadruped and the skeleton of the *Megatherium* having been discovered on the same continent.

"2. The skeleton, or its parts which have been actually associated with the bony armour above mentioned, belongs to a different and smaller quadruped.

"3. No part of the skeleton of the *Megatherium* presents those modifications which are related to the support of a bony dermal covering.

"4. The proportions of the component tesseræ of the bony armour in question to the skeleton of the *Glyptodon*, are the same as those between the dermal tesseræ and skeleton of existing Armadillos, but are vastly smaller as compared with the bones of the *Megatherium*.

"5. No bony armour composed of tesseræ, having the same relative size to the bones of the skeleton of the *Megatherium*, as in the *Glyptodon* and existing Armadillos, has yet been discovered.

"6. The skeleton of the *Megatherium* has never been found associated with bony armour of any kind, neither have its parts been found associated."

(Owen, *Proceedings of Geological Society*, vol. vii., 2nd series.)

GMELIN, LEOPOLD, was born at Göttingen on the 2nd of August, 1788. This eminent chemist and contributor to the literature of the science of which he was an equally eminent academic teacher, belonged to a family which for four generations had been actively engaged in the pursuit of chemistry, the medical sciences, and several branches of natural history, and one member of which, if not more, is still so engaged. Three of his eminent relatives have already been noticed in the 'Penny Cyclopædia.'

Johann George Gmelin, apothecary at Tübingen, who was born in 1674, and died 1728, had three sons, all of whom devoted themselves to chemistry and the allied sciences. The eldest Johann Conrad Gmelin (born 1707) was a physician and apothecary at Tübingen; his grandson, Christian Gottlob Gmelin (born 1792) is now professor of chemistry in the same university. The second is the subject of the article Gmelin, John George. The third son, Philip Friedrich Gmelin (born 1722), succeeded the last-mentioned in his professorship of chemistry and botany at Tübingen, and died there in 1768. His elder son was Gmelin, Samuel Gottlieb, and his younger son Gmelin, John Frederick, who succeeded him in that chair, and afterwards became professor of chemistry at Göttingen, was the father of the distinguished man we have now to commemorate.

Leopold Gmelin, from 1799 to 1804 attended the Lyceum in that city, and in the summer of 1804, his father's lectures on mineralogy. In the autumn of the same year he went to Tübingen, where he practised chemical manipulation in the pharmaceutical laboratory of his near relation, Dr. Christian Gmelin (the son of Johann Conrad Gmelin and father of Christian Gottlob Gmelin, both already mentioned), and attended Killmeyer's lectures on chemistry. In the autumn of 1805 he returned to Göttingen, where he devoted himself with zeal to all branches of medical science, but especially to chemistry, for which he attended Stromeyer's lectures; he also studied mathematics. After passing a distinguished examination, he went, in the summer of 1809, to Würtemberg, and thence to Switzerland, which he traversed in all directions, hammer in hand. From the autumn of 1809 to Easter 1811 he remained in Tübingen, and then went to Vienna, where he visited the hospitals, and carried out, in Jacquin's laboratory, the greater part of the experiments, which form the basis of his Doctor-dissertation 'On the Black Pigment of the Eye,' published in 1812, and afterwards in the tenth volume of Schweigger's Journal. He left Vienna in the spring of that year, and went to Italy, where he remained till the spring of 1813, chiefly at Naples, but for some time also at Rome.

The observations and collections made in these journeys supplied the principal materials of the chemico-mineralogical investigations which formed the subject of his 'Habilitation-Schrift' or thesis at Heidelberg, 'On Hauyne, and minerals related to it, together with geognostic observations on the mountains of ancient Latium,' published in 1814. On his way back to Göttingen he stayed some time at Heidelberg, where the professor of chemistry, George Succow, being then recently dead, Gmelin was encouraged to give lectures on that science. Availing himself of the opportunity thus presented, he obtained the 'venia docendi' in Heidelberg, spent the remainder of the summer at Göttingen, making the necessary preparations for his new duties, and in the autumn of the same year began his career as an academic teacher in Heidelberg, which he subsequently pursued with zeal and success for nearly forty years. Twelve months afterwards he was appointed extraordinary professor of chemistry in the university. His celebrated 'Handbook of Chemistry' was then already begun. In the autumn of 1814 he went to Paris, and occupied himself chiefly with practical researches in Vauquelin's laboratory. Two years afterwards he married Luise Maurer, the daughter of a clergyman of Heidelberg, and settled there, declining the appointment of professor of chemistry at Berlin, whither he was invited in 1817, to succeed Klaproth [Klaproth, Martin Henry], who died in that year. He was soon afterwards made ordinary professor of medicine and chemistry at Heidelberg. In 1835, he declined an invitation to fill the chair of chemistry at Göttingen, preferring to remain in his adopted home, although his emoluments there were much less than they would have been either at Göttingen or at Berlin. In the latter portion of his life he was so completely engrossed with the gigantic labour of preparing the fourth edition of his 'Handbook,' that he became quite neglectful of his health. In 1848, he had an attack of paralysis, which, though it only deprived him for a while of his power of action, destroyed the freshness and vigour of his manner, and elasticity of spirit. But he still worked at his 'Handbook' with untiring assiduity, as shown by the volumes which afterwards appeared. In 1850, he was again attacked by paralysis, which obliged him to resign his professorial functions. He still however remained active in the cause of science, and laboured earnestly at the second volume of the 'Organic Chemistry,' which he completed in May, 1852. But from that time his powers, both mental and bodily, rapidly declined; an insidious disease of the brain was steadily gaining ground. In the spring of 1853 it became evident that his end was approaching, and he died on the 13th of April, in the sixty-fifth year of his age.

Leopold Gmelin's original researches in chemistry are numerous; they are all of high character, and as complete as the means of investigation existing at the time when they were instituted would admit. In 1820 he undertook, in conjunction with Tiedemann, a series of experiments on digestion; and in 1826 and 1827 these two philosophers published their celebrated work, entitled 'Die Verdauung nach Versuchen.' But the greatest service which he rendered to science,—"a service in which," in the words of competent authority, "he surpassed all his predecessors and all his contemporaries"—consisted in the production of his 'Handbuch der Chemie,' the beginning and later progress of which have been mentioned above. The late Dr. Thomas Thomson, F.R.S., afterwards Regius Professor of Chemistry in the University of Glasgow, had published the earlier editions of his 'System of Chemistry,' in which he reduced to order, in a clear and exact manner, the facts of the science, scattered at the time he wrote over a thousand different publications, and had thus himself conferred an inestimable benefit, especially on British chemists; other writers also had arranged large quantities of materials in systematic order; but for completeness and fidelity of collation, and consecutiveness of arrangement, Gmelin's 'Handbook' is unrivalled. In it the known facts of the science are condensed into the smallest possible space, but nevertheless it presents a complete picture of them. Detached and long-forgotten observations of other chemists were often indebted to the author for first giving them their true value. In this great work, to use the words adopted, in 1854, by the President of the Chemical Society of London, of which Gmelin was a foreign member, he "sets the example of putting together, in a purely objective view, and on the authority of the several investigators, all that has been observed within the domain of chemistry, —not, indeed, withholding his own opinions, but placing them side by side with those of others, and never suppressing the latter."

The 'Handbook of Chemistry,' moreover, has often directed attention to deficiencies and contradictions in existing chemical knowledge, and has thus given rise to new investigations; it has also been widely influential in extending an accurate knowledge of chemistry, not only in Germany, but wherever the science is cultivated. The first edition, which appeared in the years 1817-1819, included in a comparatively small space the extent of chemical science then known; the fourth, which was the last prepared by Gmelin himself, was published from 1843 to 1852, and comprehends inorganic chemistry, but, unfortunately, only a small part of organic chemistry. From this the English edition, now in course of publication under the auspices of the Cavendish Society, is translated by Mr. Henry Watts, B.A., Fellow of the Chemical Society of London, of whose 'Quarterly Journal' he is also the editor. The additions made by him bring the 'Handbook' down to the existing state of chemical science at the time of publication of each volume. The desire to make this work generally available to British chemists, was one of the motives which originally contributed to the establishment of the Cavendish Society. The first volume was published at the end of the year 1848; the eleventh, being the fifth of organic chemistry, has recently appeared (November 1857). The translation is continued from a new German edition.

In the 'Annals of Philosophy' for August and September 1814, (Series I., vol. iv. pp. 115, 193,) a few months only after the appearance of Gmelin's Thesis in Germany, Dr. Thomson published satisfactory abstracts in English of the geological and mineralogical portions respectively. Of his dissertation on the black pigment of the eye, Dr. Thomson gave a short account in the same work for January 1816 (vol. vii. p. 54,) in which Gmelin's examination of the ink of the cuttle-fish, which he had found to possess very nearly the same properties with the black pigment, is compared with Dr. Prout's, then recently published.

GOAT'S BEARD. [Tragopogon.]

GOAT-MOTH. [Cossus.]

GOAT-PEPPER. [Capsicum.]

GOAT-WEED. [Ægopodium, *S.* 2.]

GODERICH. [Canada, *S.* 2.]

GOGOL, NIKOLAY, a Russian author of great celebrity, whose career throws a light on several points of the moral and political state of his country. He was born apparently about 1810, in Malorussia, or Little Russia, the inhabitants of which are distinguished from those of Great Russia by vivacity of character and a comparatively strong feeling of self-respect and independence. They have a language or dialect of their own, about as distinct from that of Russia as the Lowland Scotch from the English, but of which no use is made in serious composition. Gogol was educated at Neghin, at the Bezborodko Lyceum, a provincial high school founded and endowed by one of the Bezborodko family, and one of the few institutions of the kind in Russia which are not directly supported by the public money. On completing his education he repaired to St. Petersburgh in search of employment under government, and it is said that his claims were rejected by one of the government offices on the ground that he was insufficiently acquainted with the Russian language. Soon after he published his first work, a collection of short novels and sketches, entitled 'Evenings at a Farmhouse' ('Vechera na Khutorie'). The book became immediately popular, and the charm of the style was compared by Russian critics to that of Washington Irving. It consists of a series of delineations of country life in Malorussia, which are said to be remarkable for their fidelity. It was soon followed by 'Mirgorod,' a supplementary collection of the same character, which met with equal favour. One of the author's habits deserves remark; Gogol, like Dickens, was noted for the excellence with which he read aloud his own productions, and it is said that in composing a dialogue, it was his practice to recite all the different speeches in character before committing them to paper, by means of which he ascertained more satisfactorily if they were in complete consonance with what the character and situation required. He soon tried his powers in the drama, and his comedy of 'The Revisor' met with the most brilliant success. A revisor in Russia is the title of a high government officer despatched to a province to ascertain and report on the character of its administration. The plot and the moral of the play is, that an impostor who makes his appearance at a provincial capital, assuming this title, discovers such universal peculation and misconduct among all the government officials, that when he is at last discovered they are glad to let him off scot free and hush up the whole affair. The Emperor Nicolas, who saw the play acted more than once, gave it his marked applause. It was however chiefly popular among the Russian liberal party, who affixed to it a deeper significance than to a foreigner appears altogether just, and considered it an open and serious attack on the institutions of Russia in general. That it was not looked upon in this light by the government seems sufficiently proved by the appointment of Gogol as professor of history at the University of St. Petersburg, where it was his intention to devote himself to more serious studies. His next work however was another novel, the 'Adventures of Chichagov, or Dead Souls' ('Pokhozhdeniya Chichagova ila Mertvuiya Dushi'), published at Moscow in 1842. The English public has an opportunity of forming an estimate of this, the principal work of Gogol, as an English translation of it appeared in 1854, under the title of 'Home Life in Russia, by a Russian Noble,' falsely declared in the preface to be an unpublished novel, originally written by a Russian in the English language. The style of the English version is indeed remarkably bad, while that of the Russian original is remarkably good; but the main strength of a novel lies in the plot and characters. The hero of the 'Dead Souls,' like the hero of the 'Revisor,' is a daring impostor, who goes about to a number of country gentlemen to persuade them to sell to him the nominal property in their dead serfs, or, as they are technically called in Russia, their 'dead souls,' for the purpose of obtaining an advance from government as the proprietor of a certain number of serfs—the names of the dead not being for a certain period struck off the records. Some of the characters introduced in the tale are certainly sketched with vigour, but in no other production of Russian literature is the foreign reader so much at a loss to detect the charm which has excited the enthusiasm of the native critics. The praises which were lavished on the original may be suspected of having their origin partly in political feelings.

Soon after the appearance of the book which raised his fame to its highest point, the author, whose health was bad, obtained permission to travel abroad, and was still abroad at the time of the publication of 'Select Passages from N. Gogol's Correspondence with his Friends' ('Vuibrannuiya Miesta iz Perepiski s Druziami'), St. Petersburg, 1847, 8vo. From the height of popularity this publication sunk him at once to the lowest depths of contempt. His liberal friends found with surprise that the satirist of Russia, when at home, had become the panegyrist of Russia, autocracy and all, when beyond the frontier. Beilinsky, who was one of the principal, attacked him fiercely in the 'Sovremennik,' one of the leading reviews in St. Petersburg, in an article which could hardly have been expected to pass the censorship. Gogol addressed to him a letter of remonstrance, protesting that the change which had taken place in his opinions was the result of conviction produced by reflection and experience. Bielinsky, who dying of consumption, had himself obtained permission to leave Russia, addressed to him from his sick bed at Salzbrunn one of the most terribly crushing letters to be found in the whole annals of literature, and which was first printed, with the rest of the correspondence, in the 'Polyarnaya Zviezda,' or 'Polar Star,' a Russian periodical issued in London in 1855. "Yes," exclaims Bielinsky, "I loved you with all the passion with which a man warmly attached to his country, can love its hope, its honour, its glory, one of its great leaders in the path of self-consciousness, development, and progress. You had good cause indeed to be shaken out of your repose of soul, for a minute at least, when you lost the right to such love as this. I do not speak thus because I consider any feelings of mine an adequate recompense for such genius as yours, but because in this respect I do not stand alone, but represent a multitude of whom neither you nor I have ever seen the majority, and who have never seen you." "You," he afterwards bursts out, "you, the author of the Revisor and the Dead Souls,—can you, sincerely, and from your soul, raise a hymn of praise to the disgusting Russian clergy, placing it immeasurably above the clergy of the Roman Catholics. Let us suppose you do not know that the latter was sometimes something, while the former was never nothing but the lackey and slave of the secular power; but is it possible you do not know that our clergy stands in the lowest degree of contempt with Russian society and the Russian people. Is not a 'pope' throughout Russia for every Russian the representative of gluttony, meanness, servility, impudence? . . . . I will not dilate on your dithyrambic about the bond of affection between the Russian nation and its rulers. I will only say that this dithyrambic has met with no sympathy, and has lowered you even in the eyes of persons who in other respects are very close to you in the direction you are taking. I leave it to your conscience to intoxicate itself with the divine beauty of Autocracy; only continue to have the good sense to contemplate it from a reasonable distance,—when near, it is not so beautiful, and is apt to be dangerous. . . . . You placed yourself too high in the opinion of the Russian public for it to be able to believe in the sincerity of such convictions as this. What may seem natural enough in fools cannot seem natural in a man of genius." Bielinsky goes on to accuse him of views of personal emolument, and touches with bitterness on a passage in the 'Perepiski,' in which Gogol had appeared to speak with humility of his own works, and to intimate that he did not share the opinion of their admirers. "These persons," says Bielinsky, "may in their admiration of you have made more noise with their applause than the case required; but after all, their enthusiasm sprung from so pure and noble a source that it was altogether unbecoming in you to surrender them up in the face of their enemies and yours, and to accuse them into the bargain of attributing a wrong meaning to your productions." The reply of Gogol to this bitter diatribe is singular. "God knows," he writes, "there may be some truth in what you say.—One thing appears to me an established truth—that I do not know Russia—that much has been changed in it since I left, and that I must almost begin to study it anew to know it now. The inference I draw from this for myself is, that it behoves me not only not to print new sketches of life, but not even two lines on the subject till I have returned to Russia, have seen it with my own eyes, and touched it with my own hands." Neither Bielinsky nor Gogol ever returned. Bielinsky died in France soon after the Paris revolution of February 1848, which he hailed as the dawn of an era of liberty; and Gogol, whose last letter is dated from Ostend, in August 1847, soon followed him. His death is repeatedly alluded to in recent Russian publications, but we have not seen its real date stated.

GOLD, one of the precious metals. It differs remarkably from other metals, with a very few exceptions, in the fact that it is found in nature in its metallic state. It is occasionally found mineralised by tellurium. Native gold is Monometric, and occurs in cubes without cleavage, also in grains, thin laminæ, and masses, sometimes filiform or reticulated. The colour varies in shade, sometimes being a bright yellow, at others almost silvery-white, from the quantity of silver with which it is mixed. It is very ductile and malleable. Hardness 2·5 to 3. Specific gravity 12 to 20, varying according to the metals alloyed with the gold. Native gold usually contains silver, and in very various proportions. The finest native gold from Russia yielded—gold 98·96, silver 0·16, copper 0·35, iron 0·05; specific gravity 19·099. A gold from Marmato afforded only 73·45 per cent. of gold, with 26·48 per cent. of silver; specific gravity 12·666. This last is in the proportion of 3 of gold to 1 of silver. The following proportions have also been observed:—3½ to 1, 5 to 1, 6 to 1, 8 to 1; and this is the most common; 12 to 1 also is of frequent occurrence.

Copper is often found in alloy with gold, and also Palladium and Rhodium.

A Rhodium Gold from Mexico gave the specific gravity 15·5 to 16·8, and contained 34 to 43 per cent. of rhodium.

Iron and copper pyrites are often mistaken for gold by those inexperienced in ores. Gold is at once distinguished by being easily cut in slices and flattening under a hammer. The pyrites when pounded are reduced to powder: iron pyrites is too hard to yield at all to a knife, and copper pyrites affords a dull greenish powder. Moreover the pyrites give off sulphur when strongly heated, while gold melts without any such odour.

Native gold is to a large extent obtained from alluvial washings. It is also found disseminated through certain rocks, especially quartz and talcose rocks, and is often contained in pyrites, constituting the auriferous pyrites; the detritus affording gold-dust has proceeded from some gold-bearing rocks.

Gold is widely distributed over the globe. It occurs in Brazil (where formerly a great part of that used was obtained), along the chain of mountains which runs nearly parallel with the coast, especially near Villa Rica, and in the province of Minas Geraes; in New Granada, at Antioquia, Choco, and Grion; in Chili; sparingly in Peru and Mexico; in the southern of the United States. In Europe it is most abundant, in Hungary, at Königsberg, Schemnitz, and Felsobanya, and in Transylvania, at Kapnik, Vorospatak, and Offenbanya; it occurs also in the sands of the Rhine, the Reuss, and the Aar; on the southern slope of the Pennine Alps, from the Simplon and Monte Rosa to the valley of Aosta; in Piedmont; in Spain, formerly worked in Asturias; in the county of Wicklow in Ireland; and in Sweden at Edelfors. In the Ural Mountains there are valuable mines, also in the Cailles Mountains in Little Tibet. There are mines in Africa at Kordofan, between Dar-fur and Abyssinia; also south of Sahara, in the western part of Africa from Senegal to Cape Palmas; also along the coast opposite Madagascar, between 22° and 23° S. lat., supposed to have been the Ophir of the time of Solomon. Other regions in which gold is found are China, Japan, Formosa, Ceylon, Java, Sumatra, and the Philippines.

Until lately nearly all the gold of commerce came from Asiatic Russia and Mexico, but recent discoveries of gold in California and Australia have opened new and vast sources of supply.

From 1600 to 1700 the entire supply of gold for Europe was obtained from America, whose mines are estimated in the one hundred years to have produced 337,500,000*l*. worth of the precious metal. During the 18th century the supply of gold and silver was still mainly derived from the Americas, the great mine of Valenciana producing 125,000*l*. sterling per annum for 40 years, and the district of Zaccatecas adding largely to the amount, although these were rapidly failing towards the end of the century. A great increase of gold was produced from the mines of Russia, which are still very productive; they are principally alluvial washings, and these washings seldom yield more than 65 grains of gold for 4000lbs of soil, never more than 120 grains. The alluvium is generally most productive where the loose material is most ferruginous. The mines of Ekaterinburg are in the parent rock—a quartz constituting veins in a half-decomposed granite called Beresite, which is connected with talcose and chloritic schists. The shafts are sunk vertically in the beresite, seldom below 25 feet, and thence lateral galleries are run to the veins. These mines afforded between the years 1725 and 1841 679 poods of gold, or about 30,000 lbs. troy. The whole of the Russian mines yielded in 1842, 970 poods of gold, or 42,000 lbs. troy, half of which was from Siberia, east of the Urals. In 1843 the yield was nearly 60,000 lbs. troy; in 1845, 62,000 lbs. troy; and in 1846, 75,353 lbs.

In the five following years to 1851 nearly 296,932 lbs. troy weight of gold have been raised in Russia.

At the Transylvania mines the gold is obtained by mining, and these mines have been worked since the time of the Romans. The annual yield of Europe exclusive of Russia is not above 250,000*l*. The sands of the Rhone, Rhine, and Danube contain gold in small quantities. The sands of the richest quality contain only about 56 parts of gold in 100,000,000. Sands containing less than half this proportion are worked. Africa yields annually at least 4500 lbs. troy, and Southern Africa 1250 lbs. For an account of the gold-region and gold-produce of California, see California, *S.* 2.

From November 1850 to June 1851 the Bank of England issued 9,500,000 sovereigns, being at the rate of 18,000,000 a year, and so great is the increasing demand for gold coins, that the rate of production can scarcely keep pace with it.

It may be interesting to know, that from the account kept at the Bank when the light coin was called in, in 1842, that 12,000,000*l*. were received light, and 36,000,000*l*. still circulated of full weight; 40,000,000*l*. may therefore be regarded as the quantity of gold coin in circulation, allowing from 3 to 4 per cent. for the natural wear of the coin.

In the year 1856 there were coined at the royal mint 4,806,160 sovereigns, and 2,391,909 half-sovereigns; total 6,001,114*l*. 10*s*.

A large quantity of gold is consumed every year in arts and manufactures, and thus regularly removed from the stock of our circulating wealth. In Birmingham not less than 1000 oz. of fine gold are used every week, and the weekly consumption of gold leaf is as follows:—

	Ounces.
London	400
Edinburgh	35
Birmingham	70
Manchester	40
Dublin	12
Liverpool	15
Leeds	6
Glasgow	6
Total	584 weekly,

of which not one-tenth can be recovered. For gilding metals by the electrotype and the water-gilding processes not less than 10,000 oz. of gold are required annually. One establishment in the Potteries employs 3500*l*. worth of gold per annum, and nearly 2000*l*. worth is used by another. The consumption of gold in the Potteries of Staffordshire for gilding porcelain and making crimson and rose-colour varies from 7000 to 10,000 oz. per annum.

The Indus and the Euphrates were the earliest spots whence man obtained the precious metal, gold—Nubia and Ethiopia on the south, and Siberia on the north next opened out their auriferous treasure to gratify human necessity and to indulge human luxury. Europe then began to unfold her golden stores, and Illyria and the Pyrenees, together with the land of the Hungarians and many parts of Germany to the Rhine, were sought successfully for gold. Our islands yielded something to the store, and then the New World of the Americans opened by Columbus a source from which the Old World was to supply its golden waste. On and on still westward rolled the golden ball, until at length it rested in California; Europe and Asia rush equally to that new El Dorado, and the man of China is found at the side of the English gold streamer. Then, as if to double the girdle, the islands of the Pacific and our own Australia open their exceeding stores.

Australia is undoubtedly the most important gold-bearing district in relation to Great Britain. Her shores are now being crowded with emigrants from the mother country seeking the precious metal, and in proportion to her population she is now undoubtedly, in this point of view, the richest country of the world. [Australia, *S.* 2; Emigration, *S.* 2.]

For the purpose of guiding those who are seeking Australia on account of its gold, the professors of Natural Science, in the Museum of Practical Geology, delivered a course of lectures in the summer of 1852. These lectures were as follows:—

1. 'The Geology of Australia, with Especial Reference to the Gold Regions,' by J. Beete Jukes, M.A. F.G.S., Local Director of the Geological Survey of Ireland; author of 'Sketch of the Physical Structure of Australia.'

2. 'On our knowledge of Australian Rocks as derived from their Organic Remains,' by Edward Forbes, F.R.S.

3. 'The Chemical Properties of Gold, and the Mode of Distinguishing it from other substances resembling it,' by Lyon Playfair, C.B. F.R.S.

4. 'The Dressing or Mechanical Preparation of Gold Ores,' by W.W. Smith, M.A. F.G.S.

5 'The Metallurgical Treatment and Assaying of Gold Ores,' by John Percy, M.D. F.R.S.

6. 'The History and Statistics of Gold,' by Robert Hunt, Keeper of Mining Records.

We subjoin an account of the auriferous rocks of Australia from the lecture of Mr. Jukes:—

"In Mr. Arrowsmith's map, appended to the Parliamentary Report just issued, all the auriferous spots are marked in yellow. They occur at intervals along the flanks of the Great Eastern Chain, or on its lateral spurs and subordinate ranges through an extent of country about 1000 miles in length, about as far as from London to Gibraltar or the confines of Turkey, or as from London to Iceland in a straight line. The principal localities marked on this map are Grafton Range and Burnet River, north of the Condamine; Stanley Creek and Canning Downs in the Moreton Bay district; several spots in the neighbourhood of Liverpool Plains; the Turon and Conobalas on the Macquarrie, below Bathurst; the Abercrombie River at the head of the Lachlan; some spots on each side of Breadalbane Plains; the Braidwood and Araluen diggings in the Shoalhaven district; Lake Eimeo in the Australian Alps; and Ballarat, and Mount Alexander and Mount Blackwood, north-west of Port Phillip.

"In every one of these localities granite and metamorphic rocks occur, and quartz veins are frequently spoken of. This is an important fact to bear in mind.

"In scarcely any of them do we find mention made of the gold being seen in the actual rock, but in the drift clay, sand, and gravel, or lying loose on the surface of the ground. The hundredweight of gold, indeed, found by Dr. Ker, north of Bathurst, is described as a block of highly auriferous quartz, lying among a lot of other loose blocks, evidently derived from a broad quartz vein running up the hill behind them. Such a mass, indeed, could hardly be transported far from its original site by any conceivable current of water.

"The superficial drift in which the diggings have been carried on varies in thickness from a few inches to 20 or 30 feet. The following is an extract from a lecture given by a Mr. Gibbon, in Melbourne, and reported in the 'Melbourne Argus,' giving an account of the Ballarat diggings:—'On the surface of the earth was turf in a layer of about a foot thick, below which was a layer of rich black alluvial soil, and below that gray clay; below that again was a description of red gravel, which was sometimes very good; then red or yellow clay, in which gold was found; and then a stratum, varying in thickness, of clay streaked with various colours, and scarcely worth working; and the next stratum was of hard white pipe-clay, which was a decided barrier. Immediately above it however was a thin layer of chocolate-coloured clay, tough and soapy. This was the celebrated blue clay, and was very rich.

"'The ground on which the diggings were situated was a sloping bank. The blue clay is found near the surface on the brow of the hill, that is, at the depth of about a foot; but it is sometimes necessary to dig 20 feet before arriving at it.'

"Mr. Latrobe, governor of Victoria, describes the Ballarat diggings as carried on through—

"'1. Red ferruginous earth and gravel.

"'2. Streaked yellowish and red clay.

"'3. Quartz gravels of moderate size.

"'4. Large quartz pebbles and boulders; masses of iron-stone set in very compact clay, hard to work.

"'5. Blue and white clay.

"'6. Pipe-clay.

"'In some workings the pipe-clay may be reached at the depth of 10 or 12 feet, in others not at 30 and upwards.'

"To enter farther into the details of the several diggings would be alike tedious and useless. I must refer you for them to the two Parliamentary Reports published, the one in February and the other in June, and to the many small publications with which the shops are now swarming.

"My object to-night has been to give you such a rough sketch of the geology of Australia, and of the geological facts and principles that ought to guide any one in his search after gold, as may be of use to those intending to emigrate there.

"In conclusion, I may perhaps be allowed to utter one word of advice.

"Gold-digging is very hard work—just such work as you see navigators at in a railway cutting, or brick-makers in a brick-pit. You must work hard all day, lie hard all night, with but little shelter, often with scanty food, and with nothing of what you have probably been accustomed to consider necessary comfort. If you find you have no luck at the diggings, or if your health, or strength, or resolution fail you, do not therefore give up or despond altogether. You go out to dig for gold; do not be ashamed to dig for anything else. I speak to those now who have been hitherto unaccustomed to manual labour. Recollect, it is the avowed object of your voyage, and the only thing you have to trust to. If you fail to dig up gold there are lands to be ploughed, sheep to be herded and sheared, cattle to be tended, corn to be sown and reaped—every one of these fully as honourable occupations as digging for gold. Go, then, with a bold and resolute heart, determined to get your living by the strength of your own arms and the sweat of your own brows; and be assured that industry and perseverance lead to fortune in Australia with fewer impediments and uncertainties in the way than in any part of the world."

Since the above was written, other districts in Australia have yielded the precious metal, and every day is adding to our knowledge of the wide extension of this metal on the surface of the earth.

GOLD COAST COLONY. The Gold Coast is part of Upper Guinea, but its boundary is not exactly determined. Geographers state that Cape Three Points (2° 30′ W. long.) constitutes its western boundary; but our navigators extend it farther west to the small river Assinnee (about 5° W. long.), nearly 70 miles E. from Cape Lahoo. On the east, the eastern mouth of the river Lagos (4° 20′ E. long.) is generally considered as constituting its boundary towards Benin, though the most eastern districts are often distinguished by the name of the Slave Coast. In the interior are the powerful kingdoms of the Ashantees and Dahomey, on which most of the small states along the coast are dependent. According to Governor Hill, in his despatch to the Secretary of State for the Colonies, transmitting the 'Blue Book' for 1851, the territory under British protection is estimated to include about 8000 square miles of country, with a population of about 400,000. In a despatch of April 15th, 1853, however, Governor Hill states that he considers his previous estimate of the population to be exaggerated, and that it is probably not more than 300,000. The revenue of the colony is derived from a government grant of 4000*l.* per annum, a duty of half per cent. ad valorem on all imports, and certain small fees. The income for 1853 amounted to 12,339*l.*, the expenditure to 12,045*l.* The value of the imports for the year 1853 amounted to 60,000*l.*; the value of the exports for the same year amounted to 115,000*l.* The imports for 1854 amounted to 107,200*l.*; the exports for the same year to 200,002*l.* The chief article of export is palm-oil.

Nearly in the centre of the coast is the fortress of Accra. The country west of Accra has an undulating surface, with a small proportion of level ground: the hills are covered with shrubs and timber of small growth. The coast, though rarely high, is rocky and bold. At Accra the low country begins, and extends a considerable way to the eastward. It is a fertile, open, and level plain, which contain extensive savannahs covered with high grass; but in some parts it is thickly wooded with fine trees. The shores here are flat and sandy. There are no harbours along the coast; and as the surf is very violent, the trading vessels are obliged to anchor four or five miles from the beach. This coast was formerly much resorted to by European and American vessels for slaves. At present it is visited by a few vessels for palm-oil, gold, and ivory: they give in exchange fire-arms, iron, and ironware, tobacco, rum, Manchester cottons, and some other articles.

The whole of this coast being near 5° N. lat., is considered one of the hottest countries on the globe; yet the mean temperature is only 78°, and in the cold season the thermometer sometimes falls to 73° or 74°. During the Hamattan season, from the middle of December to March, which is the driest and coolest part of the year, the wind blows from north-east. The great rainy season begins in March, and continues to the beginning of June. From June to the end of September is the warm season, which is the most unhealthy, especially the month of August, when the fogs are denser than at other times, and generate fevers. In October and November showers of rain are frequent. Except during the Hamattan season, the winds blow from the west in the middle of the day, from 11 to 3 o'clock, but in the evening from south-west, and in the morning from north-west. The climate is in general unhealthy, especially to Europeans on their arrival. Every person is attacked by a fever, which is called the seasoning. This fever in many instances proved fatal; but it is stated that of late years the administration of quinine has been found exceedingly useful in promoting the recovery of persons attacked by the fever.

Cape Coast Castle is the principal English fortress; it is situated in 5° 5′ N. lat., 1° 12′ W. long., and covers a considerable area. In it are apartments for the officers, and barracks for the private soldiers. There are some spacious warehouses. It is built on a rock close to the sea. Near it are the small outposts called Fort William and Fort Victoria. The town, which is behind the fortress, is of considerable extent; it has about 10,000 inhabitants, of whom about 20 are Europeans. The streets are regularly arranged, but the houses are of mud, and huddled together. Within Cape Coast Castle is a government-school, which in 1852 was attended by 153 boys.

The other forts are Accra, Annamaboe, and Dixcove. Fort St. James at *Accra* is occupied by a small garrison. The native population is stated to be about 3000. The fort is situated on the coast in 5° 32′ N. lat. 0° 12′ W. long, and the station is regarded as among the most healthy on the Gold

Coast. Two insurrections occurred at Accra in 1854. Severe measures were required to suppress the second insurrection. Near Accra is the Dutch fort of Crevecœur. About 3 miles E. from Accra is the fort of Christiansborg, and about 30 miles N.E. from Accra is the fort of Fredensborg, both recently purchased from the Danes by the British government. The purchase of the Danish forts on this coast has added considerably to the area of territory under British protection. Annamaboe has been noticed separately. The population is said to be about 4500. The exports include the articles usually sent from this coast, namely, palm-oil, gold-dust, ivory, and grains, and the imports include British manufactured goods of a useful description, besides arms, gunpowder, spirits, and wines. Annamaboe is an entrepôt of commerce for Ashantee and the interior. *Dixcove* is situated in 4° 48′ N. lat., 1° 57′ W. long. The bay affords accommodation for vessels of 100 tons to take in their cargoes. The native population inhabiting the town is about 1200.

The introduction of civilising influences to the native population of the Gold Coast, is chiefly owing to the labours of the Wesleyan missionaries. From the despatches of successive governors of the colony, addressed to the Secretary of State, it would appear that considerable progress has been made in communicating to the natives the benefits of an educational and industrial training. In the year 1852 the Wesleyan chapels were attended by upwards of 6000 persons, and about 1200 children were in attendance at the schools of the mission. Mr. Freeman, the missionary superintendent, established in 1851 an industrial school and garden at Beulah, about 8 miles from Cape Coast Castle. In February 1852 there were 23 native youths under training at this establishment. On December 31st 1852 Mr. Freeman, writing to Governor Hill, says, "We have now about 750 vines and 5000 coffee-plants. The lads in the establishment work willingly, and behave well." The Wesleyan Missionary Society expends about 5000*l.* a year on the Gold Coast Mission. Among other evidences of advancing civilisation may be noticed the erection by the natives of many neat cottages for the residence of their families, with some pretension to the conveniences and comforts of European dwellings, and the construction of several good roads to facilitate communication between the towns and villages in the interior. The roads have been constructed voluntarily by the natives under the direction of the missionaries. These encouraging features have been more particularly noticeable in the neighbourhood of Abrakrampa, the capital, and Domonasi, the second town of the Abrah tribe and district, in the Cape Coast territory. In some of the principal towns of the interior chapels for Christian worship have been built by the chiefs at their own expense.

Governor Hill has endeavoured to enlist the sympathies and co-operation of the native chiefs, by forming them into a kind of legislative body, including the council, with the executive at its head. Each chief has agreed to pay a poll-tax of 1*s.* yearly for each person belonging to his tribe: from the fund thus provided each chief is to receive a stipend to support the dignity of his position, and from it is to be defrayed the cost of such general measures of improvement as the legislative body may agree to undertake. Besides the school at Cape Coast Castle, already noticed, the Governor has recently established one in the interior, which in April 1853 had 24 scholars, and he proposes to establish schools at such places within the range of his government as have not been already supplied by the Wesleyan body. He has also employed the natives composing the Gold Coast corps, numbering 333 non-commissioned officers, rank and file, in executing works of public utility, giving them the opportunity of attending the regimental school when they can be spared from other service. In this way many members of the corps have made considerable progress in reading, writing, and a knowledge of the mechanical arts. By their labours 40 miles of a military road has been opened through the Assin country, directly into the interior towards the capital of Ashantee; and a fine carriage-road to Annamaboe was in process of construction in April 1853. On this road a handsome bridge had been constructed, at the entrance of the town, the granite for which had been first quarried by the soldiers from a deposit opened by them in the immediate neighbourhood.

(Robertson, *Notes on Africa;* Hutton, *Voyage to Africa;* Adams, *Remarks on the Countries extending from Cape Palmer to the River Congo;* Monrad, *Gemählde der Küste von Guinea; Parliamentary Papers.*)

GOODS. In actions for the non-delivery of goods, the plaintiff, if successful, may now have the same alternative judgment as in the action of Detinue (*S.* 2); that is, either to have the goods themselves specifically delivered to him, or the value of them assessed by the jury. This most beneficial change in the law is made, and an appropriate writ of execution, to give effect to it, provided by the Mercantile Law Amendment Act, 1855, 19 & 20 Vict. c. 97.

GOOLE. [Yorkshire.]

GOOSE-GRASS. [Galium, *S.* I.]

GORGONIA, a genus of Animals belonging to the order *Polypifera*, and the type of the family *Gorgoniadæ*. It has the following generic characters:—Polype-mass rooted, arborescent, consisting of a central axis backed with a polypiferous crust; the axis horny, continuous, and flexible, branched in co-equality with the polype-mass; the crust when recent soft and fleshy, when dried porous and friable; the orifices of the polype-cells more or less protuberant. The species of *Gorgonia* thus defined are not numerous. Dr. Johnston enumerates four species as being found on the British coasts.

G. verrucosa, the Warted Sea-Fan, is somewhat fan-shaped, much and irregularly-branched, the branches cylindrical, flexuous, backed when dry with a white warted crust; segments of the cells unequal, obtuse. This polype is found abundantly on the whole of the south coast of England. It lives in deep water.

G. pinnata, branched and pinnated, the branches compressed; polype-cells in regular rows on each margin, mammillate, unarmed. This species was dredged by Professor E. Forbes and Mr. M'Andrew in the sound of Skye, where they found it attached to stones in 30 fathoms water.

G. placomus, irregularly branched, the branches disposed in a dichotomous order and a flattish form, cylindrical, warty; cells protuberant, conical, surrounded at top by little spines. This is the Warted Sea-Fan of Ellis, and is found on the Cornish coast, but is rare.

G. anceps, the Sea-Willow of Ellis. It is branched, subdichotomous; branches with the flesh fat on each side, with a row of little mouths along both the margins. This is a rare species. It was found originally by its describer Mr. Dale, near Margate. It is of a violet colour when fresh. It is a doubtful native of our seas.

G. flabellum has been found on British coasts, but it has been undoubtedly accidental.

(Johnston, *British Zoophytes.*)

GÖTHITE, a Mineral, to which also the name *Lepidokromite* is given. It is a hydrous peroxide of iron, differing from the brown iron-ore by containing half as much water. The crystals are of a brown colour, and blood-red by transmitted light when sub-transparent. It has a hardness of 5; and its specific gravity 4 to 4·2. It is found with hæmatite at Eiserfeld in Nassau, at Clifton in Cornwall, also in Siberia. *Turgite*, from the Ural, seems to be identical.

GRAINING. [Leuciscus.]

GRAMINACEÆ. [Graminaceæ.] The following list of British genera is from Babington's 'Manual of British Botany:'—

Digitaria.
Setaria.
Anthoxanthum.
Phleum.
Knappia.
Polypogon.
Agrostis.
Stipa.
Psamma.
Cynodon.
Leersia.
Lagurus.
Corynephorus.
Avena,
Holcus.
Kœleria.
Molinia.
Poa.
Sclerochloa.
Cynosurus.
Festuca.
Serrafalcus.
Triticum.
Elymus.
Nardus.
Echinochloa.
Phalaris.
Hierochloe.
Alopecurus.
Gastridium.
Milium.
Apera.
Arundo.
Phragmites.
Spartina.
Sesleria.
Aira.
Trisetum.
Arrhenatherum.
Triodia.
Melica.
Catabrosa.
Glyceria.
Briza.
Dactylis.
Bromus.
Brachypodium.
Lolium.
Hordeum.
Lepturus.

"The family is very numerous. Persoon's 'Synopsis' contains 812 species, 1-26th part of all the plants therein enumerated. In the system of Roemer and Schultes there are 1800, and since this work, were it brought to a conclusion, would probably contain 40,000 in all, it may be assumed that the grasses form a 22nd part. It is more than probable however that in future the grasses will increase in a larger ratio than the other phanerogamic plants, and that perhaps the just proportion will be as 1 to 20 or as 1 to 16. Greater still will be their proportion to vegetation in general when the number of individuals is taken into account, for in this respect the greater number, nay perhaps the whole, of the other classes are inferior. With regard to locality in such a large family, very little can be advanced.

"Among the grasses there are both land and water, but no marine plants. They occur in every soil, in society of others and alone, the last in such a degree as entirely to occupy considerable districts. Sand appears to be less favourable to this class, but even this has species nearly peculiar to itself. The diffusion of this family has almost no other limits than those of the whole vegetable kingdom. Grasses occur under the equator, and *Agrostis algida* was one of the few plants which Phipps met with on Spitzbergen. On the mountains of the south of Europe *Poa disticha* and other grasses ascend almost to the snow line, and on the Andes this is also the case with *P. malulensis* and *P. dactyloides*, *Deyeuxia rigida*, and *Festuca dasyantha*. The greatest differences between tropical and extra-tropical grasses appear to be the following:—

"1. The tropical grasses acquire a much greater height, and occasionally assume the appearance of trees. Some species of *Bambusa* are from 50 to 60 feet high.

"2. The leaves of the tropical grasses are broader, and approach more in form to those of other families of plants. Of this the genus *Paspalus* affords many examples.

"3. Separate sexes are more frequent in the tropical grasses. *Zea*, *Sorghum*, *Andropogon*, *Olyra*, *Anthistiria*, *Ischæmum*, *Ægilops*, and many other genera which only occur in the torrid zone, and are there found in perfection, are monœcious or polygamous. *Holcus* is perhaps the only extra-tropical genus with separate sexes.

"4. The flowers are softer, more downy, and elegant.

"5. The extra-tropical grasses on the contrary far surpass the tropical in respect of the number of individuals.

"That compact grassy turf, which especially in the colder parts of the temperate zones in spring and summer composes the green meadows and pastures, is almost entirely wanting in the torrid zone. The grasses there do not grow crowded together, but like other plants, more dispersed. Even in the southern parts of Europe the assimilation to the warmer regions in this respect is by no means inconsiderable.

"*Arundo donax* by its height reminds us of the Bamboo, *Saccharum Ravennæ*, *S. Teneriffæ*, *Imperata arundinacea*, *Lagurus ovatus*, *Lygeum spartum*, and the species of *Andropogon*, *Ægilops*, &c., by separate sexes exhibit tropical qualities. The grasses are also less gregarious, and meadows seldomer occur in the south than in the north of Europe. The generality are social plants.

"The distribution of cultivated grasses is one of the most interesting of all subjects. It is determined not merely by climate but depends on the civilisation, industry, and traffic of the people, and often on historical events. Within the northern polar circle agriculture is found only in a few places. In Siberia grain reaches at the utmost only to 60°, in the eastern parts scarcely above 55°, and in Kamtchatka there is no agriculture even in the most southern parts (51°). The polar limit of agriculture on the north-west coast of America appears to be somewhat higher, for in the more southern Russian possessions (57° to 52°) barley and rye come to maturity. Only in Europe, namely in Lapland, does the polar limit reach an unusually high latitude. Beyond this dried fish, and here and there potatoes, supply the place of grain.

"The grains which extend farthest to the north in Europe are barley and oats. These, which in the milder climates are not used for bread, afford to the inhabitants of the northern parts of Norway and Sweden, of a part of Siberia and Scotland, their chief vegetable nourishment. Rye is the next which becomes associated with these. This is the prevailing grain in a great part of the northern temperate zone, namely in the south of Sweden and Norway, Denmark, and in all the lands bordering on the Baltic, the north of Germany, and part of Siberia. In the latter another very nutritious grain, buckwheat, is very frequently cultivated. In the zone where rye prevails wheat is generally to be found, barley being here chiefly cultivated for the manufacture of beer, and oats supplying food for the horses. To these there follows a zone in Europe and Western Asia where rye disappears, and wheat almost exclusively furnishes bread. The middle and the south of France, England, part of Scotland, a part of Germany, Hungary, the Crimea, and Caucasus, as also the lands of middle Asia, where agriculture is followed, belong to this zone. Here the vine is also found; wine supplants the use of beer, and barley is consequently less raised. Next comes a district where wheat still abounds, but no longer exclusively furnishes bread, rice and maize becoming frequent. To this zone belong Portugal, Spain, part of France on the Mediterranean, Italy and Greece, further, the countries of the East, Persia, Northern India, Arabia, Egypt, Nubia, Barbary, and the Canary Islands; in these latter countries however the culture of maize or rice towards the south is always more considerable, and in some of them several kinds of *Sorghum* (Doura) and *Poa Abyssinica* come to be added. In both these regions of wheat, rye only occurs at a considerable elevation, oats however more seldom, and at last entirely disappear, barley affording food for horses and mules. In the eastern parts of the temperate zone of the old continent, in China and Japan, our northern kinds of grain are very unfrequent, and rice is found to preponderate. The cause of this difference between the east and the west of the old continent appears to be in the manners and peculiarities of the people. In North America, wheat and rye grow as in Europe, but more sparingly. Maize is more reared in the western than in the old continent, and rice predominates in the southern provinces of the United States. In the torrid zone, maize predominates in America, rice in Asia; and both these grains in nearly equal quantity in Africa.

"The cause of this distribution is, without doubt, historical, for Asia is the native country of rice, and America of maize. In some situations, especially in the neighbourhood of the tropics, wheat is also met with, but always subordinate to these other kinds of grain. Besides rice and maize there are in the torrid zone several kinds of grain as well as other plants which supply the inhabitants with food, either used along with them or entirely occupying their place. Such are, in the new continent, Yams (*Dioscorea alata*), the Manihot (*Jatropha Manihot*), and the Batatas (*Convolvulus Batatas*), the root of which and the fruit of the Pisang (*Banana Musa*) furnish universal articles of food; in the same zone in Africa, Doura (*Sorghum*), Pisang, Manihot, Yams, and *Arachis hypogæa*; in the East Indies and on the Indian Islands, *Eleusine coracana*, *E. stricta*, *Panicum frumentaceum*, several Palms, and *Cycadaceæ* which produce the Sago, Pisang, Yams, Batatas, and the Bread-Fruit (*Artocarpus incisa*). In the islands of the South Sea, grain of every kind disappears, its place being supplied by the bread-fruit tree, the pisang, and *Tacca pinnatifida*. In the tropical parts of Australia there is no agriculture, the inhabitants living on the produce of the sago, of various palms, and some species of *Arum*.

"In the high lands of South America, there is a distribution similar to that of the degrees of latitude. Maize indeed grows to the height of 7200 feet above the level of the sea, but only predominates between 3000 and 6000 feet of elevation. Below 3000 feet it is associated with the pisang and the above mentioned vegetables, while from 6000 to 9260 feet the European grains abound: wheat in the lower regions, rye and barley in the higher, along with which *Chenopodium Quinoa* as a nutritious plant must also be enumerated. Potatoes alone are cultivated from 9260 to 12,300 feet. To the south of the tropic of Capricorn, wherever agriculture is practised, considerable resemblance with the northern temperate zone may be observed. In the southern parts of Brazil, in Buenos Ayres, in Chili, at the Cape of Good Hope, and in the temperate zone of Australia, wheat predominates; barley, however, and rye make their appearance in the southernmost parts of these countries, and in Van Diemen's Land. In New Zealand the culture of wheat is said to have been tried with success, but the inhabitants avail themselves of the *Acrostichum furcatum* as the main article of sustenance. Hence it appears that in respect of the predominating kinds of grain, the earth may be divided into five grand divisions, or kingdoms—the kingdom of rice, of maize, of wheat, of rye, and lastly of barley and oats. The first three are the most extensive; the maize has the greatest range of temperature, but rice may be said to support the greatest number of the human race." Schouw, in Jameson's 'Philosophical Journal.'

The uses of this most important tribe of plants for fodder, food, and clothing, require little illustration. The abundance of wholesome fæcula contained in their seeds renders them peculiarly well adapted for the sustenance of man; and if the Cereal Grasses only, such as Wheat, Barley, Rye, Oats, Maize, Rice, and Guinea corn, are the kinds commonly employed, it is because of the large size of their grain compared with that of other grasses; for none are unwholesome in their natural state, with the exception of *Lolium temulentum*, a common weed in many parts of England, the effects of which are undoubtedly injurious. *Bromus purgans* and *catharticus* are said to be emetic and purgative; *Bromus mollis* is also unwholesome, and *Festuca quadridentata* is said to be poisonous; *Molinia varia* is injurious to cattle; and some other species are supposed to affect the milk of cows which graze upon them.

Among corn-plants not generally known may be mentioned *Eleusine caracana*, called Natchnee on the Coromandel coast, and Nagla Ragee, or Mand, elsewhere in India; *Setaria Germanica*, yielding German millet; and *Panicum frumentaceum*. There are many other species.

The value of grasses as fodder for cattle is hardly less than that of corn for human food. The best fodder-grasses of Europe are usually dwarf species, or at least such as do not rise above four or five feet from the ground. The most esteemed are *Lolium perenne*, *Phleum*, and *Festuca pratensis; Cynosurus cristatus*, and various species of *Poa* and dwarf *Festuca*. The fodder-grasses of Brazil are of far more gigantic stature, and perfectly tender and delicate. In Australia the favourite is *Anthistiria australis*, or Kangaroo Grass; in India *A. ciliata* is also in request; but the most common Indian fodder-grass is Doorba, Doorwa, or Hurryalee (*Cynodon dactylon*). Gama grass (*Tripsacum dactyloides*) has a great reputation as fodder in Mexico; and attention has lately been directed to the Tussac Grass of the Falklands (*Festuca flabellata*), a species forming tufts five or six feet high, and said to be unrivalled for its excellence as food for cattle and horses.

The fragrance of our sweet Vernal Grass is by no means confined to it; other species possess the same quality, which is connected with the presence of aromatic secretions, which have in part recommended grasses to the notice of medical practitioners. Sugar is a general product of grasses. It exists in great quantities in the Sugar-Cane (*Saccharum officinarum*). Maize so abounds in it, that its cultivation has been proposed in lieu of the sugar-cane.

For economical purposes Grasses are often of much importance. The strong stems of the bamboo are employed instead of timber and cordage. The cuticle of some species contains silex, which occurs in large masses after the burning of a heap of corn, or a stack of hay, in the shape of a colourless glass mass.

(Lindley, *Vegetable Kingdom;* Babington, *Manual of British Botany*.)

GRASSHOPPER. [Locust.]

GRAYHOUND. [Greyhound.]

GREAT BRITAIN AND IRELAND. [Census of 1851, *S.* 2.]

GREECE, KINGDOM OF. The following table shows the principal divisions, capitals, area, and population :—

Nomes.	Capitals.	Area in Eng. Sq. Miles.	Population in 1853.
Northern Greece (Hellas).			
1. Attica and Bœotia . .	Athens . . .	3,821	88,275
2. Phocis and Phthiotis . .	Lamia (Zeitun) .		80,693
3. Ætolia and Acarnania .	Mesolonghi . .		96,060
Peloponnesus.			
4. Argolis and Corinth . .	Nauplia . . .	10,159	106,162
5. Achaia and Elis . . .	Patras . . .		116,757
6. Arcadia	Tripolitza . .		115,711
7. Messenia	Kalamata . . .		98,139
8. Laconica	Sparta . . .		86,899
Islands.			
9. Eubœa and North Sporades.	Chalcis . . .	1,255	64,821
10. Cyclades	Hermopolis (Syra)		134,856
Total	. . . . . .	15,235	990,373

GREEN IRON-EARTH. [Mineralogy, *S.* 1.]

GREENOUGH, HORATIO, American sculptor, was born in Boston, United States, September 6, 1805. From his earliest childhood he showed a great facility in drawing and modelling, and his tastes were carefully cultured; but it was not till he had completed the ordinary collegiate training that he began seriously to contemplate the adoption of sculpture as a profession. Sculpture had then few practitioners in America, and none of any mark; Greenough therefore proceeded to Rome in order to study the art. Rome continued to be his residence for some years, and he derived much professional advantage from the friendly services of Thorwaldsen. His health however gave way, but it was speedily restored by a visit to his native land. There however he did not stay long. On his return to Europe he remained long enough in Paris to execute a clever bust of Lafayette, and then proceeded to Florence, where he fitted up a studio, and where during a residence of several years his principal works were executed. Of these the most important perhaps are his colossal statue of Washington, which now stands in the grounds of the Capitol at Washington; and, the 'Rescue,' or, as it is sometimes termed, the 'Pioneer's Struggle,' now in the Capitol itself: both of these works were commissioned by Congress. The 'Rescue,' a work of considerable originality and power, is intended to typify the struggle between the native and European races, and consists of a group of a pioneer rescuing his wife and child from an Indian. Besides these he executed several portrait-statues and monumental groups, numerous busts, and some very pleasing and graceful poetic figures and busts. He returned to America in 1851 to superintend the erection of his group of the 'Rescue,' and eventually determined not again to return to Europe. But he had become inured to an Italian climate, and his constitution proved unable to withstand the variations of an American one. After a severe illness he died December 18, 1852.

Greenough will probably not ultimately rank among the foremost of modern sculptors, but he occupies, and will no doubt continue to occupy, a very respectable position; while he will always retain a prominent place in the history of American art as the first of his countrymen who obtained a European reputation as a sculptor. Greenough's attainments were not limited to sculpture: he painted with some skill, and he wrote well both in verse and prose. In private life, while thoroughly unassuming, few men have been more esteemed.

GREENOCKITE. [Mineralogy, *S.* 1.]

GREENOVITE. [Mineralogy, *S.* 1.]

GREGAN, JOHN EDGAR, architect, claims notice as one of those who have contributed by their works to the architectural improvement of the city of Manchester, where great progress in art has been manifested during the last twenty years. Gregan was born in 1813 in Scotland; it is believed at Dumfries. He received an excellent general education at Edinburgh, and acquired his first professional knowledge from Mr. Walter Newall, architect, at Dumfries. About the year 1836 or 1837 he went to Manchester, where he was for some time an assistant to Mr. T. W. Atkinson, an architect, who may be said to have commenced the improvement which has been referred to. Mr. Atkinson left Manchester in the year 1840, when Gregan commenced practice on his own account, and wholly by merit and exertion raised himself into a prominent position. His works include several churches and schools in the neighbourhoods of Manchester, Bolton, and Preston, and the chapel of the Diocesan Training School at Chester,—these being in the mediæval styles; the church of St. John at Miles-Platting, and the Presbyterian churches at Green-Heys and Ancoats, schools to the latter, and the Jews' school at Cheetham Hill—all in the style of Northern Italy; several private houses at Manchester and neighbouring towns; warehouses (the class of buildings through which the chief architectural character of Manchester is expressed); the lodges to the public parks of the same city, and other buildings. His best work however, and it is of great merit, is the bank of Sir Benjamin Heywood, Bart., and Co., of which an illustrated account may be found in the 'Builder' (vol. vii.), where also is a view, or an elevation, of one of his warehouses (vol viii.). The bank is designed in an adaptation of the Venetian Italian style,—with careful attention to beauty of detail. The new Mechanics' Institution at Manchester, from his designs, has been mainly carried out under Mr. Corson's superintendence, since the death of the original designer. Gregan died suddenly, after a short illness brought on by over-exertion, on the 29th of April 1855. He was a Fellow of the Institute of British Architects, Honorary Secretary to the Manchester Royal Institution, and took great interest in the local School of Design, the establishment of the Free Library, and other institutions. He possessed a cultivated taste in general art, was ready with pencil and brush, and was a skilful performer on one or two musical instruments.

GREGORY XVI., Mauro Capellari, was born September 18, 1765, at Belluno, in the Lombardo-Venetian kingdom. He entered at an early age into the Camaldolensian order of monks, and having distinguished himself by his learning was elected their vicar-general. On the 21st of March 1825, Leo XII. created him a cardinal, and soon afterwards appointed him prefect of the college De Propaganda Fide. Under Pius

VIII. he conducted the negociation on mixed oaths with the kingdom of Prussia, and was the author of the celebrated papal brief of 1830. On the 2nd of February 1831, he was elected pope, and crowned on the 6th of February. In honour of the founder of the college De Propaganda Fide, Gregory XV., he assumed the name of Gregory XVI. He was a man of respectable character in private life, but his church administration was bigoted and exclusive, his temporal government harsh and despotic. In the early part of his reign he called in the Austrians to suppress the disturbances which had broken out in the Legations, and his pontificate of fifteen years was nothing less than a long oppression of his subjects. He died June 1, 1846, and was succeeded by the present pope, Pius IX.

GRETNA-GREEN. [DUMFRIESSHIRE.]

GRIFFON-VULTURE. [VULTURIDÆ.]

GRISTLE. [CARTILAGE.]

GROTEFEND, GEORG FRIEDRICH, a distinguished philologist and antiquarian, was born at Münden in Hanover on June 9, 1775. He was educated in his native town and at Ilfeld till 1795, when he proceeded to Göttingen, where he became intimate with Heyne, Tychsen, and Heeren. On the recommendation of Heyne he was appointed in 1797 assistant teacher in the Göttingen town school; and after he had made himself known by his work 'De Pasigraphia sive Scriptura Universali,' published in 1799, he was chosen prorector of the Gymnasium of Frankfurt-on-the-Main in 1803, and shortly afterwards con-rector. Besides many learned contributions to the 'Allgemeinen Cyclopädie' of Ersch and Gruber, and to other periodical works, he published in 1815, 'Anfangsgründe der deutschen Poesie' (Elements of German Poetry), and founded in 1817 a society for the investigation of the German language. In 1821 he was called to be director of the Lyceum at Hanover, which thenceforth became his residence. In 1823–24 he published an entirely remodelled edition of Wenck's Latin Grammar in 2 vols. 4to, and a smaller one for the use of schools in 1826. His most noticeable works however are those relating to the deciphering of the eastern cuneiform inscriptions, on which he expended much and successfully directed labour; and those devoted to an investigation of the old Italian languages and geography. Among these works are his 'Neuen Beiträge zur Erläuterung der Persepolitanische Keilschrift' (New Contributions towards the Explanations of the Persepolitan Cuneiform Inscriptions), 1837; and 'Neue Beiträge zur Erläuterung der Babylonische Keilschrift,' 1840. For early attempts these works possessed considerable merit, but their value has been lowered by the indefatigable labours of more recent investigators. On the Italian antiquities he published, in eight parts, between 1835 and 1838, 'Rudimenta Linguæ Umbricæ ex inscriptionibus antiquisenodata;' in 1839 'Rudimenta Linguæ Oscæ;' 'Die Münzen der griechischen, parthischen und indoskythischen Könige von Bactrien und den Ländern am Indus,' (The Coins of the Greek, Parthian, and Indo-Scythian kings of Bactria and of the Countries on the Indus; and in 1840-42, in five parts, his investigation 'Zur Geographie und Geschichte von Altitalien,' a work remarkable for the copiousness of its materials and the bold felicity of many of its theories. The part he took in the controversy respecting the genuineness of Sanchuniathon's 'History of the Phœnicians,' has been already mentioned. [SANCHUNIATHON.] Grotefend has also published a history of the Lyceum at Hanover. He died December 15, 1853.

GROUCHY, EMMANUEL, COMTE DE, Marshal and Peer of France, was born in Paris, October 23rd 1766. He entered the artillery branch of the army in 1780. He was already a captain of horse in 1784, and in the course of the ensuing year, became one of the gardes-du-corps of Louis XVI. However, no sooner did the first dawn of the revolution appear than he quitted the gardes-du-corps and ardently embraced revolutionary principles. In 1792, he was made colonel of the 2nd regiment of dragoons, a few months later he became major-general, and was appointed to head the cavalry attached to the army of the Alps. In that campaign Savoy was conquered by Montesquieu and annexed to France, General Grouchy having mainly contributed to its reduction.

Though scarcely in his 27th year, he began already to be esteemed the first cavalry officer in the French armies. In 1793 he was ordered to join the army of the Côtes de Brest in La Vendée, relieved Nantes, besieged by Charette, and by his skilful manœuvres at the head of the vanguard in the left wing he arrested the progress of the insurrection, preventing at one time, and rendering abortive at another, the repeated attempts of the royalists to open a communication with the English. At the battle of Sarrinieres, in a critical moment, seeing the republican infantry waver, Grouchy leapt from his horse, placed himself at the head of a few hundred grenadiers, charged the Vendeans, and in spite of a wound he received, wrested the victory from them. In December 1793, on account of his noblesse, he was removed from his command; but his soldiers having heard of his intended departure, flocked to his quarters to prevent it, and Grouchy had to rebuke their attachment, and recall them to obedience. Shortly afterwards the army of the insurgents having crossed the Loire, and approached the district in which he was residing, Grouchy mingled in the ranks of the national guards as a private soldier, and assisted in repulsing the enemy. His retirement lasted but eight months. In September 1794, Carnot gladly restored him to his dragoons; and on the 11th of June 1795, confirmed him in his post of general of division, to which the soldiers themselves had raised him. Carnot, shortly after, offered him the command of the army of the Côtes de Brest. The republic had, at this juncture, three armies operating against the royalists, and Grouchy feeling that a divided command would injure the service, declined the offer, and recommended that General Hoche should be placed at the head of the three armies. This was done. Grouchy took service under Hoche, and defeated Charette in his intrenchment at Saint-Cyr; and soon after the Vendean chiefs, Charette and Stafflet, were taken prisoners. At the beginning of 1797 Grouchy was appointed second in command of the army under Hoche, intended to invade Ireland, but the French fleet having been dispersed by a tempest, was compelled to regain the coasts of France. Early in 1798 he was ordered to Italy to join Joubert's army, shortly after commanded by Moreau, under whom, and at the head of a few troops, he took part in that celebrated campaign of Piedmont, where during six weeks 25,000 French soldiers held their ground and manœuvred in presence of the Austro-Russian army of 80,000 men. Grouchy afterwards distinguished himself at the battles of Valence and San Juliano; and on the 14th of June 1799, he defeated General Bellegarde on the banks of the Bormida. At the battle of Novi, in which Joubert was killed, Grouchy shared with Pérignon the command of the left wing, took 1200 Austrian prisoners, and charged the enemy eleven times at the head of his dragoons; but being placed between two fires, he fell from his horse, with fourteen wounds, and was taken by the Austrians. The Grand-Duke Constantine sent his own surgeon to attend him, ordered his servants to wait upon him, and offered him a liberal sum of money. After his recovery and exchange, Moreau anxious to mark his sense of Grouchy's services, put him at the head of his grand division, consisting of 18,000 troops. At the battle of Hohenlinden, in 1800, he took fourteen pieces of artillery, and greatly assisted in obtaining the victory.

During the trial of Moreau, in 1804, Grouchy stood by the side of his leader, and gave him continual proofs of esteem and friendship. At the battle of Zedenick, Grouchy, at the head of his dragoons, routed the Prussian horse, pursued the fugitives for nine miles, and utterly destroyed the famous regiment of the Queen of Prussia. After the combat of Prenzlau, October 27, 1805, he pursued the enemy into the town, and compelled several battalions to ground their arms. The dismay produced by this exploit, obliged the prince of Hohenlohe to sign a capitulation, by which 16,000 men, 64 pieces of artillery, and great stores of ammunition were given up to the French. General Grouchy shortly after, meeting the Prussians near Lubeck, drove them through the town, and well nigh captured Blucher. In the heat of the battle of Friedland, June 14, 1807, he was again grievously wounded, on which occasion his conduct was observed by the emperor, who gave him the grand cordon of the legion of honour. Throughout the Russian campaign, in 1812, his courage and intrepidity were conspicuous, and when Napoleon formed his sacred battalion, consisting of none but officers, whose duty was to watch over him, the command of this chosen band was given to General Grouchy. This was, perhaps, the greatest act of real confidence ever shown by Napoleon to a general officer; yet, in 1813, the Emperor refused Grouchy's application for the command of a corps, and for a time he abandoned the service. But the following year, when France was invaded, he offered his services, and Napoleon gave him the command of his cavalry. His name now appeared in almost every battle, at Brienne, January

26, 1814, at La Rothière, February 1, and at Vauchamps, February 14. His bravery and skill, at this last battle, rang throughout all France; the anger of Napoleon, which had lasted ten years, gave way before it, and Grouchy was created a Marshal.

After the battle of Ligny, June 16, 1815, Marshal Grouchy was commissioned to pursue the retreating army of Blucher with a force of 34,000 cavalry, and 100 pieces of cannon. In consequence of these orders, he found himself posted at Wavre, and was engaged in action against the Prussian general Thielemann, whilst Napoleon was fighting at Waterloo, on the 18th. The marshal heard the report of artillery, and was strongly urged by his lieutenant-generals to march towards the point whence it proceeded; but he declared himself bound to obey the orders he had received from the emperor on the 17th. Fatal as the battle of Waterloo proved to the French arms, nothing was publicly said at that period against Grouchy's conduct, nor for three years after. After the second abdication of Napoleon, the provisional government appointed the marshal to the united command of all the corps of the grand army; but the entire muster only amounted to 45,000 men.

Banished from France, after the return of Louis XVIII., he withdrew to the United States, where he was living in 1818, when the narrative of the battle of Waterloo, dictated to General Gourgaud, at St. Helena, was published. In this account a charge of treachery was made for the first time against him. Grouchy returned to France, in 1819. He was reinstated in all his titles and honours in 1831, by Louis Philippe, and died at Saint-Etienne, May 29, 1847, having been sixty-seven years in the French armies.

GROUND-IVY. [Nepeta, *S.* 1.]

GUALEGUAY. [Entre Rios, *S.* 2.]

GUANINE. [Chemistry, *S.* 2.]

GUATEMALA, Republic of, Central America, occupies the table-land of Guatemala, with the hilly country between it and the Gulf of Honduras, and a portion of the table-land of Yucatan. It lies between 13° 40′ and 18° 10′ N. lat., 81° 15′ and 93° 20′ W. long. On the S.E. it is bounded by the Republic of Salvador; E. by Honduras; N.E. by the Gulf of Honduras and the British settlement of Belize, or British Honduras; N. by the Mexican state of Yucatan; W. by Chiapa; and S. by the Pacific Ocean. The area is about 50,000 square miles; the population about 500,000.

Coast-line Surface, &c.—The general bearing of the Pacific coast from the Salvador boundary of the State to the Barra de Guacalate is W. by N., and thence to the Rio Sintalapa, the boundary between Guatemala and Chiapa, it is N.W. The shore is for the most part low, the descent from the table-land being steep, and a strip of lowland, from 20 to 30 miles across, being left between its base and the sea; but in many places the shore is high and rocky, and several rocky barriers lie off it. The only port at present frequented on the coast is that of Ystapa, at the mouth of the Rio Michetoyat; but though it is a port of entry, the harbour is little better than a roadstead, affording no protection for shipping. Ocos, further north, formed by the Barra de Ocos, is also an available port, but, owing to the absence of inhabitants, is not resorted to. The low tracts along the coast are very thinly peopled. On the northern coast Santo Tomas, in Honduras Bay, is a good and well-sheltered port; and somewhat inland, in the lake known as Golfo Dolce, is the port of Yzabal, in some respects the principal port of Central America; most of the European goods designed for that market being brought to it by vessels, and thence transported to the interior by mules: owing to a bar at the mouth of the Rio Dolce, Yzabal is inaccessible to vessels drawing over 7 feet of water.

The table-land of Guatemala occupies all the countries between the isthmus of Chiquimula and that of Tehuantepec in Mexico; the island in the interior of the peninsula of Yucatan, usually called the table-land of Yucatan, forms its north-eastern projection. Near its southern borders, about the town of Guatemala, it is nearly 5000 feet above the sea; and this may be considered as the mean height of that portion which is south of the Rio Motagua. But north of this river the country rises higher. The most elevated part of it appears to lie between the towns of Totonicapán and Gueguetenango (15° 30′ N. lat.). From this point it begins to lower gradually, and its north-western edges, which belong to the Mexican state of Chiapa, are indented by deep and sometimes wide valleys. No continuous range of any considerable elevation traverses this plain, the surface of which is slightly undulating, like the central parts of England; but here and there it is traversed by a range of hills, rising a few hundred feet above the plain. The descent from this plain to the low shores of the Pacific is extremely steep, and consequently when seen from that side it has the appearance of a mountain range, an illusion which is confirmed by a few lofty volcanoes standing near the edge of this descent. The most remarkable are the active volcano of Atitlan, near Gueguetenango, and the two volcanoes situated S. and N.W. of the town of New Guatemala, of which the Volcano de Agua (or Water Volcano), according to Colonel Galindo, is 12,620 feet, but according to other authorities 13,578 feet high; and the Volcano de Fuego (the Fire Volcano), appears to be somewhat higher, but which has not been ascended. All the volcanoes, whether active or extinct, are situated near the Pacific, and are in line with those of Salvador and Nicaragua. The eastern border of the table-land, by which it descends to the Gulf of Honduras, is cut by deep valleys, between which the high land takes the shape of ridges, which extend to a great distance, and in some places, as between the Rio Motagua and the Golfo Dolce, advances to the very shores of the sea. The country between the table-land and the Gulf of Honduras, may therefore be considered as a succession of valleys and ridges, except the part to the west and north-west of the Golfo Dolce, which is a low plain.

The state is well watered by a large number of rivers, but very few of them are navigable: the principal are the Dolce, Polochic, and Motagua. The Rio Dolce, though short, is the most important river of Central America, being the channel by which the Golfo Dolce discharges its waters into the Gulf of Honduras, 15° 35′ N. lat. The Golfo Dolce is a fresh-water lake, about 50 miles in circuit, having on its southern bank the small port-town of Yzabal. The Rio Dolce, issuing from the eastern portion of the lake, turns to the north, and expands into a small lake, called the Golfetta (the Small Gulf), about 10 miles in width. This river is about 20 miles long, and of considerable depth, except on its bar, where there are only 6 or 7 feet water.

The Rio Polochic rises near the village of Taçtiç, on the table-land of Guatemala, but soon descending into a wide and deep valley, it becomes navigable at the Embarcadero de Teleman, a considerable distance above the Golfo Dolce, into which it falls. It is a rapid river, and deep enough for vessels drawing several feet of water, but on the bar at its mouth there are only 3 or 4 feet of water.

The Motagua rises near the town of Solola on the table-land of Guatemala, through which it runs in an eastern direction till it descends from it some distance west of Zacapa. At Gualán, some miles further down, the river becomes navigable, but, owing to its numerous rapids and shoals, it can only be navigated by boats not drawing more than a foot and a half water. Towards its mouth the river turns to the north-east, and falls into the Gulf of Honduras about 15 miles west of Omoa. By means of this river a considerable quantity of European goods, especially the heavier kind, is sent into the interior of Guatemala; they are transported from Gualán to the places of consumption on mules.

The Lacantun, which rises in this state, and separates it for a considerable distance from Yucatan, becomes an important river after its entry into the state of Yucatan. The rivers which enter the Pacific are numerous, but have all a short course. One of the most important is the Michetoyat, which at its mouth forms the harbour of Ystapa, the port of the city of Guatemala.

There are four rather considerable lakes in the state. Of these, that called Golfo Dolce, noticed above, is the most important, as by means of it most of the foreign trade of the republic is carried on. The lake of Peten, situated in the most northern district of Vera Pas, on the table-land of Yucatan, is of an oval form and about 70 miles in circuit. It contains several islands, on the largest of which is a small fortress and a collection of houses forming the village of Flores. The lake of Atitlan is 80 miles north-west of the city of Guatemala, and near the western edge of the table-land. It is about 18 miles long and 9 miles broad, environed by lofty heights, including the volcano of Atitlan, and remarkable for its extraordinary depth, and for having no outlet, though several small rivers fall into it. The lake of Amatitan, 18 miles south-east from the city of Guatemala, is 9 miles long and 3 miles wide, and of great depth. It is much resorted to as a bathing-place by the inhabitants of the city during the season from February to April; and near the lake are several hot and mineral springs. The Rio Michetoyat flows from this lake.

Climate, Soil, Productions.—The climate of the table-land is that of a perennial spring; the thermometer scarcely varying throughout the year. The average heat in the middle of the year is from 68° to 70° Fahr.; but during the north winds, which prevail in the dry season, from October to May, it sometimes though rarely descends 20 degrees within a few hours. The rainy season usually sets in in May and lasts till October; but rain seldom falls except between 3 o'clock in the afternoon and 6 o'clock in the morning. In June thunder is frequent; in August and September the Pacific coast is subject to violent storms from the south-west. The table-land is considered to be very healthy, but goître is prevalent, especially among the mixed races, and is often accompanied by idiotcy. Earthquakes are painfully frequent.

The soil is generally very fertile. The table-land is nearly without trees, and even bushes, except on the declivities of the hilly ranges, which traverse it in every direction. On the lower lands by the Pacific trees of very large size form extensive forests, and are a source of great natural wealth; but, owing to the thinness of the population and the want of roads, are at present of little profit. Among the trees are mahogany, cedar, Brazil, Santa Maria, guaiacum, pimento, &c. Various medicinal plants are also abundant. On the low tract by the Gulf of Honduras there is a luxuriant and vigorous vegetation.

On the table-land wheat and maize of excellent quality are largely grown. Most European fruits and vegetables produce well; and tropical fruits and vegetables abound. In the lower tracts excellent rice is raised. Tobacco, cotton, sugar, cacao, vanilla, and indigo are raised for exportation. Most of the cochineal, which forms so important an article in the commerce of Central America, is obtained in Guatemala. The agricultural resources of Guatemala remain however but slightly developed. The country is thinly peopled, and owing to its unsettled state, and the inert character of the major part of the people, little has been done towards improving the rude systems of cultivation or introducing superior implements; and a considerable portion of the country lies almost waste. Of this uncultivated land a large part is used as grazing ground, and a rather large number of cattle is kept. Sheep are reared in considerable numbers, the wool, which is somewhat coarse, being used for the native manufactures. The horses are small, but hardy and handsome. Mules are numerous, being largely used for carrying goods. Hogs abound, and are of good quality. A good deal of poultry is raised.

Several metals are believed to exist in sufficient quantities to be profitably worked, under favourable circumstances. Gold, silver, lead, copper and iron are said to have been found. Lead mines are worked by the Indians in Totonicapán. Jasper and marble are obtained. Brimstone of good quality is procured in the vicinity of some of the volcanoes. Salt is made along the Pacific coast.

The manufactures are chiefly confined to articles of domestic consumption. The cotton manufacture, once of considerable importance, has greatly declined. It is now chiefly carried on in the corregimientos of Guatemala and Sacatepeques. The manufacture of woollen cloth has retained more of its former consequence: the making of the ordinary coarse cloths, and of a kind of black cloak much worn in the country employs a large number of looms. Hats, jewellery, furniture, earthenware, and the ordinary articles of domestic use are largely made in several of the towns.

The exports are confined to few articles. Of these the most important is that of cochineal, which was introduced into Guatemala as late as 1811, and did not for several years produce more than sufficient for home consumption. In 1811 about 15,000 lbs. were exported: in 1849 the quantity had increased to 1,469,100 lbs. The other articles of export are chiefly mahogany and other woods employed in cabinet work; vanilla, sarsaparilla, and other medicinal roots and plants; indigo; and hides. Sugar, coffee, and cotton are also exported in small quantities. The imports are British cotton and dry goods, linen and silk fabrics; cutlery and hardware; porcelain and fine earthenware; fancy goods; wines, &c. In 1851 the exports amounted to 994,488 dollars; the imports to 1,354,430 dollars.

Divisions, towns, &c.—Guatemala is divided into seven departments (corregimientos), which, with their chief towns, are as follows:—

1. Guatemala occupies the south-eastern portion of the territory, has an area of nearly 5000 square miles, and a population of about 90,000. The surface of the country is considerably diversified, the climate equable and genial, and the soil remarkably fertile. This and the following department form the great cochineal district. The nopal (*Cactus opuntia*), the plant on which the cochineal insect is produced, grows freely and luxuriantly, especially around the town of Amatitan, where are the chief plantations: the insects come to maturity in April, and the collecting of them continues for about a month. The other productions of this department are maize and wheat, sugar and coffee, most of which however is required for home consumption. The principal towns are GUATEMALA, the capital of the state, Amatitan, Escuintla (population 3000), and Jalpatagua. *Amatitan*, at the foot of the lake of the same name, which formerly depended on the persons who annually resorted to it for bathing, is now, in consequence of the great increase in the rearing of cochineal, a rich and flourishing place, having a population including the suburbs of upwards of 9000.

2. Sacatepeques lies to the west of the corregimiento of Guatemala; it contains above 1900 square miles, and a population of about 56,000, who are chiefly settled in its southern part. The country around the city of Old Guatemala is one of the most picturesque in the world, and the soil is extremely fertile. Maize and other grains, and vegetables and fruit in great variety, are largely grown. Cotton, coffee, tobacco, and sugar flourish here, though they are not yet grown to any great extent. Poultry and hogs are raised in considerable quantities for the supply of the capital. The olive and vine grow well here, but are not cultivated to any extent. The chief town is Old Guatemala, but there are several other populous places around it notwithstanding the proximity of the two volcanoes Agua and Fuego, and the frequency and severity of the earthquakes with which it is visited. The larger of these towns are Chimaltenango, population 4000, and Patsun.

3. Sololá, lies to the west of the former corregimientos, and contains about 4000 square miles. The surface is very much broken, and the soil, especially in the valleys, very fertile. The climate is colder than in some other parts of the state. Wheat, maize, and fruits are the chief products. Sheep are bred in large numbers. Jerga and other coarse woollens are manufactured. At least three-fourths of the inhabitants are Indians, who are mostly engaged in agriculture or weaving: twelve or fourteen of their villages are placed around the shores of the lake Atitlan, which is nearly in the centre of Sololá. From the midst of this lake rises the volcano of San Pedro. The chief towns of this department are Sololá, population 5000, Atitlan, and Masatenango, but neither of them is of any importance.

4. Quesaltenango lies to the north-west of Sololá; it contains above 4500 square miles, and 70,310 inhabitants; and is one of the most important of the departments in an industrial point of view. It has a tolerably level surface, a temperate climate, and a very fertile soil. The products are maize and wheat, sugar, cacao, and various fruits and vegetables, which are largely exported to the city of Guatemala, to Salvador, and Chiapa. Large herds of cattle and mules, and great flocks of sheep are maintained. The capital *Quesaltenango*, population 20,000, a large portion of whom are Indians, is the next town in importance to Guatemala. It stands on the little river Samala, and is a large, well, and regularly-built place. It contains a spacious church, and six churches of smaller size, a large town-hall, a plaza, or great square, with a fountain in the centre, has a daily market, and is a place of considerable trade. In its vicinity is a hot spring, which ejects the water to a height of above 20 feet. The other towns are San Marcos, Tapachula, and Tejutla.

5. Totonicapán, is an inland department, lying north-east of Quesaltenango; it contains 5600 square miles, but is very thinly peopled; the larger part of the inhabitants are Indians. The surface is much broken; the climate is temperate but considerably varied; the soil in the valleys, which are well watered, is fertile. Maize and wheat, sugar, fruit, and vegetables are the chief products of the soil. Sheep and cattle are largely bred. Lead-mines are wrought by the Indians in the neighbourhood of Chiantla. Salt is made from springs near Yxtatan. The only town of any importance is Totonicapán, which is said to contain 12,000 inhabitants, nearly all Indians, who make considerable quantities of

woollen cloth, earthenware, and wooden utensils. The other towns are Momostenango, Gueguetenango, and Jacaltenango.

6. Chiquimula, occupies the north-eastern extremity of the state, bordering on the republic of Honduras: its area is nearly 5000 square miles; its population about 80,000. The surface is considerably diversified, and in parts very fertile; the valleys and low tracts by the Golfo Dolce and the Bay of Honduras are hot, moist, and unhealthy. Tobacco, cotton, rice, and sugar are raised largely, with maize, frixoles, &c. The sugar is grown chiefly for distillation or for making chicha, a favourite intoxicating drink of the Indians. Horses, mules, and cattle are reared in large numbers. The chief towns are Chiquimula, population 4500; Acasaguastlan, 3600; Jalapa, 3500; Jilokepeque, 3200; Mita, 3300; Quesaltepeque, 4000; Zacapa, 3000; and the little port town of Yzabal on the Golfo Dolce. Near this last place are the remarkable ancient remains of Quirigua, consisting of seven lofty columns, and various sculptured slabs.

7. Vera Paz, the largest of the seven corregimientos, comprehends the projecting tract of country which forms the most northern part of the republic; the area is about 11,000 square miles: the population is estimated at 65,000, of whom nine-tenths are Indians. The country is very varied in surface and character of soil: but comparatively very little of it is cultivated. Mahogany, rosewood, and other valuable timber-trees abound; the coffee, cacao, indigo, and nopal plants are said to be indigenous in the forests. In the northern part of Vera Paz is the lake of Peten. The most populous town is Coban, situated in a remarkably fertile valley of the same name, with a population of above 10,000, nearly all Indians, who are industrious and wealthy, possessing fine plantations of sugar-cane, bananas, pimentos and various kinds of fruit; the other towns are Salamá, population, 4500, Cajabon, 4000; and Rabinal, 6000; but none of them call for specific notice.

Government, &c.—According to the constitution of the 19th of October, 1851, the executive is confided to a president elected by a general assembly, composed of the legislative chamber, the archbishop of Guatemala, the members of the supreme court of justice, and the members of the council of state having a deliberative voice. The president is elected for four years, but is eligible to be re-elected. The legislative assembly consists of 59 members. The council of state is composed of the ministers, eight councillors chosen by the legislative assembly, and of others appointed by the president. The revenue and expenditure average somewhat over 400,000 dollars. The debt amounts to 1,200,000 dollars. The army consists of 1000 men, with a patriotic corps and a militia of 5000 men.

The population consists of aboriginal tribes, some of whom live in a state of almost perfect independence, but the main body have obtained all the rights of free citizens of the republic, and form the bulk of the population; of the descendants of Europeans, and of the mixed offspring of Europeans and Indians, who are known as 'ladinos.' The Roman Catholic is the established religion, and there are few if any open dissenters. The church is presided over by the Archbishop of Guatemala.

During the Spanish occupancy Central America was termed the kingdom of Guatemala, the city of Guatemala being the capital and seat of Government. During the struggle for independence it remained quiet and subject to Spain; but on the declaration of independence in 1821 it was for awhile united to the Mexican empire of Iturbe. On the publication of the new constitution, July 2nd, 1823, by which the federal union of Central America was formed, Guatemala became one of the united states. This union was however after a short time dissolved, and Guatemala then became an independent republic, and has so continued to the present time.

(Haefkin, *Centraal Amerika*; Juarror, *Guatemala*; *Travels of* Humboldt, Dunn, Byam, Thompson, &c.; Baly, *Central America.*)

GUARANINE. [Chemistry, *S.* 2.]

GUELDER-ROSE. [Viburnum.]

GUELPH. [Canada, *S.* 2.]

GUISBOROUGH. [Yorkshire.]

GUM-TREE. [Eucalyptus.]

GUN-COTTON. [Chemistry, *S.* 2.]

GURNEY, JOSEPH JOHN, was born August 2, 1788, at Earlham Hall, near Norwich, the country residence of his father, John Gurney, who was a member of the Society of Friends, and one of the partners of the Norwich bank. He was the tenth child of eleven children left by Mrs. Gurney at her death, Elizabeth Gurney being the third. [Fry, Mrs. Elizabeth, *S.* 2.] Joseph Gurney completed his education at Oxford under a private tutor, without becoming a member of the university, of which however he enjoyed many of the advantages. He acquired the Hebrew and Syriac languages, as well as Greek and Latin, mathematics, and a large amount of general knowledge. After the death of his brother John in 1814, he assumed his brother's Christian name in addition to his own. Joseph John Gurney in 1818 became a recognised Minister of the Society of Friends, and his preaching is described as having been very impressive. He accompanied Mrs. Fry in her journey to Scotland in 1818, and to Ireland in 1827, to inquire into the state of the prisons, and of the results of this last journey he wrote a Report addressed to the Marquis Wellesley, lord-lieutenant of Ireland, which was afterwards published. In 1837 he visited the United States of America and the Canadas, and was absent about three years. The journal of his travels was printed, but only for private circulation. In 1841 he made a journey to Holland, Belgium, and Germany, accompanied by Mrs. Fry, and in 1842-43-44, another journey to France and Switzerland, in the earlier part of which he was again accompanied by Mrs. Fry. The object of these journeys was to introduce improvements in prison-discipline, and also to induce the French government to abolish slavery in the French colonies, for which purposes he had an interview with Louis-Philippe, and much communication with M. Guizot.

Joseph John Gurney was the author of several works, religious and moral. His 'Observations on the Distinguishing Views and Practices of the Society of Friends' has been several times reprinted, as have also his 'Essays on the Evidences, Doctrines, and Practical Operation of Christianity,' a work intended for Christians generally. All his works are ably and judiciously written. He took an active part in many benevolent societies, such as those for the abolition of slavery, for the repeal of the laws inflicting capital punishments, in peace-societies, temperance-societies, the British and Foreign Bible society, and others. His donations to charitable institutions and for the relief of public distress were numerous and princely. His private gifts were only bounded by his judgment as to what was appropriate in each particular case. He died on the 4th of January 1847, at Earlham Hall.

(*Memoirs of Joseph John Gurney, with Selections from his Journal and Correspondence, edited by Joseph Bevan Braithwaite*, 2 vols. 8vo.)

GURWOOD, JOHN, an officer whose name will always be honourably associated with that of the Duke of Wellington, must have been born in 1791, as it is incidentally mentioned that he ceased to be a ward of chancery and came of age in 1812. He entered the army as an ensign in the 52nd regiment in 1808, and served during the war in the Peninsula, where he was distinguished for his accurate knowledge of the French and Spanish languages. He first emerged into notice as Lieutenant Gurwood, by volunteering to lead the forlorn hope at the storming of Ciudad Rodrigo, on the 19th of January 1812. Circumstances afterwards led him to print a minute account of all the transactions in which he was personally concerned on that night in a pamphlet, which is one of the most curious and instructive contributions in existence to the history of the Peninsular War, containing a number of details which are eminently characteristic and suggestive. When he knew that his offer had been accepted, "I kept on eating," he tells us, "principally bread, but I carefully controlled my thirst, knowing how insatiable it becomes under nervous excitement. On the concerted signal for the assault—three guns from the batteries—my heart beat double quick, and I applied my mouth to the calabash of Jack Jones, from which I swallowed a gulp of 'aguardiente.' On arriving at the top of the breach, I saw a musket levelled not far from my head, and a Frenchman in the act of pulling the trigger. I bobbed my head in time, but was wounded and stunned by the fire. I found myself at the bottom of the breach; I cannot tell how long I was there, but on putting my hand to the back of my head, where I felt that I had been wounded, I found that the skull was not fractured." Recovering from his trance, "we again set up a shout, scrambled up the breach, and gained the rampart of the bastion." Here his attention was attracted by seeing one of his men, Pat Lowe, in the act of bayoneting a French officer who resisted being plundered, and he saved the Frenchman by knocking down the Irishman. His prisoner guided him to a tower, where he found the French governor of the place, and some other officers, who had shut themselves up from the now victorious English soldiers. He summoned them to surrender, and the door was unbarred; but Pat Lowe, who had rejoined him, called out, "Dear Mr. Gurwood, they will murder you!" and as he entered he was seized round the neck, and fully expected a sword in his body; but his alarm ceased on finding himself kissed by the person who had seized him, who added that he was the governor, General Barrié, and that he yielded himself his prisoner. Gurwood conducted him to Lord Wellington, whom he found on the ramparts, who said to him, "Did you take him?" and, on his replying in the affirmative, handed to him the governor's sword, which had just been surrendered, with the observation, "Take it, you are the proper person to wear it." He wore it ever afterwards, and by special privilege when every other officer in the English army wore a regulation sword. From this time he became a noted officer; but though he served with distinction during the rest of the Peninsular war, and at Waterloo, where he received a severe wound, the rank of colonel was the highest that he attained, and he did not become full colonel till 1841. In 1830 he was placed on the unattached list, and shortly afterwards became private secretary to the Duke of Wellington. This appointment led to a very remarkable publication. In 1834 he commenced the issue of 'The Despatches of Field-Marshal the Duke of Wellington, K.G., during his various campaigns in India, Denmark, Portugal, Spain, the Low Countries, and France, from 1799 to 1818, compiled from official and authentic documents, by Lieutenant-Colonel Gurwood.' The work extended, with a volume of index, to thirteen volumes; the publication of it occupied the colonel for a series of years, and its popularity was unexpected and unexampled. No collection of official documents of any length has ever found its way into so many libraries and so many hands. A second edition was called for, and an abridgement into one volume was issued to satisfy the curiosity of those who could not purchase the complete edition. The reputation of the Duke of Wellington appears to have been materially raised by the publication, and most of his popularity in later life was based on the 'Despatches.'

Colonel Gurwood urged him to give his consent to other publications bearing on his military career, but did not always succeed. The Colonel was in the habit of showing his friends a paper by the Duke on the battle of Waterloo, in answer to the observations on the subject by the Prussian general Clausewitz, and was much surprised at finding that one of those to whom he showed it was guilty of a breach of confidence. The whole appeared in print in 'Fraser's Magazine,' as a portion of a review of Captain Siborne's 'History of the Battle.' The reader who is curious to see what Wellington had to say on Waterloo may be assured that he will find it word for word in that magazine for July 1844, without the slightest intimation from whose pen it proceeds—a fact which would indeed never be conjectured by any one perusing the article without previous information as to its authorship. The Duke also supplied to the late Earl of Ellesmere some observations on the battle which are interwoven with his article on Alison's 'History of the War' in the 'Quarterly Review.' In return for the Colonel's services the Duke appointed him Deputy-Governor of the Tower of London. He again visited Spain in company with Lord Eliot, the present Earl of St. Germans, to endeavour to mitigate the cruelties of the civil war between the Carlists and Christinos, in which neither party gave quarter; and their mission was partially successful.

From the time of the publication of some portions of Napier's 'History of the Peninsular War' in 1840, Colonel Gurwood was involved in a disagreeable controversy respecting the circumstances of the capture of the governor of Ciudad Rodrigo. An officer of the rank of Major, who had commanded one of the storming parties, made a statement in October 1838 to the effect that he (the major) had accepted the surrender of the governor; that a sword, afterwards found to be that of an aide-de-camp, had been presented to him in token of surrender; and that while he was engaged with two officers who laid hold of him for protection, one on each arm, Lieutenant Gurwood came up and obtained the sword of the governor; on seeing him present which on the ramparts, the major, according to his own account, "turned on his heel and left the spot." The major died in 1839, and this statement was made public in the following year in a second edition of that portion of Napier's history relating to the events of Ciudad Rodrigo, the first having stated that "Mr. Gurwood, who though wounded had been amongst the foremost at the lesser breach, received the governor's sword." Colonel Gurwood had been in garrison with the major in 1834 at Portsmouth, and always wore the sword when in uniform; but this circumstance had not produced any remark from that officer. A long and vexatious discussion ensued on the point, which was brought to a close by a very singular incident. Gurwood did not know the name of the French officer whom he had rescued from Pat Lowe, and whose evidence would of course be most important to show the justice of his claims, as the Frenchman had guided the Englishman to the tower where the governor was found, and witnessed what then took place. In turning over the Duke's papers in 1844, the Colonel found a letter addressed to Lord Wellington in 1812 by a captive French officer named Bonfilh, who might, he inferred, be the person he was in search of. He made inquiries in Paris to ascertain if M. Bonfilh was still alive, found that he was, wrote off to him, and received a letter dated the 1st of May 1844, in which M. Bonfilh informed him that he was indeed the officer whose life he had saved, and gave a statement of all that he remembered of the night of the storm, which differed in some few unessential particulars from the recollections of the Colonel, but in all essential ones confirmed his statement, and was irreconcileable with that of the major. The Colonel read it with feelings which he declared it impossible to describe. He visited M. Bonfilh at his residence in France, and embodied the history of the whole affair in a pamphlet, of which he printed only fifty copies for private circulation, from one of which these particulars are taken. The preface is dated on the 14th of June 1845, and it was his last literary effort. On the 25th of December in the same year, in a fit of temporary insanity, which was attributed at the inquest to the effects of the wound he had received so many years before at Ciudad Rodrigo, he terminated his life by his own hand at Brighton, leaving a widow, a French lady, and three daughters.

GUTTA PERCHA. [ISONANDRIA, *S.* 2.]

GUYON, GENERAL RICHARD DEBAUFRE, was born March 31, 1813, at Walcot, near Bath, Somersetshire, in which city he received his early education. His grandfather was a captain in the Dragoon Guards; his father, John Guyon, of Richmond, Surrey, was a commander in the royal navy, and died in 1844. Richard Guyon was intended for the army, and at an early age held a commission in the Surrey militia. At the age of eighteen he obtained a commission in the Hungarian Hussars of the Austrian army, and after some years' service attained the rank of lieutenant, and was appointed aide-de-camp to Field-Marshal Baron Splenyi, commander of the Hungarian life-guards. In November, 1838, he married the daughter of Baron Splenyi, and soon afterwards retired to the neighbourhood of Pesth, where his wife's relations resided, and where he spent his time in country occupations and field-sports.

In September, 1848, when Jellachich, the Ban of Croatia, invaded Hungary, Guyon offered his services to the Hungarian diet, and received the appointment of Major of the Honveds, or national guards. On the 29th of September he contributed materially to the defeat of Jellachich at Sukoro. In the battle of Schwechet, near Vienna, on October 30th, Major Guyon with his raw troops achieved at Mannswörth the only successes of that disastrous day, when, his horse having been shot under him, he led his men to the charge on foot, and armed them with the muskets of the slain Austrians, in place of the scythes with which many of them had fought. He was rewarded by being raised to the rank of Colonel on the field of battle. He was afterwards raised to the rank of General at Debreczin. He commanded the rear of Görgei's army on the march from Pesth to Upper Hungary; and at Ipolysag (January 10, 1849), by a daring and skilful effort saved the baggage from the pursuing Austrians. On the 5th of February, with 10,000 Hungarians, he stormed the defiles and heights of Branyiszko, defended by 25,000 Austrian troops under General Schlick, took prisoners and baggage to a large amount, and cleared the way for the van of the army to pass, Görgei having vainly attempted to turn the defiles by a flank movement. At the battle of Kapolna (February 26) he commanded a division of Dembinski's army. On the 21st of April he entered the fortress of Komorn with a small body of troops, though it was then closely besieged by the Austrian troops, and announced to the despairing garrison the approach of Görgei with a relieving army. When Görgei was appointed minister of war, General Guyon for a time performed the duties of the office, in order to enable Görgei to retain his command-in-chief. On the 9th of August the Austrian and Hungarian armies met near Temesvar, where the impetuous bravery of Guyon and his Hussars could not save the Hungarian army from a defeat. On the 11th of August Kossuth resigned his office of governor, and named Görgei dictator, who on the 17th of August put an end to the war by an unconditional surrender.

Guyon, Bem, Dembinski, Kmety, and other officers who had not been included in the surrender, made their escape with much difficulty to Turkey, where, in defiance of the conjoint demand of Austria and Russia, they were protected by the sultan. After some time Guyon was joined at Constantinople by his wife, whose property in Hungary had been confiscated by the Austrian government. He was offered and accepted service under the Turkish government; and though he decidedly refused to become a Mohammedan, was sent to Damascus with the rank of lieutenant-general on the staff, and with the title of Kourschid Pasha. In November 1853 he was directed to proceed from Damascus to the army in Asia Minor, and reached Kars by a series of rapid journeys. There he had the appointment of chief of the staff and president of the military council, but without any real command over an army of 15,000 undisciplined troops under twenty-one pashas, each with the rank of a general. He was allowed, however, to organise the army and to construct defences. That organisation and those defences, though doubtless much improved afterwards by General Williams and his officers, became a basis for the heroic defence of Kars. He died of cholera, October 14th, 1856, at Constantinople, and was interred with Turkish military honours at Scutari.

(*The Patriot and the Hero; General Guyon on the Battle-Fields of Hungary and Asia*, by Arthur Kinglake.)

GWILT, GEORGE, architect, was well known as an antiquary, and for his restoration of the choir and tower, and the Lady Chapel, of St. Mary Overy's church, in the parish of St. Saviour's, Southwark. George Gwilt and Joseph Gwilt were the sons of George Gwilt, an architect, resident in the parish, who was surveyor for the county of Surrey, and who erected amongst other buildings, Horsemonger Lane Gaol and Newington Sessions House. He died on the 9th of December 1807. George Gwilt, the elder of the sons, was born on the 8th of February 1775. He was sent to a school at Hammersmith, but was indebted for his general education mainly to his own exertions. His professional knowledge was acquired in the office of his father, whom he succeeded in practice. Prior to this, however, Gwilt junior had commenced his own professional course with the building, about the year 1801, of the warehouses of the West India Docks. He soon acquired a marked taste for objects of antiquarian art, of which he at length got together, at his house in Union Street, an important collection, many of the remains being found in St. Saviour's. In 1815 he was elected a Fellow of the Society of Antiquaries. In March and June of that year two valuable communications by him, on the remains of Winchester Palace, Southwark, appeared in the 'Gentleman's Magazine'; and he contributed occasionally at other times to the same journal. In 1818 he was engaged upon the restoration of the steeple of Bow Church, a work which required much professional skill, and which he performed with strict regard to the preservation of Wren's design. The peristyle of columns and the obelisk had to be removed and rebuilt, and the whole was completed on the 11th of July 1820, when the copper vane (in the form of a dragon) eight feet 10 inches long, was fixed. Very soon afterwards, the foundations of the same church being found defective, some important works for their maintenance were carried out under Gwilt's supervision; and during these works the interesting Norman remains of the original building were identified, and were described by him to the Society of Antiquaries in June 1828, in a paper under the title of 'Observations on the Church of St. Mary-le-Bow, chiefly relating to its Original Structure,' and which paper was afterwards published, with six plates, in the 'Vetusta Monumenta,' vol. 5. The restoration of the choir and tower of St. Mary Overy's church was commenced about the year 1822, and was completed in about two years, with great fidelity and practical skill. In 1824 Gwilt visited Italy, and we find little to say of him till the year 1832, when the Lady Chapel of the church last mentioned being rescued from destruction, he undertook the direction of the restoration without remuneration, and completed it in 1833, with the skill which he had exhibited in the other part of the church. George Gwilt lived to the advanced age of eighty-one, occupied in his favourite pursuits till within a few days before his death. He had however suffered long from a painful complaint, and the loss of his wife who died a few weeks before him, was severely felt. He died on the 27th of June 1856, and was buried in the family vault, next the choir of St. Mary Overy's Church.

Joseph Gwilt, the younger brother of George Gwilt, is also an architect, and the author of several valuable works on architecture.

GYMNARCHUS, a genus of Malacopterygious Apodal Fishes. The body is long and scaly; the gill opening before the pectoral fins; dorsal fin running the whole length of the back; tail ending in a point; head naked and conical; mouth small, with a single row of cutting teeth. *G. Niloticus* is the only species; it inhabits the Nile.

GYMNEMA, a genus of plants belonging to the natural order *Asclepiadaceæ*. It has a sub-urceolate 5-cleft corolla, the throat usually crowned by five scales or teeth inserted in the recesses between the segments of the corolla. The stamineous corona is wanting. The anthers terminate by a membrane, the pollen masses are erect, fixed by the base. The follicles smooth. Seeds comose, generally marginate. The species are usually twining shrubs, natives of the East Indies, the tropical parts of Australia, and Equinoctial Africa. The leaves are opposite, membranous, and flat. The umbels interpetiolar and cymose. In the greater number of species the stamens are not usually naked, but are furnished with a gland-like body or fleshy tuft at the base of each filament.

G. lactiferum, Cow-Plant, or Milk-Bearing Gymnema, has an erect stem, or rather twining; the leaves are on short petioles, ovate, bluntly acuminated, usually unequal-sided; the umbels many-flowered, shorter than the petioles; the throat of the corolla crowned by five fleshy tubercles; the tube furnished with double pilose lines running from the tubercles. It is a native of Ceylon, where the milk of the plant is sometimes substituted for cow's milk, and the leaves are boiled with food.

G. tingens is a native of Pegu. It has a twining glabrous stem, cordate leaves, acuminated to oval; the umbels or corymbs often twin, at first shorter than the petioles, and at length spirally elongated; the glands of the filaments one-half shorter than the stamens; follicles cylindrical, spoon-shaped; stigma simple, oval, mutic, crowning the tube of the corolla, and therefore exceeding the stamens. The flowers are largish, numerous, and of a pale-yellow colour. The calyx 5-cleft to the base. From the leaves of this plant a green dye is prepared by the Burmese. Seventeen species of this genus are enumerated, none of them of any particular interest.

(Lindley, *Vegetable Kingdom; Don, Dichlamydeous Plants*)

GYMNETRUS, a genus of Fishes belonging to the group of Riband-Shaped *Acanthopterygii*. It has the following characters:—Body elongated, compressed; a single dorsal fin extending the whole length of the back; ventrals consisting each of a single ray, only sometimes very long and dilated at the end; no anal fin; teeth pointed, small. The species of this genus have very rarely been obtained entire. They have generally been taken dead, and consequently have been crushed and mutilated. Of the species of this genus, Mr. Yarrell says, "three probably belong to the Mediterranean, two to the seas of the North of Europe, and two to India. One northern species, besides one of those apparently belonging to India, has been taken on the shores of this country. That of the north has occurred more than once in Scotland; that of India, once on the coast of Cornwall."

G. Hawkenii (Bloch), Hawken's Gymnetrus, the Oared Gymnetrus, the Ceil Conin of Cornwall. This species has been taken in Cornwall. The following description has been drawn up by Mr. Couch from a drawing and notes of a specimen taken in a net at Mount's Bay in 1791:—"The length without the extremity of the tail, which was wanting, was 8½ feet; the depth, 10½ inches; thickness, 2¼ inches; weight, 40 lbs. In the drawing the head ends in a short and elated front; eye large; pectoral fin round; no anal fin; the dorsal fin reaches from above the eye to the tail. The ventrals are formed of four long red processes, proceeding from the thorax, and ending in a fan-shaped appendage, of which the base is purple, the expansion, crimson. The back and belly are dusky-green; the sides whitish; the whole varied with clouds and spots of a darker green; the fins crimson." A very fine specimen of this fish caught off the coast of Northumberland, was exhibited in London at the time the discovery of the Great Sea-Serpent was announced, and was supposed to explain the nature of this discovery.

The *Gymnetrus arcticus* of Cuvier, the Vaagnaer, or Deal-Fish, has been referred to the genus *Trachypterus*. [TRACHYPTERUS, *S.* 2.]

GYRINIDÆ, a family of Coleopterous Insects belonging to the section *Pentamera*, and the sub-section *Hydrodephaga* or Water-Beetles, and distinguished by the minute size of the antennæ, which are clubbed and shorter than the head, the second joint being dilated into a kind of ear externally; the two fore legs are long and advanced in front like arms, but the four posterior legs are very short and compressed, but broad, forming two pair of short strong oars. The eyes are four in number, two being placed above and two below; the palpi are very small; the thorax short and transverse; and the elytra oval, depressed, and obtuse at the extremity, leaving the tip of the abdomen exposed.

This family corresponds with the genus *Gyrinus* of Linnæus, and unlike the *Dyticidæ* to which they are nearly allied, these insects are distinguished by the metallic brilliancy of their covering; living for the most part on the surface of the water, they receive the impressions of the light in a more direct manner than the *Dyticidæ*, and are accordingly ornamented with tints of a brassy or bronzed metallic hue, which glitter in the sun in the greatest degree. The velocity with which they execute their evolutions upon the surface of the water is really surprising, and has obtained for them the name of Tourniquets by the French, and Whirlgigs and Waterflies by the English. Sometimes indeed they remain stationary for a time, so that it seems easy to secure them, but on the least motion they are instantly alert, escaping with surprising agility and diving to the bottom of the water. The situation of their eyes adds greatly to their defence, enabling them to see objects both above and below them. In the 'Journal of a Naturalist' we find the following account of their proceedings:—"Water quiet, still water affords a place of action to a very amusing little fellow (*Gyrinus natator*), which about the month of April, if the weather be tolerably mild, we see gamboling upon the surface of the sheltered pool; and every school-boy who has angled for minnows in the brook is well acquainted with this merry little swimmer in his shining black jacket. Retiring in the autumn, and reposing all the winter in the mud at the bottom of the pond, it awakens in the spring, rises to the surface, and commences its summer sports. They associate in small parties of ten or a dozen near the bank, where some little projection forms a bay or renders the water perfectly tranquil; and here they will circle round each other without contention, each in his sphere, and with no apparent object from morning until night with great sprightliness and animation, and so lightly do they move on the fluid, as to form only some faint and transient circles on its surface. Very fond of society; we seldom see them alone, or if parted by accident they soon rejoin their busy companions. One pool commonly affords space for the amusement of several parties; yet they do not unite or contend, but perform their circlings in separate family associations. If we interfere with their merriment they seem greatly alarmed, disperse or dive to the bottom, where their fears shortly subside, as we soon again see our merry little friends gamboling as before. When they dive to the bottom of the water in the manner above described, they carry with them a little bubble of air affixed to the extremity of their bodies. Also they are sometimes to be found flying, their well-formed wings permitting such an operation, while the high polish of the body protects them from the action of the water." With the exception of a few exotic species, the insects of this family are of a small size, seldom exceeding a quarter of an inch in length; and the largest ones do not reach one inch. Some of the species are found on the margins of the ocean. They emit when touched a disagreeable scent, arising from a milky fluid which exudes from the different parts of the body, and which is not readily dispelled. The structure of the fore legs indicates their mode of life, serving as arms to convey the food, which they find floating upon the surface of the water, and which consists of small dead insects, &c., to the mouth. The number of species of this family does not exceed 50 or 60, and of these not more than eight or nine are found in this country; of these the *Gyrinus natator* is the most common. It is of a brilliant bronzy black colour, with the sides of the body and antennæ metallic; the margins of the elytra and legs reddish. The elytra are ornamented with lines of impressed spots. It is about a quarter of an inch in length.

H

HADLEIGH. [SUFFOLK.]

HÆMATIN. [TISSUES, ORGANIC, *S.* 1.]

HÆMATITE, a name given to certain forms of the native Peroxide of Iron. When of a red colour it is called Red Hæmatite; and when brown, Brown Hæmatite. [IRON.]

HAILSHAM. [SUSSEX.]

HAIR. [TISSUES, ORGANIC, *S.* 1.]

HALDANE, JAMES ALEXANDER, son of Captain James Haldane of Gleneagles, Perthshire, was born at Dundee, on the 14th of July, 1768, within a fortnight after his father's death. In many respects his career was a counterpart of that of his elder brother Robert. In 1777 he accompanied his brother to the High School of Edinburgh, and subsequently pursued his studies at the university. Declining a partnership which was offered him in connection with Messrs. Coutts's Bank, London, he entered in 1785 the East India Company's naval service. In 1793 he obtained the command of the Melville Castle, East Indiaman. In September of that year he married the only daughter of Major Joass, of Culleonard, in the county of Banff. At the close of this year he succeeded by his courage and presence of mind in quelling a mutiny which broke out in a ship which lay near the Melville Castle, in Portsmouth Harbour, and which was beginning to assume an alarming appearance. His views on religious matters becoming more decided, he at length resolved on retiring from the sea. Early in 1794 he rejoined his wife in Scotland. Soon afterwards he took up his residence in Edinburgh, and manifested a deep interest in various efforts for the religious instruction of the people. He took a leading part in the preaching tours which were undertaken through various parts of Scotland, in the establishment of Sunday Schools, and other Christian efforts. In December 1797, the Society for propagating the Gospel at Home was instituted. In February 1799, Mr. James Haldane became the first pastor of the Tabernacle or Circus Church. In May 1801 the congregation removed to a new Tabernacle, built at the head of Leith Walk, at the entire cost of Mr. Robert Haldane. In 1808 Mr. James Haldane having changed his views with respect to Infant Baptism, although he left the communion open to parties who might differ in their views of this question, many of the members of his church left. Mr. Haldane continued minister here till his death, which took place on the 8th of February 1851. Mr. Haldane published numerous pamphlets on subjects which at the time excited attention in the religious world. Among his larger treatises may be named his works on 'The Doctrine of the Atonement;' 'On Christian Union;' his 'Exposition of the Epistle to the Galatians;' and 'Views of Social Worship.' Some of his pamphlets were directed against the opinions of the Irvingites.

HALES OWEN, Worcestershire, a market-town and borough, in the parish of Hales Owen, is situated in 52° 32′ N. lat., 2° 5′ W. long., distant 36 miles S.E. by E. from Shrewsbury, and 117 miles N.W. from London by road. The population of the borough of Hales Owen in 1851 was 2412. The living is a vicarage in the archdeaconry and diocese of Worcester.

The town of Hales Owen is pleasantly situated in a valley, and contains many good houses. The parish church is a fine building, with a handsome spire, supported by four arches. The Independents, Baptists, and Wesleyan Methodists have chapels. In Hales Owen are a Free School, founded about 1652, which has an income of above 100*l.* a-year, and had 60 scholars in 1853; National Schools, and an Infant School. Nails and hardware are extensively made. The market-day is Monday; fairs are held on Easter Monday and Whit-Monday. Some remains exist of an abbey of Præmonstratensian canons, built in the reign of King John. Near Hales Owen is the Leasowes, the birthplace and residence of the poet Shenstone, and the grounds of which were arranged by him. Shenstone was buried in Hales Owen churchyard, and the church contains a monument to his memory.

HALESWORTH. [SUFFOLK.]

HALIBUT, OR HOLIBUT. [HIPPOGLOSSUS.]

HALOSCIAS (Fries), a genus of Plants belonging to the natural order *Umbelliferæ*, and the tribe *Seselineæ*. It has a calyx of 5 small persistent teeth; the petals ovate, with an inflexed lobe and short claw; the fruit elliptical, terete, or slightly dorsally compressed; carpels with five sharp somewhat winged ridges; interstices and commissure with many vittæ; seed not cohering to the carpel, without vittæ. One species of this genus is a native of Great Britain.

H. Scoticum, Scottish Lovage, is found on rocks on the sea-coast of Scotland and Northumberland. It has an herbaceous stem, tinged with red, from 12 to 18 inches high.

HALTICA. [TURNIP-FLY.]

HALTWHISTLE. [NORTHUMBERLAND.]

HAMILTON. [CANADA, *S.* 2.]

HAMILTON, SIR WILLIAM, as head of the old family of the Hamiltons of Preston, in Haddingtonshire, inherited a baronetcy created in 1673, but for a time dormant. He was born on the 8th of March, 1788, in Glasgow, where his father, Dr. Hamilton, was a professor in the university; and there he received the earlier part of his academical education. The Snell foundation of exhibitions in Balliol College has long been a prize for the more distinguished among the Glasgow students: Adam Smith, among others, owed his English education to it. As a Snell exhibitioner Hamilton went to Oxford; and he took his degree with honours as a first-class man, proceeding afterwards to A.M.

In 1813 he was admitted a member of the Scottish bar. But law, except the Roman, did not receive much of his attention; and the only practice he ever had was the very little which became incumbent on him, when, after a time, he was appointed Crown solicitor of teinds or tithes. Even while a very young man, he had acquired no small part of his singular and varied stock of knowledge; and mental philosophy began early to be his favourite pursuit. On the death of Thomas Brown, in 1820 he stood for the professorship of Moral Philosophy in the University of Edinburgh: but Mr. Wilson was the successful candidate. Next year, on the nomination of the bar, he became Professor of Universal History in the same university. This appointment, little more than nomimal in respect of emoluments, was hardly better as to the performance of duty. The department is not in any way imperative on students: and it never commanded pupils, unless for a while under the elder Tytler. Sir William, being, though not rich, yet independent of professional drudgery, was left undisturbed and undiverted, to the prosecution of his studies and speculations. It was long before these bore fruits visible to any but his immediate friends. For the digesting of his thoughts he was nearly as independent of the necessity of writing, as his iron memory made him to be for the preservation of his knowledge; and he seems to have long shrunk from the toil of endeavouring to expound ideas, for which he did not hope to find an apt or sympathising audience. It was only, as he himself has declared, on the pressing request of the editor of the 'Edinburgh Review,' that he was induced, in 1829, to give to that periodical the first of a series of contributions, which closed in 1839, and which unfortunately constitutes as yet by much the larger proportion of his published writings. Those papers exhibit the variety of his learning not less than its depth; and the philosophical essays which were among them speedily found readers, who, if few, were competent to do them justice.

In 1836 he found his right place: he was appointed by the town council of Edinburgh, though not without a contest, to be Professor of Logic and Metaphysics in the University. He was, what very few of the Scottish professors holding offices thus designated have been, at home in both of the spheres indicated by the official title. The vague term which stands second, opened up to him in his teaching any walk he might choose to tread in the vast field of mental philosophy, of which he had probably in his studies traversed more than any other man then or now alive. The first title pointed his way to one special mental science, which he had studied in all its existing shapes, and which he now set about systematising in harmony with new lights that had dawned on his own mind. Instead of following the usual professional practice, of combining the whole matter of his instructions into one course of lectures, to be delivered in one and the same session (a term of six months in each year), he lectured alternately in the one named section and in the other—in Logic one year, in Metaphysics the next; and he had the gratification of defeating, after a whimsical squabble, an attempt of the town council, who are the legal administrators of that university, to force him into the common practice. His reputation and his influence now extended rapidly. Long before 1836, he had become celebrated in the learned circles of Germany, and had begun to be known and estimated by many at home: the most eminent foreign thinkers had concurred with not a few of our own, in pressing earnestly the pre-eminence of his claim to the Logic chair; and in England, as well as in Scotland, philosophical speculators discovered more and more plainly that, in those fragmentary treatises of his, there had been opened veins of thought which thinking men durst not leave untested. His teaching, again, now worked energetically on many young and ardent spirits gathered round him in his lecture-room. There is not evidence indeed that his logical lectures have as yet had much effect on his personal pupils. But the metaphysical lectures excited a keen interest in philosophy among all of his students who were qualified for severe abstract thinking; while they guided the thinking of not a few into channels in which it long or always continued to flow. He was, too, not less anxious in encouraging and directing for the young men wide philosophical reading, than in prompting them to active philosophical reflection and reasoning.

Sir William's studies seem to have been conducted, thenceforth, with a steadier view than before to systematic exposition and publication. Still the labour proceeded slowly. Academic business, and other temporary occasions of controversy, were somewhat too apt to interrupt the progress of one who was armed for warfare less ignoble. Among other things, he, himself a Presbyterian, published a pamphlet on the schism which split the Church of Scotland in 1843. Very soon, likewise, after that year, his health began to fail; and paralysis struck the right side of his body from head to foot. He was for a time utterly disabled from teaching, and was afterwards able to lecture only with frequent assistance. But the vigour, both of intellect and of will, was as unimpaired as it had been with Dugald Stewart under a similar calamity. His reading and thinking were still carried on; even his writing was so, not without very much aid from others. That more of his large designs were not executed, is a fact for which there were thus, in his latest years, but too sorrowful reasons. He had long worked at intervals on that which he had set himself as his first task, the annotating of the works of Thomas Reid. He aimed at showing the relations of Reid's system, both to older philosophical opinions on the one hand, and on the other to newer ones, especially to Hamilton's own metaphysical doctrines—doctrines which he himself always regarded, and firmly and thankfully represented, as having their essential germ and foundation in Reid, and as being merely a development of the 'common sense' philosophy to results made possible by a combination of scholastic and German methods. Sir William Hamilton's annotated edition of 'The Works of Dr. Thomas Reid' appeared in 1846, much of it having been printed long before. But all that has been published down to this date (1856) leaves it lamentably incomplete. On not a few problems of deep interest—on not a few also bearing closely on our comprehension of Hamilton's own system of thought, we are left with references, in foot-notes, to supplementary dissertations, of which not a word is yet given us; and a dissertation asserting his own peculiar theory of the Association of Ideas is broken off abruptly at the end of the volume. In 1852 appeared the first edition of a reprint, with large additions, of his periodical articles—'Discussions on Philosophy and Literature, Education and University Reform—chiefly from the Edinburgh Review.' Translations of several of the essays had previously been made into French, Italian, and German; Peisse's French translation and notes are particularly valuable. Sir William's regard for the Scottish school in philosophy next showed itself, not (unluckily) in the completion of his 'Reid,' and those further developments of his own doctrines which he had there promised, but in a tribute to the memory to another of its celebrated masters, from whom he had neither derived, nor professed to derive, much if anything in his own opinions. He undertook to edite, with notes, the collected works of Dugald Stewart. The publication, begun in 1854, is still uncompleted; and nothing has appeared of the biography which was to introduce it. In 1855, when in country-quarters, Sir William suffered fracture of a limb; and he died in Edinburgh on the 6th of May, 1856. He has left a widow and family. The manuscripts of his lectures, in both divisions, are said to be in such a state, that they may easily be prepared for the press.

As those who knew Sir William Hamilton through his writings only, cannot do full justice to the multifariousness of his knowledge; so likewise such as look chiefly to those of his writings which had personal bearings, will do positive injustice to the real likeableness of his personal character. He was undoubtedly a stern, and keen, and often eager controversialist, occasionally even a haughty one; in debate he never beat about for smooth words; and, absorbed in his love for science and learning, he sometimes forgot to be gentle towards those whom he thought to be erring or knew to be comparatively ignorant. He was watchfully jealous also (and once or twice, as in his controversy with Mr. De Morgan, needlessly and unjustly so), of anything that looked like interference with his claims to originality in points he had thought out for himself. But even in controversy, if he did hit hard, he never struck a man from behind; and the same chivalrous openness marked all his dealings. Under the combative tendency, moreover, there lay great generosity, great kindliness and warmth of heart: he was invariably amiable when occasion did not force on polemics: he was an active and steady friend, beloved as well as esteemed by those who were admitted to his friendship.

About his erudition there cannot well be two opinions among those who have had opportunities and competency for judging. Its mere mass was a thing extraordinary: it was minutely exact in all those points which raise the question of accurate scholarship: it spread over tracts of reading the most obscure and neglected; and it was, everywhere, the real knowledge of a thinking man, not the word-cramming of a pedant. His range embraced all the great divisions of knowledge, except mathematics and physical science; while here, too, it did not exclude anatomy, with physiology and some other branches of medicine. He was a thorough linguist in the classical tongues, and in German. With as little as possible of the poetical temperament, he was well read in the great poets; and his historical information was unusually extensive. In philosophy he was familiar with the Greek writers one and all: Aristotle and his commentators he had probably studied more extensively and profoundly than any even of our Teutonic neighbours. He knew the whole course of the scholastic philosophy, as no man else has ever known it since the middle ages departed. With British systems it is needless to say that he was familiar in all directions; and he was the only man among us who came near to having studied—and nowhere either carelessly or at second-hand—all the German systems that have emerged or diverged from that of Kant.

As to his originality, this question may be put: not whether Hamilton was the most original of philosophers; but whether there has ever been any philosopher who, to learning even half as great as his, united so much of real and active originality as a thinker. In his treatment of details he has a favourite manner, which often disguises his independence. He likes the position of an interpreter: he is wont to speak as if the best way of discovering philosophical truths were by deciphering them in some mediæval text through the dust of centuries. He takes a pride in quietly fathering on some schoolman or other a doctrine or an argument which many men would have been too glad to take credit for as their own; and sometimes, half-hidden in a brief note, there is given, as an obvious and matter-of-course comment on a scholastic brocard or term, some assertion which proves on close inspection to presuppose a wide process of new inference. The outlines, however, of those sections in his own philosophical creed which he has taken the trouble to expound, are laid down broadly enough to let their character be seen clearly. Be his leading doctrines held true or false, valuable or worthless, they are at least his own,—as much his own as very many systems which all of us rightly admit to be essentially novel,—as much his own, it may be said, as any system of philosophical opinions can be, unless it ignores everything that great thinkers have ever thought before.

What may be the correctness, and what the value, of his peculiar opinions, is a question on which, if it were to be adjudged at present, contradictory verdicts would be given. Probably no one will be competent to decide it justly, till there has taken place a long and intelligent sifting of speculations, which travel in a track, not only at several points new in itself, but likewise, everywhere, little familiar to most thinkers in this country. Hamilton's writings are Germanic rather than British; and that not merely in the freedom with which he has taken German doctrines and methods (with a large admixture of Scholasticism) as materials to be distilled in his own alembic. The exotic character is observable, both in his highly speculative aims, and in his severe exactness of technical expression. The former of these characteristics is distinctively alien to the broadly practical English mind; and the latter is one which has never, before him at at least, been made to take root in the philosophic mind of Scotland. Nor can his writings be mastered without pains. He never cares for doing more than saying what he thinks to be worth saying—saying it unequivocally, and saying it in the smallest number of words that is consistent with safety. He will not turn aside to amuse us; he will not hurry or rise to excite us. He is a hard thinker, and a hard, vigorous, precise, dry, writer. But for such as will take the trouble to follow his course of thought, and reflect on its contents, there are perhaps no philosophical discussions, certainly none of our times, that are so suggestive of processes of thought—processes wide in range, definite in direction, and lofty in design and in possible result.

Of Hamilton's Psychological and Metaphysical doctrines, nothing special requires to be said. They are before us, in certain parts, in his own exposition; and that they have already been much discussed, and have in some quarters excited a powerful influence on speculation, is a good omen for philosophy. We have, especially, his treatment of three great problems in philosophy. First, there is his theory of the two kinds of human knowledge, Immediate and Mediate. Secondly, there is a special application of this theory to the construction of a theory of External Perception. Thirdly, there is an exhaustive system of Metaphysics Proper, or Ontology, in his 'Philosophy of the Conditioned,' or 'Conditions of the Thinkable'—a vast and noble idea, traced out for us, as yet, in nothing but a tantalising fragment.

Regarding his Logical system, our public information is still very unsatisfactory. It is to be gathered from an appendix to his 'Discussions,' and an authorised but meagre publication from lectures, Baynes's 'New Analytic.' These materials will probably convey no distinct notion of the system, unless to readers who are familiar with the German methods of logical analysis since Kant. The leading points may be four; and it is perhaps possible to make these intelligible, very briefly, to persons acquainted with the outlines of the science in its received forms. 1. Hamilton insists on having, in all propositions through common terms which are set forth for logical scrutiny, a sign of quantity prefixed to predicate as well as to subject. The point, though merely one of form, is curiously suggestive of difficulties, and hence of solutions. 2. Instead of recognising only four forms of propositions, the A, E, I, O, of the old logicians, he insists on admitting all the eight forms which are possible. (See Thomson and Solley.) 3. He widens the range of the syllogism, by admitting all moods which can validly be constructed by any combination of any of his eight kinds of propositions. 4. The Port-Royal doctrine, of the inverse ratio of the extension and comprehension of terms, is worked out by him in its reference to the syllogism. This application of the doctrine has certainly not been anticipated by any logician; and, when elaborated to its results, it throws many new lights on the character and mutual relations of the syllogistic figures.

HAMMER-PURGSTALL, JOSEPH, BARON VON, was born in 1774 at Grätz in Styria, where his father held a respectable post under the Austrian government. He was educated at Vienna, and 1788 removed to the Oriental academy established by Prince Kaunitz. After having taken a part in the compilation of Meninski's Arabian, Persian, and Turkish Lexicon, he was appointed in 1796 secretary to the Baron von Jenisch, the reporter to the Oriental section in the ministry for foreign affairs. While in this employment he translated a Turkish poem on the Last Judgment, and supplied several other poems to Wieland's 'Deutschen Mercur.' In

1799 he was attached to the embassy of the learned Baron von Herbert at Constantinople, who sent him with one of the imperial consuls on an important errand to Egypt, where he procured for the imperial library some mummies of the ibis, hieroglyphic stones from the catacombs at Sakkara, several Arabian manuscripts, and other rarities. As interpreter and secretary he made the campaign in Egypt under Hutchinson, Sir Sidney Smith, and Jussuf Pacha, against Menou, and in the autumn of 1801 proceeded by Malta and Gibraltar to England. After his return to Vienna in April 1802, he accompanied, in August, the Austrian ambassador, the Baron von Stürmer, as secretary of legation to Constantinople. In 1806 he was appointed consular-agent in Moldavia. In 1807 he returned to Vienna; in 1811 he was made a state counsellor, and appointed court and state interpreter; in 1817 promoted to be imperial privy counsellor; and in 1845 created a baron, after having succeeded to the estates of the Countess von Purgstall. In 1815 he had occupied himself earnestly in procuring the restoration of the Oriental manuscripts and other treasures which had been removed from the Vienna library to Paris by Denon, during the occupation of Vienna by the French in 1809. In 1847, continuing to be in the active service of the department of foreign affairs as counsellor extraordinary, he was chosen president of the newly instituted academy, which he resigned after holding the office for two years. His intervals of leisure from business were spent at his castle of Hainfeld in Styria, where he laboured on his very numerous literary works, and where he died on November 21, 1856.

His works are extremely numerous, and those of a historical character highly valuable. His publications of Turkish, Arabian, and Persian poems are in many instances interesting to the general reader, but his philological knowledge was not sufficiently exact to enable him to render them satisfactory to the student. Among the more noticeable of his historical works are 'The Trumpet of the Holy War,' 1806; 'The Constitution and Government of the Ottoman State,' 1816; 'Glances upon a Journey in 1804, from Constantinople to Broussa and Olympus, and thence back by Nicæa and Nicomedia,' 1818; 'History of the Assassins, from Eastern Sources,' 1818, a work which has been translated into English by Mr. Wood; 'Constantinople and the Bosphorus, topographically and historically described,' 1821; 'Codices arab., pers., turk., bibliothecæ caes.,' 1822; 'History of the Ottoman Empire,' in ten volumes, 1827-1834, an excellent work, of which several editions have been published; 'The Government under the Khalifats,' 1835; 'Picture Gallery of the great Mussulman Commanders, with Memoirs,' in six volumes, 1837-39; 'History of the Golden Horde of Kiptschak, that is, of the Mongols in Russia,' 1840; 'History of the Ilkhane, that is, of the Mongols in Persia,' 1842-44. All these contain a vast collection of materials relating to the history and present state of the East. Of his other productions we may mention, 'Schirin,' a Persian poem, 1800; his translation of the 'Divan,' of Hafiz, from the Persian, 1813; his 'History of the Literature of Persia, with Specimens from 700 Poets,' 1818; 'The Eastern Trefoil,' from Persian, Arabian, and Turkish sources, 1818; 'The String of Jewels,' from Abul-Maanis, 1823; a translation of the Arabian lyrical poet Motenebbi, 1823; a translation from the lyrical poems of Baki, 1825; a 'History of Turkish Poetry,' with selections from 2200 poets; Fasli's allegorical Turkish Epic of the Rose and Nightingale, 1834; Samaschari's Arabian poem of the 'Golden Necklace,' 1835; Mahmud Schebisterei's didactic poem on Suffism, entitled the 'Rose-Bloom of Secrets,' 1838; 'The Falconer,' an old Turkish didactic poem on falconry, 1840; and a 'History of Arabian Literature,' in three vols. 1850-52. He has also written a volume 'Memnon's Drieklang,' (Memnon's Triad), containing an Indian pastoral, a Persian opera, and a Turkish comedy. For his translations of the 'Contemplations of Marcus Aurelius' into Persian, published in 1831, he was rewarded by the Shah with the order of the Sun and Lion. In 1810 he established a periodical work 'Mines of the Orient,' to which he contributed much, and in which he was assisted by Count Weusel Rzewuski, which was continued till 1819; and he was a frequent contributor to the 'Jahrbüchern für Literatur' (Year-Books for Literature), and to other periodical works,

HANDSWORTH. [Staffordshire.]

HARAR. [Hurrar, *S.* 1.]

HARBURG, a sea-port town in the kingdom of Hanover, province of Lüneburg, is situated on the left bank of the southern arm of the Elbe, opposite Hamburg, 106 miles by railway N. from the city of Hanover, and has about 8000 inhabitants. It is surrounded by walls, and defended by a citadel, which also commands the passage of the Elbe. There are two churches, an hospital, a gunpowder factory, sugar refineries, tanyards; manufactories of woollen stuffs, linen, and hosiery; and an active transit trade with Hamburg and the countries south of the Elbe. The timber trade of Harburg also is extensive. A steam-ferry affords frequent and rapid communication with Hamburg. As sea-going vessels could not formerly be brought alongside the quays, goods were usually trans-shipped at Hamburg or Altona and brought thence to Harburg, in lighters; but simultaneously with the construction of the railway from Hanover to Harburg (which, it may be added, connects the port with all the principal commercial towns of Germany) the harbour was deepened and enlarged so as to afford accommodation for 500 vessels, which may now land their cargoes on the wharfs. The depth of the channel between Harburg and Altona is 10 feet at low and 15 feet at high water. The port extends to the railway goods-station, and merchandise is lifted by a crane out of the hold of vessels and placed on the train. The improvement of the harbour, the completion of the railway, and the declaration of the freedom of the harbour in 1850 gave a great impetus to the commerce of Harburg, which still continues to improve, although the freedom of the port was suppressed in 1853 by the commercial treaty with Austria and Prussia. The distance to Hamburg across the Elbe is four miles and a half.

HARDINGE, HENRY, VISCOUNT, third son of the late Rev. Henry Hardinge, rector of Stanhope, in the county of Durham, by Frances, daughter of James Best, Esq., of Chatham, was born at Wrotham, Kent, on the 30th of March, 1785. He was a member of a family which has long been located at King's Newton Hall, Derbyshire, and is said to have originally come from Denmark.

Having spent a short time at Eton, Henry Hardinge was gazetted ensign in a regiment of foot, October 8, 1798, obtained his lieutenancy in 1802, and captaincy in 1804. It was his good fortune early to attract the notice of the Duke of Wellington, then Sir Arthur Wellesley, under whom he served throughout the whole of the Peninsular War, and for a considerable time was upon the staff of the commander-in-chief; he was also for nearly the entire period deputy-quartermaster-general of the Portuguese army. He was present at the battles of Roleia and Vimiera, where he was severely wounded; at the battle of Corunna he was by the side of the gallant Sir John Moore when he received his fatal wound. After having lost his friend at Corunna, he was present at the passage of the Douro, the battle of Busaco, the lines of Torres Vedras, and the battle of Albuera. In this engagement he displayed the greatest skill, courage, and self-command; it was a hard-fought field; and to the change in the fortunes of that day, effected as it was by the persevering valour of the British infantry, Lord Hardinge often pointed back in after life as having encouraged him as a general to persevere through every obstacle, and to place perfect confidence in the enduring valour of British troops. After this we find him side by side with Lord Wellington in almost every engagement of the war. He took part in the first and second sieges of Badajoz, at Salamanca, and at Vittoria, where he was again severely wounded, and also at Pampeluna, at the battles of the Pyrenees, and at Nivelle, Nive, and Orthes. When he returned to England after the close of the Peninsular War, he was justly regarded as one of the most gallant officers in the service. Upon the renewal of hostilities he was again in arms, and took an active part in the campaign of 1815 under the Duke of Wellington, upon whose staff he then was serving. Two days before the battle of Waterloo he was employed as a brigadier-general with the Prussian army at Ligny, where, in a skirmish with the enemy, he was wounded in the left arm, which had to be immediately amputated, and prevented him from taking a personal part in that glorious victory. He was however rewarded with the dignity of K.C.B. on the enlargement of the order of the Bath in the same year, and with a pension of 300*l.* a year for the loss of his arm.

When upon the resignation of Lord Goderich, in 1828, the Duke of Wellington undertook the construction of a ministry, he chose Sir Henry Hardinge (who had been returned as member for Durham in 1820 and again in 1826), to succeed Lord Palmerston as secretary at war. He was sworn a member of the privy council, and two years later exchanged this position for that of the chief secretaryship for Ireland, under the late Duke of Northumberland as lord lieutenant. Here however he did not remain long: the Duke's ministry retired from office in the autumn of the same year, and Sir Henry Hardinge returned to England. He resumed his high post however under the short-lived ministry of the late Sir Robert Peel, which lasted from November 1834 to April 1835. From this time till the return of Sir Robert Peel to power in September 1841, Sir Henry Hardinge remained in opposition. At the latter date he returned to Ireland as chief secretary under Earl de Grey, where he remained until 1844.

Towards the close of the year 1843 events arose in India to which we need not allude further than to say, that the directors of the East India Company thought that the time had come when it was necessary for them to recall Lord Ellenborough from the high post of governor-general of India. It was stated by Sir Robert Peel in his place in the House of Commons, that whilst the East India House and the Home Government were at issue as to the propriety of this step, they were quite of one mind as to the selection of his successor; and that when the premier recommended Sir Henry for the vacant post, on the ground of his great experience of civil matters, his high personal character, and his military eminence, the chairman of the company answered that his own choice had already fixed upon the same individual.

In April 1844 he accordingly undertook the government of India, and was sworn into office on landing at Calcutta in the July following. On his arrival he found the vast territories under British rule enjoying the most profound peace. The disasters of the Afghan campaign had been avenged; Sir Charles Napier had reduced the ameers of Scinde at Meeanee and Hyderabad; Scinde itself had been annexed to our dominions; and the Mahratta war had been terminated by the submission of the Durbar at Gwalior. The governor-general had therefore ample time to make himself master of very many details of government, in which he was not slow to perceive that considerable reforms were needed. Able and indefatigable in his efforts, he did his best to bring about a better feeling and a more friendly footing than had hitherto prevailed between the services; he admitted the claims of the natives to many privileges; he promoted a stricter discipline among the troops in general; he lent his powerful aid to the organisation of those Indian railways which have since been carried out with such marked success under his successor Lord Dalhousie; and in short, he did all that was in his power to promote the welfare of the community at large.

But the course of Indian events was not long destined to flow on in peace. A storm of war and bloodshed was gathering in the north; and Sir Henry Hardinge, with all his precaution, could not have foreseen or avoided the events which awaited him. The death of Runjeet Sing, 'the Lion of Lahore,' had paved the way for an infinity of plottings and intrigues in the capital of the Panjab. With the death of the Lion, it seemed that the controlling power had left Lahore; the young maharajah, Dhuleep Sing, a child of four years old, was, together with his mother, in the hands of the Sikh soldiery, who were wearied with domestic faction, and clamoured to be led out against their English neighbours. Active preparations were made by the Sikhs for crossing the Sutlej; but long before the public had any idea of what was going on, Sir Henry Hardinge was on the alert, and had quietly concentrated a force of 32,000 men and 68 guns round Ferozepore, Loodianah, and Umballa. The governor-general reached the latter place about the middle of December, and, proceeding to Loodianah, inspected the various cantonments, and made himself acquainted with the actual position of affairs. He at once moved up the whole of his force from Umballa; and on the 13th, learning that a large Sikh force had crossed the Sutlej River, he issued a proclamation against the hostile invasion. On the 17th the Sikhs advanced, and partly entrenched themselves within strong earthworks at Ferozeshah, while the other part encamped near Moodkee, opposite Ferozepore. The combined operations of the British cavalry under Brigadiers Gough, White, and Mactier, and the infantry under Sir Harry Smith, Sir J. M'Caskill, and General Gilbert, drove back the Sikhs from their well-contested position, and won the glorious victory of Moodkee—a victory too dearly purchased by the death of Sir Robert Sale. On the 22nd the attack was renewed at Ferozeshah; but night came on before the victory could be completed, and some Sikh guns were being brought to bear with deadly aim upon the British columns, when the governor-general mounted his horse, and at the head of the 80th regiment, and a portion of the Bengal 1st Europeans, carried the guns at a charge, and spiked them. The next day the Sikh entrenchments were carried by the bayonet, the enemy's guns were captured, and the invaders recrossed the Sutlej. The want of cavalry alone prevented Sir Hugh Gough from following the enemy into their country, and marching on Lahore. There is something truly touching in the fact that, in this important battle, Sir Henry Hardinge, though he held the supreme civil authority in India, offered his services to Sir Hugh Gough as second in command, and took an active part in the eventful scenes of this and the following day, directing the left wing of the army throughout. The Sikhs, again defeated at Sobraon and Aliwal, were forced to sue for terms; and the treaty of Lahore, concluded by Sir Henry Hardinge, exhibits him in the light of a moderate and magnanimous conqueror. He exacted from the Sikhs the whole expense of the war, and left a British garrison, under the late Sir John Littler, in Lahore, the capital of the Panjab, for the protection of the maharajah's authority. This country—a healthy, well watered, and fertile region—was subsequently annexed to our dominions by the Marquis of Dalhousie. On the ratification of this treaty, Sir Henry Hardinge received the thanks of both Houses of Parliament, together with a pension of 3000*l.* a-year, and was also advanced to the peerage as Viscount Hardinge of Lahore. The East India Company also conferred on him a further pension of 5000*l.* a-year; and the city of London voted him their freedom. In January 1848 he was superseded in his Indian government by Lord Dalhousie. Though originally of Tory principles, after his elevation to the peerage Lord Hardinge rarely spoke or busied himself in the House of Lords on any measures except those of military interest. On Lord Derby's advent to power in February, 1852, Lord Hardinge again took office as master-general of the ordnance, and succeeded to the post of commander-in-chief, on the death of the Duke of Wellington, in the September following. He obtained the colonelcy of the 57th Foot in 1843, and was promoted to the dignity of G.C.B. in 1844. Among foreign orders, he received those of the Red Eagle of Prussia, Wilhelm of the Netherlands, the Tower and Sword of Portugal, and that of San Fernando of Spain. He also received a cross and five clasps for his Peninsular services, and was present in no less than sixteen general actions for which medals were granted. He was promoted to the rank of Field-Marshal on the 2nd of October, 1855. He resigned the office of commander-in-chief in consequence of a paralytic seizure, in July 1856. In the administration of the Horse Guards, as a veteran disciple of the Duke of Wellington, Lord Hardinge trode most carefully and religiously in his Grace's steps. In 1821 he married the Lady Emily Jane Stewart, daughter of Robert, first marquis of Londonderry, and widow of John James, Esq., by whom he had an only daughter and two sons. The younger son, Arthur, now captain and lieutenant in the Coldstream Guards, was aide-de-camp to his father in the battles on the Sutlej, and was also present at the Alma. His lordship died September 24, 1856, and was succeeded by his eldest son, Charles Stewart, born in 1822, who had been private secretary to his father while governor-general of India.

HARE. [Leporidæ.]

HARE, JULIUS CHARLES, a distinguished English divine and controversialist, was born in 1796, and was one of the sons of the Rev. Robert Hare, rector of Hurstmonceaux and vicar of Ninfield in Sussex, who was the son of Dr. Francis Hare, bishop of Chichester. He was educated at Trinity College, Cambridge; was a fellow of the College; and graduated B.A. 1816, and M.A. 1819. In 1832 he was instituted to the rectory of Hurstmonceaux (a living belonging to his family); in 1840 he was appointed Archdeacon of Lewes; in 1851 he became one of the prebendaries of Chichester; and in 1853 he was nominated one of her Majesty's chaplains. He died at Hurstmonceaux on the 23rd of January, 1855. Such are the principal external facts in the life of a man whose personal influence in his day was very great, and who has besides left some contributions to our literature. His first literary appearance of any note was in 1827 when, in conjunction with a younger brother (the Rev. Augustus William Hare, M.A., of New College, Oxford, and rector of Alton Barnes, Wiltshire, who died in 1834), he published a volume of miscellaneous thoughts and observations entitled 'Guesses at Truth, by Two Brothers.' (Subsequent and enlarged editions of this work have been published; and also a 'Second Series' under the same title). In 1828, in conjunction with the Rev. C. Thirlwall, afterwards bishop of St. David's, Mr. Hare appeared as translator of the first two volumes of 'Niebuhr's History of Rome,' from the German. Of his subsequent publications, the following are the most important:—'The Children of Light: a Sermon,' 1828; 'A Vindication of Niebuhr's History of Rome from the charges of the Quarterly Review,' 1829; 'Sermons preached before the University of Cambridge,' 1839; 'The Victory of Faith, and other Sermons,' 1840; 'The Better Prospects of the Church: a Charge to the Clergy of the Archdeaconry of Lewes,' 1840; 'The Unity of the Church: a Sermon,' 1845; 'The Mission of the Comforter, and other Sermons,' 2 vols., 1846; 'The Means of Unity: a Charge,' 1847; 'A Letter to the Dean of Chichester on the Agitation excited by the appointment of Dr. Hampden to the See of Hereford,' 1848; 'The Duty of the Church in Times of Trial; a Charge,' 1848; 'The True Remedy for the Evils of the Age: a Charge,' 1849; 'Education the necessity of Mankind: a Sermon,' 1851; 'The Contest with Rome: a Charge,' 1852; 'Vindication of Luther against his recent English assailants (H. Hallam, Esq., J. H. Newman, W. G. Ward, and Sir William Hamilton),' 1854. From this list it will be seen that Archdeacon Hare's chief activity was in theological literature and ecclesiastical controversy. In the church he was regarded, alone with his friend Mr. Maurice, as being at the head of what has been called 'the broad party,' as distinct from either the 'high' or 'low.' The liberality of his opinions in philosophy and his tolerance of religious differences may be inferred from the fact of his having been the intimate friend of the late John Sterling, whose 'Remains' he edited, with a long and affectionate Memoir, in 1848. It was Mr. Carlyle's dissatisfaction with his memoir, as an account of his friend, that led him to write his 'Life of Sterling.' Mr. Hare's memory is held in high veneration, not only by those who regarded him as an ecclesiastical leader, but also by many who had learnt to respect him as an earnest thinker on social and philosophic subjects.

HARMELINE. [Chemistry, *S.* 2.]

HARPAGUS. [Falconidæ.]

HARRAR. [Hurrar.]

HARRINGTON. [Cumberland.]

HARROLD. [Bedfordshire.]

HARTITE. [Mineralogy, *S.* 1.]

HARTLEY. [Northumberland.]

HASLEMERE. [Surrey.]

HASSELTIA, a genus of Plants belonging to the natural order *Apocynaceæ*. It has a 5-parted permanent calyx: a corolla with the tube contracted in the middle; the throat naked; the limb campanulate, 5-parted and contorted. The stamens are inserted in the throat. Anthers large, cuspidate, callous at the back, adhering to the stigma; the ovary double, surrounded by a fleshy ring; styles 2; stigma clavate; follicles 2, distinct, and long; seeds with a stipitate coma at the lower end.

H. arborea is found in Java, near Tjampiam. It is a handsome tree, with oval leaves, rather acute at each end, smooth above, paler and a little downy on the under side. The flowers are large, yellowish-white, in axillary fascicles. In Java the milk obtained from the trunk by incision, mixed with honey and reduced with boiling water, is employed as a powerful drastic for destroying the tape-worm; it is however apt to produce inflammation of the intestines, and in some cases has proved fatal.

HATCHETINE. [Chemistry, *S.* 2.]

HAVELOCK, MAJOR-GENERAL, SIR HENRY, K.C.B., was born April 5, 1795, at Bishopwearmouth, near Sunderland, at which latter town his father carried on an extensive business as a ship-builder and merchant. His father retired from business in 1799, and purchased Ingress Park, Dartford, Kent. Young Havelock was placed in the Charterhouse School, where he distinguished himself by his application and success, and where he had for contemporaries the Greek historians Thirlwall and Grote, Archdeacon Julius Hare, Sir C. L. Eastlake, and several others who have attained eminence in various walks of life. The bar being the profession selected for him, he in 1813 was entered of the Middle Temple, and in 1814 became a pupil of Chitty. His own inclination was however for a military life. His elder brother, Colonel William Havelock, had attracted favourable official notice by his gallant conduct on more than one occasion in the Peninsula—honourable testimony is borne to his merits in Napier's 'History of the Peninsular War'—and through him Henry applied for a commission. In July 1815 he was made second lieutenant in the Rifle Brigade, and he served with his regiment in England till 1823, when having exchanged into the 13th Light Infantry, he embarked for India, and from this time his career of active duty may be dated, he being engaged in almost every subsequent Indian campaign. The Birmese having made various inroads upon the British territory, and collected large armies with the avowed determination of driving the English out of Bengal, Lord Amherst, in March, 1824, issued a formal declaration of war against the king of Ava. Havelock was appointed Deputy-Assistant-Adjutant-General, and in that capacity took part in the chief operations of the war. When the court of Ava was constrained to sue for peace, Havelock was named one of a commission to obtain the royal signature to the treaty which was concluded in February 1826.

Lord Combermere having formed a military depôt at Chinsurah, Havelock was appointed adjutant of it in 1827. On Feb. 9th, 1829, he married Hannah the third daughter of Dr. Marshman, the learned Baptist missionary at Serampore, with whose theological opinions his in a great measure coincided: and it is noteworthy, as an illustration of the extent to which deference to Hindoo notions has been carried in India, that it was long after made a matter of serious complaint against Havelock, that he was accustomed to hold meetings in his quarters for religious worship, and the charge was gravely investigated by the higher authorities. On the breaking up of the Chinsurah depôt Havelock returned for a while to his regiment; afterwards proceeded to Calcutta, passed an examination in the native languages, and in 1835 was appointed regimental adjutant. On the breaking out of the first Afghan war in 1838, Captain Havelock (for he had in this year, after twenty-three years' service, been promoted to a company), was placed on the staff of Sir Willoughby Cotton, and accompanied the army throughout the campaign, being present at the storming of Ghuznee, the capture of Cabul, &c. He published an account of this campaign, 'A Narrative of the War in Afghanistan in 1838, 1839,' 2 vols. 8vo., Lond., 1840.

Captain Havelock was now sent to the Panjab with a detachment, and placed as Persian interpreter on the staff of Major-General Elphinstone. On the recurrence of difficulties in Afghanistan in 1841, he joined the force of General Sale, and shared in the desperate fighting through the Khoord Cabul Pass and the difficult country beyond it to Jellalabad; in the protracted and noble defence of which fortress, as well as in the final defeat of Akbar Khan in the open field, April 7, 1842, the name of Havelock was one of the most distinguished, and he received the well merited reward of a brevet majority and the companionship of the Bath. As Persian interpreter he accompanied General Pollock in his march, and took part in the several encounters in which the army engaged. In 1843 he was appointed Persian interpreter on the staff of General Sir Hugh (now Viscount) Gough, and fought in the battle of Maharajpoor in which the Mahrattas, 18,000 strong, were defeated with a loss of about 3,400 men. In 1844 he was made lieutenant-colonel by brevet. The following year was marked by the commencement of the Sikh war. He was present at the battles of Moodkee, December 18, 1845 (where two horses were killed under him), Ferozeshah, December 21, 22, and Sobraon (where he lost another horse) February 10, 1846. When peace was restored he was appointed Deputy-Adjutant-General of the Queen's troops, at Bombay. In 1849 he came to England on leave of absence for two years on account of ill-health. On his return to India, Lord Hardinge, who had witnessed his gallantry and skill in the battles near the Sutlej, made him first Quarter-Master-General, and then Adjutant-General of the Queen's troops in India.

When the Indian government declared war against Persia, Colonel Havelock was despatched with the expeditionary force under General Sir James Outram, in command of the second division of the army, and took part in the brilliant affair of Bushire, and was present at the capture of Mohammerah. The war ended, he embarked in the Erin for Calcutta with the gallant 78th. The vessel was wrecked, April 1857, off Ceylon; but happily Havelock and his brave comrades were spared to do memorable service in the rescue of their countrymen and countrywomen subjected to far more fearful peril than that of shipwreck, and in inflicting retribution on their brutal assailants.

Immediately on reaching Calcutta he was despatched with the rank of Brigadier-General to Allahabad. He left that city on the 7th of July at the head of a column of about 1200 Europeans and Sikhs to retake Cawnpore, where the garrison had been treacherously massacred after surrendering on terms, and where some of the women and children were still in the enemy's hands. He had to force his way against terrible odds, but he made good his ground, and on the 16th of July he defeated Nana Sahib at the head of about 5,000 mutinous sepoys—his own force being 1000 Europeans and about 300 Sikhs. On the 17th he entered Cawnpore, too late notwithstanding all that he and his noble army had done to save their unhappy countrymen, yet he had in the last eight days marched 126 miles, and won four actions against overwhelming odds. Hardly waiting to give rest to his men, or to pay the last rites of sepulture to the mangled corpses of those who had been foully murdered in Cawnpore, Havelock prepared to push on for Lucknow. On the 19th of July he again inflicted a severe defeat on the mutineers, and finding that Nana Sahib had evacuated his stronghold of Bithoor, renewed his march. But he had to fight at every step, stout fortresses had to be captured, and at length after, on the 16th of August, achieving his ninth victory over six times his own numbers, he found his men so reduced by death, wounds, and sickness, as to render it imperative on him, after almost coming within sight of the besieged citadel to fall back upon Cawnpore—not however without being able to communicate cheering words to the besieged. Being strengthened by the arrival of General Neill with a small additional force, and joined by his old commander, General Sir James Outram, Havelock at the head of 2800 men crossed the Ganges from Cawnpore on the 19th of September. Sir James Outram—one of the best and bravest of the many officers who have achieved eminence in India—would of course, as the superior in rank, in the usual order of things, supersede Havelock as commander, but with the genuine chivalry of a true-hearted soldier, he in an order of the day announced to the army that "in gratitude for and admiration of the brilliant deeds in arms achieved by General Havelock and his gallant troops," he would "cheerfully waive his rank on the occasion, and accompany the force to Lucknow in his civil capacity as chief commissioner of Oude, tendering his military services to General Havelock as a volunteer." On the 21st of September the fortified position at Meengarsour was forced; on the 25th Lucknow was reached, and the garrison, which had been blockaded for nearly four months, relieved, just as it had been mined and was ready to be blown up by the besiegers. The following day the intrenchments of the enemy were stormed, though with great loss, including that of the gallant General Neill.

On the 17th of November, Sir Colin Campbell, after four days' operations and some very severe fighting, forced his way into the residency at Lucknow, and the garrison was relieved. General Havelock died of dysentery in the fortress of Alumbagh, near Lucknow, on the 24th of November, 1857.

We need hardly add that the splendid march of Havelock on Cawnpore and the relief of Lucknow have not merely rendered him the popular hero of the Indian war, but added new glories to the British arms. As a reward for his eminent services he was created (Sept. 1857) a Major-General in the army, his promotion bearing date July 30, 1857, made a Baronet, and raised to be a Knight-Commander of the Bath; and, in accordance with a royal message to both Houses of Parliament, voted a pension of 1000*l.* a-year for life, which is continued to his eldest son, who, when Captain Havelock, served on his father's staff as Deputy-Assistant Adjutant-General, and who is now Sir Henry Marshman Havelock, the second Baronet. He was born in 1830.

HAVERSIAN CANALS. [Tissues, Organic, *S.* 1.]

HAWK-MOTH. [Sphingidæ.]

HAYDON, BENJAMIN ROBERT, was born January 25th 1786 at Plymouth, where his father was a bookseller. Haydon was educated first at the Plymouth grammar-school and afterwards at the Plympton grammar-school, where Sir Joshua Reynolds had received his education. Haydon's father drew a little himself, and had a taste for art, and was delighted with his son's skill in drawing; but he wished him, as there was no other son, to adopt his business, and Benjamin was accordingly apprenticed. But the youth hated the business, and expressed his resolution to become a painter so determinedly, that after much opposition his father consented, and in May 1804 he started for London. Through Prince Hoare, a friend of the family, he got introductions to Northcote and Opie, and afterwards to Fuseli, keeper of the Royal Academy, by whom he was readily admitted as a student at the Royal Academy; and thus at the age of eighteen, an enthusiast for Raffaelle, Michel Angelo, and high art, Benjamin Haydon commenced his career. Here he drew with great earnestness, and soon acquired great readiness of hand. He also spent much time in dissecting and the study of anatomy generally, of which he obtained a very fair amount of knowledge. But his studies were too desultory and interrupted, and there can be little doubt that the weakness of his sight—he had while a youth been for a short time quite blind—was a great hindrance to successful study in both form and colour. At the academy, Wilkie, Jackson, and others subsequently famous, were his fellow-pupils, yet he seems to have been generally regarded as one of the most promising students in the institution, while he was a great favourite with his companions there.

Haydon exhibited his first picture at the Royal Academy in 1807. The title alone will show the daring of the young painter, 'Joseph and Mary resting with our Saviour after a day's journey on the road to Egypt.' Mr. Hope, author of 'Anastasius,' became the purchaser of this picture. The reputation which the artist gained by it gave him increased energy and ambition. 'Dentatus' was the subject chosen by him next year; and from this period Haydon dates the commencement of a quarrel with the Royal Academy, whom he accused of illiberality or mismanagement in hanging his 'Dentatus' where it could not be seen, and of a fear of historical painting as the cause of their refusal to admit him as an associate, while they admitted less skilful artists. The 'Dentatus' was purchased by Lord Mulgrave, and in the following year was exhibited in the British Institution, where it received the praises of the public, and the prize of the committee. About this time the Elgin Marbles were first exhibited in London, and Haydon's enthusiasm about them was boundless. For a time he did scarce anything but draw, write, and talk about them; and to the last he was glad to believe that to his earnest pleas with men in power the purchase of them for the nation was partly due.

Haydon now got diverted from steady application to painting by his fondness for controversy; and the attacks he published on the Royal Academy, by estranging from him some personal friends among artists and the patrons of art, greatly exasperated his temper, and there can be little doubt produced a lasting ill effect on his fortunes. From this time his life was to a great extent one of strife, and of constant struggle with pecuniary difficulties. Still he was at no time without friends. Sir G. Beaumont gave him a commission for a subject from Macbeth, and his 'Judgment of Solomon' was bought by Mr. Elford and Mr. Tingcomb for 700 guineas; his 'Alexander returning in triumph, after vanquishing Bucephalus,' found a purchaser at 500 guineas in the Earl of Egremont; and his 'Venus and Anchises' was purchased for 200 guineas by Lord de Tabley. Another application for admission to the Academy resulted again in disappointment.

His next great work was 'Christ's Entry into Jerusalem,' begun in 1814, but not exhibited till 1820, when it formed part of an exhibition of his own in Bond Street. The picture did not sell, but this did not prevent him from painting 'Christ in the Garden,' and 'Christ Rejected.' In May 1821 he married. His 'Raising of Lazarus' was painted in 1823. About 1815 he began to receive pupils, his first being the Landseers—Edwin, Charles, and Thomas—and his purpose being "to form a school, and to establish a better and more regular system of instruction than even the Academy offered." With many drawbacks he made a good teacher, and some of our best living painters are numbered among his pupils, but he was ill fitted to carry on such an institution with the necessary regularity. He also became connected with Mr. Elmes in the conduct of the 'Annals of the Fine Arts,' and that publication became a vehicle for constant attacks by him on the Royal Academy, and eulogies (probably by Mr. Elmes) on Haydon and his pupils. But the school could not so prosper, the writing brought in no money, and his painting, when not neglected, was not of a kind to find ready patronage. He got deeper and deeper into debt, and became an inmate of the King's Bench prison. Here he found a subject for a successful picture in the 'Mock Election,' which took place within those walls in July 1827. George IV. purchased this work for 500 guineas. Haydon followed up the subject in his 'Chairing the Members,' which was sold for 300 guineas to Mr. Francis of Exeter. He had previously regained his liberty with the assistance of friends. Another picture of the same period was his 'Pharaoh dismissing Moses after the Passover,' for which he obtained 500 guineas from Mr. Hunter, an East India merchant.

Haydon's next subjects, after making an unsuccessful attempt to obtain employment as a portrait painter, were 'The Great Banquet at Guildhall' at the passing of the Reform Bill, and 'Napoleon musing at St. Helena:' the former was considered a failure, but the other met with great success. 'The Duke on the Field of Waterloo' fell far short of this, both in merit and public estimation. Again in 1836 he became a prisoner for debt in the King's Bench, but after a time he was able to effect a settlement with his creditors. He now engaged with great zeal in lecturing on painting at various literary institutions in London and the provinces, and his lectures were everywhere attended with signal success.

The determination of the government to decorate the interior of the new houses of parliament with pictures opened a new and grand field before the imagination of Haydon. He had petitioned, written, and lectured in favour of so adorning our public buildings, and impressed with a very high notion of his own capacity for executing such works, his sanguine temperament never permitted him for a moment to doubt that he would be one of the painters selected for the task. Accordingly, finding that fresco was the vehicle in favour with the authorities, he set himself to acquire mastery over the use of that material, and when the cartoon competition was summoned, he addressed himself eagerly to the preparation of a cartoon. The judges gave in their award, however, and his name was not among the successful competitors, even of the third class. It was a death blow to all his hopes; and though he struggled bravely against the disappointment, he never really recovered the shock. His last works were 'Uriel and Satan;' 'Curtius leaping into the Gulf;' 'Alfred and the Trial by Jury;' 'The Burning of Rome,' and numerous repetitions of his 'Napoleon.' 'Alfred,' and 'The Burning of Rome,' were exhibited in 1846 at the Egyptian Hall. The exhibition failed, and added to the embarrassment of his pecuniary affairs. Haydon's mind now entirely gave way under his misery. He died by his own hand, June 22, 1846. It should be added that a post mortem examination showed that there had been long standing disease of the brain. He left a wife and family, for whom a public subscription was immediately got up. It is not a little to the honour of Sir R. Peel, that, at what was perhaps the most busy and exciting period of his parliamentary career, he had found time just five days before the painter's unhappy death, to think of the artist, to whom he inclosed a cheque for 50*l.* Haydon's 'Lectures' are almost his only contributions to literature. Considerable difference of opinion exists as to his merits as a painter. The exaggeration and hardness, which it must be admitted disfigured his general style, are ascribed to his early intimacy with and imitation of Fuseli, but unjustly; they are Haydon's own, the result partly of insufficient study, partly of incomplete artistic education, more of his peculiar physical temperament, and habit of working. But he had many merits, and he did much to raise the character of English art, and to extend an interest in and a love of it.. For a fair and far from partial review of the character of Haydon as a man and an artist, the reader is referred to the concluding pages of the third volume of Taylor's 'Life of Benjamin Robert Haydon,' 2nd ed., 3 vols., 1853.

HAYESINE. [MINERALOGY, *S.* 1.]

HEAD, SIR GEORGE, Knight, was born in 1722, at the Hermitage, a few miles north from Rochester, in Kent. James Roper Head, father of Sir George Head and Sir Francis Bond Head, was descended from Fernando Mendez, a Jew, who came from Portugal to England, and was physician to King Charles II. The father of James Roper Head, married a daughter of the Rev. Sir Francis Head, Bart., and assumed the name of his wife's father.

George Head spent his early years at his father's residence, the Hermitage, and was afterwards educated at the Charter House School, London. Early in 1808 he obtained a captain's commission in the West Kent Militia, and having obtained leave of absence, in the spring of 1809 went to Portugal, where he accepted the humble situation of a commissariat clerk, and joined the British army under Lord Wellington at Badajoz. He was afterwards appointed to the commissariat charge of a brigade. After Massena had retreated from the lines of Torres Vedras, and the battle of Fuentes d'Onor had been fought, May 5, 1811, he was appointed deputy assistant commissary general, and attached to Sir Brent Spencer's division of the army. In May 1813 he was directed to proceed to Momento da Beira to undertake the commissariat department of the third division under Sir Thomas Picton. He was present at most of the great battles in the Peninsula, as well as the concluding victories in France, after which he returned to England. Of this active period of his life he wrote an interesting narrative, which is attached to his second 'Home Tour.'

In the autumn of 1814 George Head received orders to proceed to Canada, and having landed at Quebec, was sent to Lake Huron to superintend the commissariat department of a naval establishment intended to be formed on the Canadian lakes. Peace however was soon afterwards made with America, and in ten months he was again in England. In 1816 he was sent to Halifax, in Nova Scotia, and remained there five years on the peace establishment. After his return to England he described his experiences and adventures in America in his 'Forest Scenes and Incidents in the Wilds of North America, being a Diary of a Winter's Route from Halifax to the Canadas, and during Four Months' Residence in the Woods on the Borders of Lakes Huron and Simcoe, by George Head, Esq.,' 12mo, London, 1829. In 1831 he received the honour of knighthood. Encouraged by the favourable reception of his 'Forest Scenes,' he published 'A Home Tour through the Manufacturing Districts of England in the Summer of 1835, by Sir George Head,' 12mo, 1836, which was followed by another volume, 'A Home Tour through various parts of the United Kingdom; being a continuation of the Home Tour through the Manufacturing Districts: also Memoirs of an Assistant-Commissary General, by Sir George Head,' 12mo, 1837. The first Tour includes most of the large manufacturing towns of the northern part of England; the second, the Isle of Man, part of Scotland, the Channel Islands, and part of Ireland. They contain a large amount of information carefully collected and clearly stated concerning the places visited and the manufactures carried on in them. Both Tours were reprinted in one volume in 1840. In 1849 he published 'Rome, a Tour of Many Days.' He was also the author of several articles in the 'Quarterly Review,' and translated from the Italian the 'Historical Memoirs of Cardinal Pacca,' 12mo, 1850, and from the Latin, 'The Metamorphoses of Apuleius,' 8vo, 1851. He died in London, May 2, 1855, unmarried.

HEADINGTON. [OXFORDSHIRE.]

HEALTH, PUBLIC. [PUBLIC HEALTH, *S.* 2.]

HEART. One of the most interesting inquiries in connection with the heart is its development, on which considerable light has been thrown by modern research. The circulating system is not perfected until the moment of birth; and in its several transitory stages of growth it resembles permanent forms of the circulating apparatus amongst the lower animals. As the egg of the bird affords the best means of studying these changes, we give an outline of them from Dr. Carpenter's 'Physiology:'—

"At an early period of incubation the yolk is found to be enveloped by a germinal membrane, composed of distinct cells, which is divisible into three layers; and a thickened portion of this is easily distinguishable, at which the embryo will be subsequently evolved.

"The middle layer gives origin to the circulating system, and is therefore termed the 'vascular layer.' The thickened portion of this that surrounds the germ soon becomes studded with numerous irregular points and marks of a dark yellow colour; and as incubation proceeds these points become more apparent, and are gradually elongated into small lines, which are united together, first in small groups, and then into one net-work, so as to form what is called the 'vascular area.' A large dark spot of a similar kind is seen in the situation to be subsequently occupied by the heart. These dark points and lines are formed by collections of blood-corpuscles, which originate in the transformation of the cells of the embryo and of the germinal membrane; and the rows and masses of blood-discs seem at first to lie in mere channels, the walls of the heart and blood-vessels that subsequently inclose them being of later formation.

"From the first however a definite plan is perceptible; the network of capillaries that is formed over the vascular area being supplied with blood by the ramifications of a pair of arterial trunks, whilst the blood is collected from them by the circular venous sinus which bounds the area, and is returned to the embryo by the venous trunk. In the blood-vessels which are first observed in the body of the embryo, as well as in the vascular area, no difference is at first perceived between the characters of the arteries and those of the veins, and these are only to be distinguished by the direction of the currents of blood circulating through them.

"But at about the fourth or fifth day of incubation the coats of the arteries begin to appear thicker than those of the veins, and the distinction between them soon becomes evident. After the principal vessels are formed, the development of new ones appears to take place in two modes, according as they are to occupy the interspaces existing among those previously formed, or are to extend themselves into out-growing parts. In the first of these cases the new capillaries appear to be formed, like the original ones, from stellate cells, whose prolongations meet the vessels in which the blood is already circulating, coalesce with them, and thus receive the current into their own cavities, to transmit it to some other vessel. But in the second, the new vessels are formed entirely by extension from those already existing. This takes place in the following mode:—Suppose a line, or arch, of capillary vessels passing below the edge, or surface, of a part to which new material has been superadded; the vessel will at first present a slight dilatation in one, and coincidently, or shortly after, in another point, as if its walls yielded a little near the edge or surface. The slight pouches thus formed gradually extend, as blind canals, or verticula, from the original vessels still directing their course towards the edge or surface of the new material, and crowded with blood corpuscles, which are pushed into them from the main stream. Still extending, they converge, and meet; the partition wall that is at first formed by the meeting of their closed ends clears away, and a perfect arched tube is formed, through which the blood, diverging from the main or former stream, and then rejoining it, may be continuously propelled. This last process may be seen in the growing parts of the tail of the tadpole, in the development of the filamentous gills and legs of the water-newt, in the first evolution of the extremities of the embryos of higher animals, and in the formation of new structures in the fully-developed organism, either for the repair of injuries or as the result of morbid processes. In some instances it would appear that the wall of the newly-forming vessel gives way, and that the blood-corpuscles escape from it into the parenchyma, at first collecting in an undefined mass, but soon manifesting a definite direction, and coming into connection with another portion of the arch, or with some adjacent vessel. Thus, then, a channel, and not a vessel is formed; and it is probably in this way that those passages are excavated, which take the place of distinct vessels in many of the lower tribes of animals, and also, according to Mr. Paget, in some of the softer and least organised growths in man.

"The first rudiment of the heart appears about the 27th hour, and is a mass of cells, of which the innermost soon break down, so as to form a tubular cavity; for some time it is simple and undivided, extending however through nearly the whole length of the embryo; but the posterior part may be regarded as corresponding with the future auricle, since prolongations may be perceived extending from that part into the transparent area, which indicate the place where the veins subsequently enter. Although the development has proceeded thus far at about the 35th hour, no motion of fluid is seen in the heart or vessels until the 38th or 40th hour. When the heart, which may be considered as analogous at this period to the dorsal vessel of the *Annelida*, first begins to pulsate, it contains only colourless fluid mixed with a few globules. A movement of the dark blood in the circumference of the vascular area is at the same time perceived; but this is independent of the contractions of the heart, and it is not until a subsequent period that such a communication is established between the heart and the distant vessels, that the dark fluid contained in them arrives at the central cavity, and is propelled by its pulsations. This fact which we have just seen to possess a very important bearing on the theory of the circulation, and which has been denied by some observers, appears to have been positively established by the latest researches of M. von Baer.

"The contraction of this dorsal vessel (for so it may be termed) begins, as in the *Annelida*, at its posterior extremity, and gradually extends itself to the anterior; but between the 40th and 50th hours a separation in its parts may be observed, which is effected by a constriction round the middle of the tube; and the dilatation of the posterior portion becomes an auricular sac, and that of the anterior a ventricular cavity. Between the 50th and 60th hours the circulation of the blood in the vascular area becomes more vigorous, and the action of the ventricle is no longer continuous with that of the auricle, but seems to succeed it at a separate period. At the same time the tube of the heart becomes more and more bent together until it is doubled, so that this organ now becomes much shorter relatively to the dimensions of the body, and is more confined to the portion of the trunk to which it is subsequently restricted. The convex side of the curve which the tube presents is that which subsequently becomes the apex or point of the heart, and between the 60th and 70th hours this is seen to project forward from the breast of the embryo, much in the situation it subsequently occupies. About the same time the texture of the auricle differs considerably from that of the ventricle, the auricle containing the thin and membranous walls which it at first possessed; while the ventricle has become stronger and thicker, both its internal and external surfaces being marked by the interlacement of muscular fibres, as in the higher *Mollusca*. About the 65th hour the grade of development of the heart may be regarded as corresponding with that of the fish, the auricle and ventricle being quite distinct, but their cavities are as yet quite single. The heart of the dog at the 21st day bears a great resemblance to that of the chick at the 55th or 60th hour; it consists of a membranous tube twisted on itself, and partially divided into two principal cavities, besides the bulb or dilatation which at this period is found at the commencement of the aorta, and which corresponds with the bulbus arteriosus of fishes.

"Having thus traced the evolution of the heart of the chick up to the grade which it presents in fishes, we may now inquire what is the condition of the other parts of the vascular system at the same time. At the end of the second day the primitive arterial trunk is seen to have divided into two canals, which separate from one another to inclose the pharynx, and then unite again to form the aortic trunk, which passes down the spine. During the first half hour of the third day a second pair of arches is formed, which encompasses the pharynx in the same manner; and towards the end of the third day two other pairs of vascular arches are formed, so that the pharynx is now encompassed by four pairs of vessels, which unite again to supply the general circulation. These evidently correspond with the branchial arteries of fishes, although no respiratory apparatus is connected with them; and in fact the distribution of the vascular system of the bird on the fourth and fifth days exactly resembles that presented by many cartilaginous fishes, as well as by the tadpoles of the *Batrachia*. The first pair of arches is obliterated about the end of the fourth day, but a pair of vessels which is sent from it to the head and neighbouring parts, and which afterwards remains as the carotid arteries, continues to be supplied through a communicating vessel from the second arch. While the first pair is being obliterated a fifth is formed behind the four which had previously existed, and proceeds in the same manner as the fourth from the ascending to the descending aorta. On the fourth day the second arch also becomes less, and on the fifth day is wholly obliterated, whilst the third and fourth become stronger. From the third arch, now the most anterior of those remaining, the arteries are given off which supply the upper extremities: and the vessels of the head are now brought into connection with it by means of the communicating branches, which previously joined the third with the second arch. When these vessels are fully developed, the branches by which these arches formerly sent their blood into the aorta shrink and gradually disappear; so that about the thirteenth or fourteenth day the whole of the blood sent through the two anterior arches is carried to the head and upper extremities, instead of being transmitted to the descending aorta as before. There now only remain the fourth and fifth pair of branchial arches, the development of which into the aorta and pulmonary arteries will be described in connection with the changes which are at the same time going on in the heart. During the fourth day the cavities of the heart begin to be divided for the separation of the right and left auricles and ventricles. About the 80th hour the commencement of the division of the auricle is indicated externally by the appearance of a dark line on the upper part of its wall, and this after a few hours is perceived to be due to a contraction which, increasing downwards across the cavity, divides it into two nearly spherical sacs. Of these the right is at first much the larger, and receives the great systemic veins; the left has then the aspect of a mere appendage to the right, but it subsequently receives the veins from the lungs when these organs are developed, and attains an increased size. The septum between the auricles is by no means completed at once: a large aperture (which subsequently becomes the foramen ovale) exists for some time at its lower part, so that the ventricle continues to communicate freely with both auricles. This passage is often closed by the prolongation of a valvular fold, which meets it in the opposite direction; it remains pervious however until the animal begins to respire by the lungs, and sometimes is not completely obliterated even then. The division of the ventricle commences some time before that of the auricle, and is effected by a sort of duplicature of its wall, forming a fissure on its exterior and a projection on its interior; and thus a septum is gradually developed within the cavity, which progressively acquires firmness, and rises higher up, until it reaches the entrance to the bulb of the aorta, where some communication exists for a day or two longer. At last however the division is complete, and the inter-ventricular septum becomes continuous with the inter-auricular, so that the heart may be regarded as completely a double organ. The progressive stages presented in the development of this septum are evidently analogous to its permanent conditions in the various species of reptiles; but it must not be lost sight of that in all reptiles the inter-auricular septum is first developed, and that it is completely formed in many instances in which the inter-ventricular septum is absent or imperfect. The changes which occur in the heart of the *Mammalia* are of a precisely similar character, and as they take place more slowly they may be watched with greater precision. Soon after the septum of the ventricles begins to be formed in the interior a corresponding notch appears on the exterior, which as it gradually deepens renders the apex of the heart double. This notch between the right and left ventricles continues to become deeper until about the eighth week in the human embryo, when the two ventricles are quite separated from one another except at their bases; this fact is very interesting from its relation with the similar permanent form of the Dugong. At this period the internal septum is still imperfect, so that the ventricular cavities communicate with each other, as in the chick on the fourth day. After the eighth week however the septum is complete, so that the cavities are entirely insulated; whilst at the same time their external walls become more connected towards their bases, and the notch between them is diminished; and at the end of the third month the ventricles are very little separated from one another, though the place where the notch previously existed is still strongly marked."

We may now finally trace the distribution of the arterial trunks to their final modifications, by which the creature is enabled to become an air-breathing animal. The first, second, and third branchial arches are replaced by the brachial and carotid arteries, and lose all communication with the primitive arterial trunk except at its commencement, when the third pair of arches arises with the other trunks from its dilated bulb. This remains as a single cavity even after the ventricles have been separated. About the fifth or sixth day the bulb in the chick becomes flattened, and its opposite sides adhere together, so as to form two tubes running side by side; one of which unites with the left, the other with the right ventricle. The one on the left becomes the ascending aorta, that on the right the pulmonary artery.

A knowledge of the changes which go on in the development of the heart enables us to explain some of the malformations to which it is subject.

(Carpenter, *Principles of Physiology, General and Comparative.*)

HEATHER. [ERICA.]

HEIMIA, a genus of Plants belonging to the natural order *Lythraceæ*. It has a hemispherical campanulate calyx, bracteolated at the base, with six erect lobes and as many alternating horn-shaped patent angles; petals 6, alternate with erect lobes; stamens 12, somewhat equal; ovary sessile, nearly globose, 4-celled; capsule included within the calyx; seeds numerous, minute, and wingless. Glabrous herbaceous plants. Peduncles 1-flowered, shorter than the calyx.

H. salicifolia is found in New Spain on the volcano of Jorullo. It has ternate or opposite leaves, the upper often alternate, on very short stalks, lanceolate, acute, narrowed to the base. The petals are obovate. It is a powerful sudorific and diuretic. The Mexicans consider it a valuable medicine, and call it Hanchinol.

HEINE, HEINRICH, was born on the 1st of January, 1800, at Düsseldorf, in the Prussian Rhine-Province, of Jewish parents. His father was a merchant. He was educated at the Lyceum at Düsseldorf, and as he was intended for the mercantile profession, he was sent in 1816 to Hamburg, to receive the necessary instruction and training. He remained there till 1819, when his father, as well as his uncle, Salomon Heine, a banker in Hamburg, acquiesced in his wish to be educated for a literary profession, and in the summer of that year he was sent to the university of Bonn, in order to study jurisprudence. In 1820 he went to Göttingen, but soon left it, and in 1821 removed to Berlin, where, in 1822, he published the first collection of his poems, 'Gedichte, von Heinrich Heine,' 12mo. Some of the earliest of these productions date as far back as 1816, and several of them had previously appeared in the periodical called 'Der Wachter' at Hamburg. He travelled in Poland in 1822, and after his return to Berlin published his remarks in the 'Gesellschafter.' In 1823 he published his tragedy of 'Almansor,' together with a one-act tragedy named 'William Radcliff,' and a 'Lyrisches Intermezzo.' While he remained at Berlin he also published in 'Der Sprecher' a series of letters under the head of 'Briefe aus Berlin,' which attracted much attention. In 1823 he returned to Göttingen, and resumed his studies in jurisprudence. On the 30th of July, 1825, he took a degree in law, and then proceeded to Hamburg, for the purpose of establishing himself there as an advocate. The practice of the law however seems to have been as little suited to the character of his mind, now developing itself, as the pursuits of trade. He appears about this time to have renounced the religion of his ancestors for that of the New Testament, in the Lutheran form, but afterwards became an unbeliever. While at Göttingen, in 1824, he had made a tour in the Harz Mountains, of which he published an account at Hamburg, 'Die Harzreise,' 1826. He afterwards made tours to the islands of the Baltic, to England, to South Germany, and to Italy, and wrote a descriptive account of each. The whole of these, including the 'Harzreise,' were published at Hamburg under the title of 'Reisebilder,' vols. 1-2 in 1826-27, and vols. 3-4 in 1830-31. These works he himself many years afterwards translated into French under the title of 'Impressions de Voyages.' In 1827 he published at Hamburg another volume of short poems, the 'Buch der Lieder,' and about the same period his poem of 'Alta Troll, ein Sommernachtstraum.' After his return from England he was employed at Stuttgart as the editor of the 'Neue Politischen Annalen.' He also wrote for the 'Morgenblatt,' and the 'Augsburger Zeitung,' and of the latter he became afterwards the Paris correspondent.

In 1831 Heine removed to Paris, where he continued to reside during the remainder of his life. In this year he published his series of letters 'On Nobility' ('Ueber den Adel'), Hamburg, 1831. In 1833 appeared his essays on modern literature in Germany, 'Zur Geschichte der Neueren Schönen Literatur in Deutschland,' 12mo, Paris and Leipzig, and his remarks on the state of France, 'Französische Zustände,' 12mo, Hamburg, which is a collection of articles previously published in the 'Augsburg Gazette.' 'Der Salon,' one of the most important of his prose works, was published at Hamburg, in 4 vols. 8vo, 1834-40. About this period he married a Frenchwoman, who was a Roman Catholic, and married her according to the Roman Catholic ritual. His observations on the 'Romantic School' ('Die Romantische Schule') appeared in 1836 at Hamburg. In 1840 he published his bitter personal attack on Börne, with whom he had become acquainted when he went to Paris in 1831, 'Ueber Ludwig Börne,' 8vo, Hamburg.

In the winter of 1843-44, Heine visited Germany for the last time. After his return to Paris he published his 'Deutschland, ein Wintermärchen' ('Winter's Tale'), which is a description of his journey. In 1847 he experienced an attack of paralysis, which deprived him of the sight of one eye; in other respects he recovered, but another attack in 1848 deprived him of the sight of the other eye also, and subjected him likewise to extreme bodily suffering, without at all injuring his mental faculties. He never afterwards left his chamber, but continued his literary labours by the aid of an amanuensis, with a cheerful resignation which was only interrupted occasionally by the severity of his sufferings. His latest poetical productions were the 'Romancero,' written in 1850-51; 'Das Buch des Lazarus,' written in 1854, and 'Neuer Frühling' ('New Spring'), written in 1855. In July 1855 he published at Paris, in the 'Bibliothèque Contemporaine,' a translation of his poems into French prose, under the title of 'Poëmes et Legendes, par Henri Heine.' The translations were made under his own supervision by his friend, the late Gérard de Nerval. A similar translation of the 'Neuer Frühling' appeared in the 'Révue des Deux Mondes,' vol. xi., 1855. His state of bodily suffering, during which he was dutifully attended by Madame Heine, was terminated by his death, on the 17th of February, 1856.

Soon after Heine's death, his brother, Dr. Gustav Heine, of Vienna, communicated to the 'Fremdenblatt' of that city some particulars of his last moments, together with the seventh clause of his will, in which he says, "Though I belong to the Lutheran confession, I do not desire to be followed to the grave by any clergyman of that denomination, and I wish to dispense with any other sacred solemnity at my burial. This is not the weak fancy of a freethinker. For the last four years I have cast aside all philosophical pride, and have again felt the power of religious truth." He regrets having so often spoken of sacred subjects in a disrespectful manner, and implores "forgiveness for any offence which in his ignorance he may have given to good manners and morals, which are the true emanations of all faith."

Heine wrote French with apparently as much facility as his native language, and was a contributor to the periodicals of Paris as well as to those of Germany. His prose-works are distinguished by great brilliancy of style and vividness of imagination, but are too often pervaded by a spirit of sarcasm which has no respect for persons, and are frequently traversed by veins of mockery which touch the most sacred subjects. His poems are distinguished by originality, freshness of feeling, fine fancy, and extraordinary beauty of versification, and will probably endure long after his prose, from its want of sincerity, has fallen into comparative neglect. The best as well as the most recent translation of his smaller poems is 'Heinrich Heine's Book of Songs, a Translation by John E. Wallis,' 12mo, London, 1856.

HEISTERIA. [Partridge-Wood.]

HELICINE. [Chemistry, *S.* 2.]

HELIGOLAND. [Helgoland.]

HELIOTROPE. [Bloodstone. *S.* 2.]

HELLENINE. [Chemistry, *S.* 2.]

HELMINTHIA, a genus of plants belonging to the natural order *Compositæ*, to the sub-order *Cichoraceæ*, and the section *Scorzonereæ*. It has the phyllaries in one row, equal, with equal sublulate adpressed ones at the base, and surrounded by 3-5 leaf-like loose bracts; the receptacle dotted; the fruit compressed, transversely rugose, rounded at the end, and with a slender beak longer than itself; pappus in several rows, feathery. There is but one species inhabiting Great Britain, *H. echioides*, the Ox-Tongue. It is a plant from 2 to 3 feet in height; the branches, stem, leaves, and involucre are covered with strong prickles springing from white tubercles, and with 3 minute hooks at the apex. It is found on dry banks; and blossoms in July, August, and September.

HELVELLACEÆ (Lindley), a natural order of Plants belonging to the *Fungales*, and equivalent to Berkeley's order *Ascomycetes*. The genera included in it are embraced in Fries' cohort *Hymenomycetes*.

HELWINGIACEÆ, *Helwingiads*, an order of Diclinous Exogenous Plants, represented by one species, *Helwingia Rusciflora*. This plant is a native of Japan, where its young leaves are eaten. It is a shrub with alternate stipulate leaves, and fascicled flowers. Decaisne, who first constituted the order, regarded it as allied to *Hamamelidaceæ*. But its minute embryo and unisexual flowers remove it far from this order, whilst its inferior fruit and seed bring it near to *Garryaceæ*. It has an indirect affinity also with *Santalaceæ*.

HEMATOSIN. [Chemistry, *S.* 1.]

HEMEROCALLIS, a genus of Plants belonging to the natural order *Liliaceæ*. It has a campanulate corolla, seated on a cylindrical tube; the stamens are bent down; the capsule is 3-edged; the root is composed of thick fibres; the leaves are scattered, linear; the flowers are large, yellow, or yellow-brown. The species are called Day-Lilies. *H. flava* is a native of Germany, and *H. fulva* of Italy. Several species are cultivated in our gardens, as *H. disticha* from China, *H. Sieboldii* from Japan, *H. speciosa*, and *H. graminea*.

HEMIPINIC ACID. [Chemistry, *S.* 1.]

HEMIRAMPHUS. [Esox, *S.* 1.]

HENIOCHUS. [Chætodon.]

HERAT. [Persia.]

HERBARIUM, the name given to specimens of Plants when they have been collected and dried. The possession of an herbarium is almost essential to the study of systematic Botany, as it is impossible to cultivate at once the larger proportion of the species of plants which inhabit the earth's surface. The use also of an herbarium will be found constantly to supply the place of recent plants. Hence all persons who study botany possess themselves of an herbarium more or less extensive according to the range and nature of their studies. The following hints for forming an herbarium are chiefly derived from Professor Balfour's valuable 'Class-Book of Botany:'—

The specimens to be dried and kept in the herbarium should, if possible, be gathered in fine weather, and free from external moisture. In selecting them care should be taken to have the plants in a perfect state of growth, with all the parts from which the characters of the order, genus, or species, are taken. The entire plant, where practicable, should be preserved. Of course this is impossible with trees, but the completer the specimens the better for study. In trees, portions of the branches, with the leaves, flowers, and fruit, should be taken, and, where possible, sections or small portions of the stem, roots, &c. In the case of tall and slender grasses and sedges, they may be folded once or twice backwards and forwards, to make room for them on a single sheet. Thick branches, roots, stems, &c., may be split to allow of pressure. In plants with diœcious flowers, both the staminiferous and pistiliferous flowers should be obtained. Some plants, as species of the genus *Rubus* and *Salix*, demand that both flowering and leafing shoots should be gathered. In glueing the plants on to the paper, care must be taken to expose both sides, so that all parts of the structure may be seen. Careful dissections of plants may be dried and fastened on to paper, and these will facilitate subsequent examination very much. All bad, doubtful, injured, or imperfect specimens should be rejected.

In collecting plants a trowel will be found useful, and when gathered they should be placed in a tin box or vasculum till they are transferred to paper. Some plants require drying or pressure immediately. Under these circumstances, Dr. Balfour recommends a field-book, consisting of some bibulous paper strapped between two pieces of board, into which the plants needing drying may be thrust at once.

The paper employed may be ordinary blotting-paper, but the paper-makers have made a paper for botanical use which may be more advantageously employed. In London, Bentall's drying-paper is used; there is also another paper used in Scotland, called the 'Edinburgh botanical drying-paper.' It is made in sheets 18 inches long and 11 inches broad. This paper is included between boards. These should be exactly the size of the drying-paper. Several sets of boards of varying thicknesses should be employed, and pressure may be applied by means of a weight or straps. The latter is the most easy process whilst travelling. In order that the plants may dry freely, various suggestions have been made for making holes in the boards or forming them of a kind of framework, by which the air would pass through.

In putting down the plants the following plan should be pursued:—"A parcel of not less than four sheets of paper is put on one of the outside boards, then one or more specimens are laid on this sheet according to their size. The specimens should be spread out carefully, their natural habit being preserved as far as possible. When plants require to be folded, the slips of paper already mentioned are passed over the bent portions so as to retain them in their position. Having placed one specimen or set of specimens on the sheet, another parcel of not less than four sheets is laid over them; and in doing this the leaves and other parts are arranged with the hand or the forceps. The same process is repeated until a dozen or more such parcels have been arranged one over the other. Then a thin board is inserted, and other parcels of paper and specimens are arranged above it, until they are exhausted, or until the bundle is of sufficient size. Another such board is then laid on the top, and the whole is subjected to pressure. The paper is changed after twelve hours' pressure, the plants being lifted by means of the forceps and placed in dry parcels of paper, while that which is moist is hung up to dry. The intervals between the changing of the paper may be increased or diminished according to circumstances." Very succulent and wet plants require frequent changing and much drying. Most specimens will dry in eight or ten days. Succulent plants need to be killed first by immersion in boiling water. Aquatic plants and wet plants should be placed in a napkin and pressed before they are put into the paper. The moist paper will dry in ten or twelve hours. Along with the plant a label should be inserted, with all particulars known about the specimen, as where gathered, what elevation, &c.

When the specimens are thoroughly dry a selection is made for the herbarium. These should be fastened by means of thin fine glue on thick wide paper, 17 inches long and 10½ inches broad. The name of the plant, its locality, or any other particulars, may be then written on the paper. In order to preserve the specimens from the attacks of insects, &c., they should be touched with a strong solution of corrosive sublimate in camphorated spirit, or in a solution of naphtha (half a drachm to the ounce). The sheets may then be arranged in a case, according to their genera or natural orders.

Fruits, specimens of wood and bark, large roots, lichens and algæ on rocks and stones, may be arranged in drawers, glazed cases, or glass jars. Succulent fruits and roots are best preserved in a strong solution of salt and water, or in pyroligneous acid, diluted with 3-5 parts of water, or in alcohol. In some instances a solution of 4 ounces of bay salt, 2 ounces of burnt alum, and 5 grains of corrosive sublimate, in 2 quarts of boiling water, has been used with advantage. These jars are best covered with a stout piece of caoutchouc tied round the neck.

HERMASIA, a genus of Plants belonging to the natural order *Paronychiaceæ*. It has 5 sepals; 5 filiform petals inserted with the 5 stamens on a perigynous ring; 2 stigmas nearly sessile; fruit 1-seeded, indehiscent, membranaceous; leaves opposite. These species are insignificant plants. Three have been recorded as natives of Great Britain. One, *H. hirsuta*, is a doubtful native; the other two are very rare.

H. glabra has a prostrate herbaceous stem, with clusters of sessile flowers coalescing on the lateral branches into a slightly leafy spike. It has been found in Suffolk and Lincolnshire in England, and in West Kerry, Ireland.

H. ciliata. The sepals are tipped with a large bristle; the clusters of flowers are distinct, sessile, and axillary. It has been found at Lizard Point, Cornwall.

HERMINIUM, a genus of Plants belonging to the natural order *Orchidaceæ* and the tribe *Ophrydineæ*. The perianth is bell-shaped, segments all erect; lip 3-lobed, tumid beneath at the base, without a spur; glands of the stalks of the pollen-masses exserted, naked. *H. monorchis*, the Musk-Orchis, is a British species. The stem is about six inches high, and the spike of flowers is dense and slender; the sepals are ovate and greenish.

HERNE BAY. [Kent.]

HERNSHAW, or HERONSHAW, a name for the Common Heron. [Herons.]

HERON'S BILL. [Erodium, *S.* 1.]

HERRERITE. [Mineralogy, *S.* 1.]

HERSCHEL, CAROLINE LUCRETIA, the sister of the great astronomer Sir William Herschel, was born at Hanover on the 16th of March, 1750. Till her twenty-second year she lived with her parents in her native place; after which she came over to England to reside with her brother, then established as an organist at Bath. When Sir William exchanged his profession as a musician for those astronomical labours which were to immortalise his name, his sister became his constant and most valuable helpmate. "From the first commencement of his astronomical pursuits," says an authority who writes from intimate knowledge, "her attendance on both his daily labours and nightly watches was put in requisition, and was found so useful that, on his removal to Datchet and subsequently to Slough, she performed the whole of the arduous and important duties of his astronomical assistant—not only reading the clocks and noting down all the observations from dictation, as an amanuensis, but subsequently executing the whole of the extensive and laborious numerical calculations necessary to render them available for the purposes of science, as well as a multitude of others relative to the various objects of theoretical and experimental inquiry in which, during his long and active career, he was at any time engaged." For these important services she was in receipt of a moderate salary allowed her by George III. But, in addition to these labours performed expressly as her brother's assistant and amanuensis, she found time to perform others of a similar character on her own account. Though sitting up frequently all night till day-break, more especially in winter, while her brother required her help, she was able, by snatching such intervals of time as her brother's occasional absences permitted, to conduct a series of observations of her own with a small Newtonian telescope, which he had constructed for her. Her special employment with this instrument was to sweep the heavens for comets; and so successful was she in this employment that she discovered seven comets, of at least five of which she was entitled to claim a clear priority of discovery. The dates of the discoveries of the seven comets were as follows:—August 1, 1786; December 21, 1788; January 9, 1790; December 15, 1791; October 7, 1793; November 7, 1795; August 6, 1797. Besides the discovery of these comets, she had the merit of having made original observations of several remarkable nebulæ and clusters of stars, included in her brother's catalogues. In 1798 she published, with an introduction by her brother, an astronomical work of great value, entitled 'Catalogue of Stars taken from Mr. Flamsteed's Observations, contained in the second volume of the Historia Cœlestis, and not inserted in the British Catalogue, with an Index to point out every observation in that volume belonging to the stars of the British Catalogue: to which is added a collection of Errata that should be noticed in the same volume.' In this work, which was published at the expense of the Royal Society, no fewer than 561 stars observed by Flamsteed, but which had escaped the notice of the framers of the 'British Catalogue,' were pointed out. During the whole of her brother's career Miss Herschell remained by his side, aiding him and modestly sharing the reflection of his fame. After his death, in 1822, she returned to her native Hanover to spend the remainder of her days. They were unusually protracted; for, though she was seventy-two years of age when she left England, she lived for twenty-six years longer. Even these venerable years were not spent idly. In 1828 she completed a catalogue of the nebulæ and clusters of stars observed by her brother, for which labour the Astronomical Society of London voted her their gold medal. She was also chosen an honorary member of that Society—an honour very unusual in such a case. Living in dignity and tranquillity, retaining her memory and the full use of her faculties almost to the last, and receiving from time to time marks of the highest respect from the king and crown-prince of Hanover and from other German sovereigns, she survived till the 9th of January, 1848, when she died in her ninety-eighth year. Among the female examples of the pursuit of knowledge, very few names deserve so high a place as that of Caroline Herschel.

HESKET-NEWMARKET. [Cumberland.]

HESPERIDIN. [Chemistry, *S.* 1.]

HETEROGYNA. [Hymenoptera.]

HETEROPTERA. [Hemiptera.]

HETTON. [Durham.]

HEYTESBURY. [Wiltshire.]

HIBBERTIA. [Dilleniaceæ.]

HICKORY. [Carya.]

HIGHAM-FERRERS. [Northamptonshire.]

HIGHWORTH. [Wiltshire.]

HILL, ROWLAND, VISCOUNT, was born on the 11th of August, 1772, at the village of Prees in Shropshire, where his father, John Hill, Esq., resided till the death of his brother, Sir Richard Hill, Bart., when he succeeded to the title, and removed to the family mansion and estate at Hawkstone in Shropshire. Sir John Hill had sixteen sons and daughters, of whom Rowland Hill was the second son and fourth child, and was a nephew of the Rev. Rowland Hill, the celebrated preacher. He was educated in his native county, where he remained till 1790, when he entered the army as an ensign in the 38th regiment of foot. Having obtained leave of absence, he went to a military academy at Strasbourg, where he remained till January 24, 1791, when he was appointed lieutenant in an independent company under Captain Broughton. On the 16th of March, in the same year, he was appointed lieutenant in the 53rd, or Shropshire regiment of foot. He went again to pursue his military studies at Strasbourg, but returned to England at the end of the summer, joined his regiment at Edinburgh January 18, 1792, and remained in Scotland till the end of that year. In the early part of the year 1793 he raised an independent company, for which service he received his commission as captain on the 23rd of March. He took his company to Ireland, delivered the men over to the 38th regiment, and returned to Shropshire in June. Lord Hood having taken Toulon from the French in August 1793, Captain Hill, before he was attached to any particular corps, was employed there as aide-de-camp to three successive generals, Lord Mulgrave, General O'Hara, and Sir David Dundas. On the 13th of December, 1793, Lord Hood and Sir David Dundas appointed him the bearer of despatches to England, where he arrived on the 14th of January, 1794. In the early part of that year Mr. Graham (afterwards Sir Thomas Graham, and subsequently Lord Lynedoch) having raised a regiment of infantry, offered Captain Hill the rank of major in it, on the condition of his supplying a certain quota of men, which he did. This regiment was the 90th, with which he was destined to win so many honours. It was afterwards augmented to 1000 men, and he was promoted to the rank of lieutenant-colonel. On the 1st of January, 1800, he was advanced to the rank of colonel.

Colonel Hill went through arduous duties with his regiment at Gibraltar and elsewhere, till, on the 8th of March 1801, he landed with his regiment at Alexandria in Egypt, as part of the army under Sir Ralph Abercromby. He received a wound on the temple in the action of March 13, 1801. After the defeat of the French he returned to England, where he arrived on the 1st of April 1802. He performed regimental duty in England and Ireland till 1805, when he accompanied the expedition to the river Weser in Germany, but was again in England at the end of January 1806, in which year he was promoted to the rank of major-general, and appointed on the staff.

In 1808, when he was on duty in Ireland, he received an order to join the army of Sir Arthur Wellesley in Portugal. He landed his troops successfully in Montego Bay, August 1st to 5th, and served under Sir Arthur Wellesley till the French evacuated Portugal, according to the terms of the so-called convention of Cintra. He afterwards served with his regiment under Sir John Moore in the latter part of 1808, till the battle of Coruña, January 16, 1809, when he returned with the shattered remains of the army to England.

After a short stay in England, Major-General Hill, in 1809, re-embarked for Portugal, in command of the troops ordered from Ireland for the next expedition, and was promoted to the rank of lieutenant-general. He served under Sir Arthur Wellesley till the 6th of February 1811, when he was compelled by illness to come to England. In May 1811 he was again in Portugal. In March 1812 he was invested by Lord Wellington with the insignia of the Order of the Bath, which had been sent over for that purpose by the Secretary of State. He received a slight wound on the head at the battle of Talavera, and received the thanks of both houses of parliament for his services in that action, as he did on other occasions afterwards. He continued to serve in the Peninsular War till it terminated with the battle of Toulouse. After his return to England Sir Rowland Hill was created, in May 1814, Baron of Almarez and of Hawkstone, with 2000*l.* a-year to himself and his heirs male. The honour was regranted to him in 1816, as Baron of Almarez and Hardwicke, with remainder, in default of male issue, to the issue male of his deceased elder brother.

On the return of Napoleon I. from Elba, in March 1815, Lord Hill was appointed to a command in the Netherlands and was engaged at the battle of Waterloo. On the restoration of Louis XVIII., he was appointed second in command of the army of occupation in France, and remained there till the evacution of the country by the allied armies.

In the year 1828 Lord Hill was appointed the General Commanding in Chief of the Army—an office which he filled with universal approbation till the declining state of his health compelled him to send in his resignation. He was then raised to the dignity of Viscount, September 3, 1842, with remainder to his nephew, Sir Rowland Hill, Bart., who is now the second Viscount Hill. He died December 10, 1842, at his residence, Hardwicke Grange, near Shrewsbury.

A column in honour of Lord Hill, erected by subscription after the termination of the Peninsular War, forms a conspicuous ornament of the town of Shrewsbury.

HINCKLEY. [Leicestershire.]

HINDON. [Wiltshire.]

HINDUSTAN. [Indian Empire, *S.* 2.]

HIPPOBOSCIDÆ, a family of Dipterous Insects belonging to the section *Pupipara* or order *Homaloptera*, containing the Forest-Flies, which exhibit such remarkable variations in their typical structure that they have been regarded by some authors as forming a distinct order. The head is received into a cavity in front of the thorax; it is divided transversely into two parts, the anterior or smaller of which supports the mouth and two small tubercles, almost imbedded at the lateral angles, being rudimental antennæ. The mouth is composed of two curved setæ, inclosed in a tubular canal, covered by two narrow elongated coriaceous plates, regarded by Latreille as palpi. The ocelli are wanting. The body is short, flat, and very coriaceous; the wings are either large or entirely wanting; the nervures of the anterior margin are very strong but they are effaced behind. In the winged species a pair of balancers are also present. The legs are very strong, and terminated by robust curved claws, which are toothed beneath. The abdomen is composed of a continuous leathery-like membrane, capable of very great distension, which peculiarity is owing to the remarkable circumstance that the young of these insects are singly nourished within the body of the parent, where they not only acquire their full size, but actually assume the pupa state, under which form, like very large eggs, they are deposited by the female. This egg-like cocoon is at first soft and white, nearly as large as the abdomen of the parent fly; but by degrees it hardens, becomes brown, of a rounded form, and often notched at one end, which is covered by a shining kind of cap, which is detached on the insect's assuming the perfect state. This cocoon is moreover entirely destitute of annular incisions, in which respect it differs from those of other Dipterous Insects. It is composed of the uncast skin of the larva, beneath which the insect becomes a real inactive pupa, with the limbs of the perfect insect laid along the breast, as in other species which undergo the strict coarctate species of transformation. M. Réaumur was the first to discover these curious particulars and he was so anxious to observe the development of the insect from these singular eggs, that he carried them in his pocket by day and took them to bed with him at night, in order that they might have a uniform degree of warmth; great was his surprise therefore when, instead of grubs as he expected, perfect flies were produced.

These insects are interesting in their habits. They live exclusively upon quadrupeds and birds; the horse is especially subject to the attacks of one of these species, hence called *Hippobosca equina*. This species is the type of the genus *Hippobosca*, in which the eyes are large and distinct, being placed at the sides of the head; the antennæ are in the shape of tubercles with three dorsal setæ: the wings are large. Mr. Curtis observes that these flies move swiftly, and like a crab, sideways or backwards; they are very tenacious of life, and live principally on horses, attaching themselves to the belly between the hind thighs and under the tail, where they are less protected by hair. It is remarked by Latreille that the ass fears them most, and that horses suffer very little from them. In the New Forest they abound in a most astonishing degree. Mr. Samouelle says, "From the flanks of one horse I have obtained six handsful, which consisted of upwards of a hundred specimens. They abound most on white and light-coloured horses."

The other genera are:—*Ornithomyia*, *Craterina*, *Oxypterum*, *Hæmobora*, *Melophagus*, *Feronia*, *Lipotepna*, and probably *Braula*. Of these the first three are British, and are found upon various birds, the *Craterina hirundinis* depositing its eggs like a cocoon in the nest of the swallow, where it receives all the necessary warmth; for which it repays the poor swallow by sucking its blood. The wings in this genus are very long and narrow. The genus *Melophagus* comprises a single species, *M. ovinus*, which is destitute of wings, and attacks the sheep. It is of a dark reddish colour, with the abdomen whitish. It is commonly called the Sheep-Louse, and is so tenacious of life that Ray states that it will exist in a fleece twelve months after it is shorn, its excrements even giving a tinge to the wool, which is very difficult to be discharged.

HIPPOGLOSSUS. [Pleuronectidæ.]

HIPPURIC ACID. [Chemistry, *S.* 2.]

HIRCUS. [Goat.]

HISTOLOGY (*ιστος* and *λογὸς*), that department of science which embraces the facts relating to the ultimate structure of the parts of plants and animals. These facts have been usually comprehended under the term General Anatomy. But more recently it has been found convenient to use the term Histology. It is only recently that this word could be needed, for the observations upon which the science is founded have only been made since the extensive employment of the microscope. It may be said to have originated with Marcellus Malpighi (1628-94) and Anton von Leeuwenhoek (1622-1723) at the time when magnifying glasses were first constructed of such a kind as to be useful in observing the structure of plants and animals. The ultimate composition of organised bodies was unknown to ancient observers, as well as those who lived in the middle ages. It is true that Aristotle and Galen speak of homogeneous and heterogeneous parts of the body; and Fallopius, at the beginning of the 16th century, defined still more accurately the idea of what are now called the tissues of the body, yet the more minute structure of these parts was entirely hidden from these observers. Even after the time of Malpighi and Leeuwenhoek little was done towards unravelling the intimate structure of the tissues till the beginning of the present century. We can only point to such men as Fontana, Muys, Lieberkühn, Hewson, and Prochaska, as having engaged in isolated observations upon the structure of various parts of the body. It was not till the year 1801 that a connected view of the tissues of the human body was given to the world, in such a form as to lay the foundations of what is now called the science of Histology. The 'Anatomie Generale' (Paris 1801) of Bichat was in fact the first attempt to treat the subject of Histology scientifically. It was not so much that Bichat contributed new observations on this subject, as that he systematically arranged what had hitherto been done, and called attention to the importance of the subject, and to the fact that it lay at the foundation of all physiological and pathological inquiries.

In the direction of botany, the present century witnessed the observations of Robert Brown, who was the first to draw the attention of botanists to the importance of minute observations on the tissues of plants. One of the earliest attempts at a systematic arrangement of the tissues of plants was made by Slack, in the 39th volume of the 'Transactions of the Society of Arts,' in a paper on the Elementary Tissues of Plants and on Vegetable Circulation. Observations upon the cellular and vascular structure of plants multiplied, and a greater value and interest was given to these than they had before possessed by the observations of Schleiden on the origin and development of the cells of plants in his paper on Phytogenesis, published in Müller's 'Archiv fur Anatomie und Physiologie,' Part ii. 1838. He here pointed out, that in the formation of vegetable cells, small sharply-defined granules are first generated in a granulous substance, and around them the cell-nuclei (cytoblasts) are found, which appear like granulous coagulations around the granules.

The results of these observations were communicated in 1837 to Schwann, who, struck with the resemblance between the cells of animals and those of plants, conceived the idea that the same history of development would be found true of the parts of animals that had been discovered by Schleiden in the parts of plants. From this time the science of Histology made rapid progress, and we cannot more appropriately present its present condition than in the language of Professor Kölliker, in his introduction to his 'Manual of Human Histology:'—

"In the year 1838 in fact the demonstration by Dr. Th. Schwann of the originally perfectly identical cellular composition of all animal organisms, and of the origin of their higher structures from these elements, afforded the appropriate conception which united all previous observations, and afforded a clue for further investigations. If Bichat founded Histology more theoretically by constructing a system and carrying it out logically, Schwann has by his investigations afforded a basis of facts, and has thus won the second laurels in this field. What has been done in this science since Schwann has been indeed of great importance to physiology and medicine, and in fact of great value in a purely scientific point of view, inasmuch as a great deal which Schwann only indicated or shortly adverted to, as the genesis of the cell, the import of the nucleus, the development of the higher tissues, their chemical relations, &c., has received a further development, but all this has not amounted to a step so greatly in advance as to constitute a new epoch. If, without pretensions to prescience, it be permitted to speak of the future, this condition of Histology will last as long as no essential advance is made towards penetrating more deeply into organic structure, and becoming acquainted with those elements of which that which we at present hold to be simple is composed. If it be possible that the molecules which constitute cell-membranes, muscular fibrils, axile fibre of nerves, &c., should be discovered, and the laws of their apposition and of the alterations which they undergo in the course of the origin, the growth and the activity of the present so-called elementary parts, should be made out, then a new era will commence for Histology, and the discoverer of the law of cell-genesis, or of a molecular theory, will be as much or more celebrated than the originator of the doctrine of the composition of all animal tissues out of cells.

"In characterising the present position of Histology and of its objects, we must by no means forget that, properly speaking, it considers only one of the three aspects which the elementary parts present to observation, namely, their form.

"Microscopical anatomy is concerned with the understanding of the microscopic forms, and with the laws of their structure and development, not with any general doctrine of the elementary parts.

"Composition and function are only involved so far as they relate to the origin of forms and to their variety.

"Whatever else respecting the activity of the perfect elements and their chemical relations is to be found in Histology, is there either on practical grounds, in order to give some useful application of the morphological conditions, or to complete them, as, from its intimate alliance with the subject, it is added only because physiology proper does not afford a due place for the functions of the elementary parts.

"If Histology is to attain the rank of a science, its first need is to have as broad and certain an objective basis as possible. To this end the minuter structural characters of animal organisms are to be examined on all sides, and not only in fully-formed structures, but in all the earlier periods from their first development.

"When the morphological elements have been perfectly made out, the next object is to discover the laws according to which they arise, wherein one must not fail to have regard also to their relations of composition and function. In discovering these laws, here as in the experimental sciences generally, continual observation separates more and more, among the collective mass of scattered facts and observations, the occasional from the constant, the accidental from the essential, till at last a series of more and more general expressions of the facts arises, from which in the end mathematical expressions or formulæ proceed, and thus the laws are enumerated.

"If we inquire how far Histology has satisfied these requirements, and what are its prospects in the immediate future, the answer must be a modest one. Not only does it not possess a single law, but the materials at hand from which such should be deduced are as yet relatively so scanty, that not even any considerable number of general propositions appear well founded. Not to speak of a complete knowledge of the minuter structure of animals in general, we are not acquainted with the structure of a single creature throughout, not even of man, although he has been so frequently the object of investigation; and therefore it has hitherto been impossible to bring the science essentially nearer its goal. It would however be unjust to overlook and depreciate what we do possess; and it may at any rate be said that we have acquired a rich store of facts, and a few more trustworthy propositions. To indicate only the more important of the former, it may be mentioned that we have a very sufficient acquaintance with the perfect elementary parts of the higher animals; and that we also understand their development, with the exception of the elastic tissue, and of the elements of the teeth and bones. The mode in which these are united into organs has been less examined; yet on this head also much has been added of late, especially in man, whose individual organs, with the exception of the nervous system, the higher organs of sense, and a few glands (the liver, blood-vascular glands), have been almost exhaustively investigated. If the like progress continue to be made, the structure of the human body will in a few years be so clearly made out that, except perhaps in the nervous system, nothing more of importance will remain to be done with our present modes of investigation. With Comparative Histology it is otherwise: hardly commenced, not years but decades will be needed to carry out the necessary investigations. Whoever will do good work in this field must, by monographs of typical forms embracing their whole structure from the earliest periods of development, obtain a general view of all the divisions of the animal kingdom, and then by the methods above described strive to develop their laws.

"As regards the general propositions of Histology, the science has made no important progress since Schwann; however, much has been attained by the confirmation of the broad outlines of his doctrines. The position, that all the higher animals at one time consist wholly of cells, and develop from these their higher elementary parts, stands firm; though it must not be understood as if cells, or their derivatives, were the sole possible or existing elements of animals. In the same way, Schwann's conception of the genesis of cells, though considerably modified and extended, has not been essentially changed, since the cell-nucleus still remains as the principal factor of cell-development and of cell-multiplication. Least advance has been made in the laws which regulate the origin of cells and of the higher elements; and our acquaintance with the elementary processes which take place during the formation of organs must be regarded as very slight. Yet the right track in clearing up these points has been entered upon; and a logical investigation of the chemical relations of the elementary parts and of their molecular forces, after the manner of Donders, Dubois, Ludwig, and others, combined with a more profound microscopical examination of them, such as has already taken place with regard to the muscles and nerves, and further, a histological treatment of embryology, such as has been attempted by Reichert, Vogt, and myself, will assuredly raise the veil, and bring us step by step nearer to the desired though perhaps never-to-be-reached end."

We refer here to some of the more important works and papers to be consulted on this subject.

Kölliker, *Manual of Human Histology*; Sharpey, *General Anatomy*, in Quain's *Elements of Anatomy*; Beale, *The Microscope and its Application to Clinical Medicine*; Todd and Bowman, *Physiological Anatomy*; Gerber, *Elements of the General and Minute Anatomy of Man and the Mammalia*; Goodsir, *Anatomical and Pathological Observations*; Hassall, *Microscopic Anatomy*; Bowman, *On the Structure of Voluntary Muscle* (*Phil. Trans.*, 1840); Kiernan, *On the Structure of the Liver* (*Phil. Trans.*, 1835); Mandl, *Manual d'Anatomie Générale*; Mohl, *On the Vegetable Cell*; Owen, *Lectures on Comparative Anatomy*; Quekett, *Lectures on Histology*; Schleiden, *Principles of Scientific Botany*; Schleiden and Schwann, *Microscopical Researches* (Sydenham Society); *Cyclopædia of Anatomy and Physiology*; Robin, *Histoire Naturelle des Végétaux Parasites*; Carpenter, *Principles of Physiology, General and Comparative*.

(*Quarterly Journal of Microscopical Science.*)

HITCHIN. [Hertfordshire.]

HOLIBUT, or HALIBUT. [Pleuronectidæ.]

HOLLYHOCK. [Althæa.]

HOLMAN, JAMES, known as 'The Blind Traveller,' was born in or about the year 1787. He entered the royal navy in December 1798, and was appointed lieutenant in April 1807. At the age of twenty-five an illness which resulted from his professional duties deprived him entirely of his sight. On the 29th of September 1812, he was appointed one of the Naval Knights of Windsor, of whom there are six, with a governor. By degrees, when he had become accustomed to his condition, in 1819, partly the state of his health and partly a desire for change induced him to set out on a journey to the Continent, of which he published an account in 'The Narrative of a Journey undertaken in the Years 1819, 1820, 1821, through France, Italy, Savoy, Switzerland, parts of Germany bordering on the Rhine, Holland, and the Netherlands; comprising Incidents that occurred to the Author, who has long suffered under a total Deprivation of Sight; by James Holman, R.N. and K.W.,' 8vo. 1822. On the 19th of July 1822, he embarked on a voyage to St. Petersburg, whence he proceeded to Moscow, Novgorod, and finally to Irkutsk, the capital of Eastern Siberia. His intention was, when the ice on Lake Baïkal became sufficiently firm, to have crossed over, and travelled through Mongolia and China. At Irkutsk however an order was received by the Russian authorities from the Emperor Alexander, prohibiting him from proceeding any farther, and he was compelled to return. He was accompanied by a Russian officer to the frontiers of Germany, and was treated with external politeness combined with much harshness and severity. After his return to England he published 'Travels through Russia, Siberia, Poland, Austria, Saxony, Prussia, Hanover, &c., during the years 1822, 1823, and 1824, while suffering from total Blindness, and comprising an Account of the Author being conducted a State Prisoner from the Eastern Parts of Siberia,' 2 vols. 8vo, 1825.

Mr. Holman's 'Travels through Russia' were intended, as he states, to have been the commencement of a series of travels and voyages round the world, which he afterwards accomplished, and which occupied about five years. After his return he published 'A Voyage round the World, including Travels in Africa, Asia, Australasia, America, &c., from 1827 to 1832,' 4 vols. 8vo, 1834. In this 'Voyage' he visited first the islands of Madeira, Teneriffe, and the western coast of Africa; thence he crossed the Atlantic to Rio Janeiro, and went to the gold-mines. After travelling some time in Brazil, he recrossed the Atlantic to the Cape of Good Hope, and visited Caffirland, Madagascar, Mauritius, and Ceylon, whence he passed to Hindustan. He next passed by the Straits of Malacca to New South Wales, Van Diemen's Land, and New Zealand, and returned round Cape Horn to England. In 1843 he visited Dalmatia, Montenegro, Bosnia, and Servia, and passed in 1844 by Moldavia into Transylvania. Lieutenant Holman's series of voyages and travels excited much interest when they were published, chiefly from the extraordinary circumstance of their having been accomplished by a man who was totally blind, but they are, as might be expected, of little value for any information which they contain. He died July 28, 1857.

HOLOCANTHUS. [Chætodon.]

HOLSWORTHY. [Devonshire.]

HONDURAS, Republic of, Central America, occupies the elevated country between the table-land of Guatemala and the plains of Mosquitos and Nicaragua. It lies between 14° 5′ and 16° N. lat., and about 85° 30′ and 88° 40′ W. long.; but a narrow tract extends southward between Salvador and Nicaragua as far as the Gulf of Conchagua on the Pacific, 13° 30′ N. lat. Honduras is bounded E. by the Mosquito territory, but the boundary line on this side remains undefined; S. by the republics of Nicaragua and Salvador, except where the narrow tract of land reaches down to the Gulf of Conchagua; W. by Guatemala; and N. by the Caribbean Sea. The area is about 30,000 square miles; the population is about 230,000, of whom three-fourths are ladinos or mulattoes.

Surface, &c.—The Caribbean coast from Cape Cameron to Cape Honduras bears, with a general concave sweep, due west; and thence to Caballo Point, and to the mouth of the Rio Motagua, a short distance east of which is the boundary of the republic, it bears W. S.W. Between Capes Cameron and Honduras the coast is low; thence westward it is for the most part high and rocky. The only available ports are Truxillo at the mouth of the river of the same name, which is merely an open roadstead in a bay formed by Cape Honduras; and Omoa, a small but good harbour near the western extremity of the republic. The whole of this coast is extremely unhealthy, and consequently very thinly peopled. The small tract owned by Honduras bordering on the Gulf of Conchagua, in the Pacific Ocean, is also low, subject to be inundated by spring tides, and very unhealthy; but in neither case does the miasmatic influence extend far inland.

The surface of the country is greatly broken. It may be described as a table-land traversed by several ridges of hills running from north-west to south-east with secondary ridges branching obliquely from them. The general level of the table-land is perhaps about 4000 feet; the highest part is the southern side, where it borders on Salvador. Close upon the shores of the Caribbean Sea a ridge of mountains, the Sierra Omoa, extends from Cape Honduras to Caballo Point, near which is Mount Omoa, 7000 feet high, which gives its name to the ridge. The culminating point of this ridge is the peak of Congrehoy, 87° W. long., which is 7500 feet above the level of the sea. The ridges which traverse the interior of Honduras do not attain any great altitude above the general level. Between the ridges are long, wide, open and fertile valleys, which mostly descend gently to the great plain on the east. Near the western end of the state are the broad valleys of the Chamalicon and the Ulua, which are overgrown by thick forests of mahogany, cedar, and fustic trees. Along the southern side of the territory runs a ridge which divides the waters which flow into the Pacific from those which fall into the Atlantic; but only a few peaks attain any considerable elevation. From this ridge, and from the transverse ridges north-west of it, a series of high and steep hills rise from a broad-backed tract of high ground and connect the table-land of Honduras with that of Guatemala. The valleys between these ridges are of comparatively moderate width.

The principal rivers flow into the Caribbean Sea. Beginning on the west we have the Chamalicon, which rises on the Merendon Mountains near 14° N. lat. and flows in a generally northern direction into the Bay of Honduras a little east of Punta de Caballos. For a large part of its upper course it flows through a wild and uninhabited country; but as it approaches the sea the valley opens out to a great width, its slopes being covered with vast forests of valuable timber trees. Like most of the rivers of the state the navigation of the Chamalicon is impeded by a bar at its mouth. East of the Chamalicon is the Ulua, a much longer and more important stream. It is formed by the union near Santiago of several branches, the longest of which rises not far from the borders of Salvador; it falls into the sea a short distance west of Punta de Sal after a course of about 300 miles; only a few miles of the lower part are navigable. The next river of any size is the Truxillo, the mouth of which forms the harbour of the same name. East of this is the Aguan, which after a course of about 100 miles discharges itself by two branches into the Caribbean Sea, about 20 miles east of Cape Honduras. None of these are navigable for more than a short distance, and then only by piraguas (a sort of river barges), except the Ulua and Chamalicon, which admit small schooners. The Choluteca, which falls into the Pacific at the Bay of Conchagua, a small stream draining a narrow valley, is the only river of the state which does not enter the Caribbean Sea. The roads throughout the republic are mere tracks worn by continual use.

Climate, Soil, Productions.—The climate, except along the coast, is on the whole salubrious, though the temperature is somewhat high. Goître is common in the elevated districts. The valleys opening to the sea are very fertile, but moist and unwholesome. Those from which the air of the sea is intercepted by ranges of hills are less humid and more habitable, but their fertility is not so great. On the tableland, and in the districts not contiguous to the Caribbean Sea, the dry season begins about the close of October, and lasts until the end of May; during which time only a few showers occasionally refresh the air. In the beginning of June thunder is frequent, and is followed by long and heavy rains. But even during this time it rains only in the evening and night: from six o'clock in the morning till three or four o'clock in the afternoon, no cloud passes over the sky, and the air is dry and pleasant. Towards the middle of October the north winds set in with frequent thunderstorms, and after them the dry season begins.

The most important natural productions are the vast forests of mahogany, cedar, fustic, pimento, and numerous other valuable trees; but owing to the badness of the roads, the scarcity of labour, and other local causes, they are turned to comparatively little account. From the same causes, and from the indisposition of the inhabitants to steady labour in the fields, agriculture is in a very backward state; not only are immense tracts of fertile land wholly neglected, but the land which is under cultivation is very far from being rendered as productive as it easily might be. Maize, rice, some wheat and barley, frixoles, plantains, and various fruits and vegetables are the principal articles grown, but scarcely in sufficient quantities for the requirements of the inhabitants. In the western districts of Gracias tobacco of very fine quality is raised, but not enough for exportation. The chief dependence of the husbandman is on the cattle, of which vast herds are reared on the plains in the interior. Yet though such large numbers are maintained, they form but a limited article of export, and tallow and hides are only exported to a comparatively small amount. Sheep are not so numerous as in some of the other countries of Central America. Horses are not much attended to, nor are they of superior kinds. Mules are numerous, they being generally used in the country for the transport of goods.

The manufactures are confined to the coarser articles of home consumption. The commerce is but small; the foreign trade is chiefly carried on through Belize. As already indicated the exports are principally of mahogany, cedar, Brazil, and other cabinet and dye-woods; sarsaparilla, hides, and the products of the mines. The imports are British cottons, woollens, and hardwares, with various French, German, and American goods. Honduras is the principal mining country of Central America. The chief mining districts are the southern and western portions of the republic, but some mines occur in every department. Gold is found in veins in quartzose rocks; and in grains in alluvial deposits in the ravines, and in the sands of several of the rivers. Silver mines occur in several places in the department of Tegucigalpa, and also more or less frequently in all the other departments. Copper is found of good quality in Choluteca and elsewhere. Lead and iron-ore are found in several places. Of the present annual products of the mines we have however no reliable statement. In Gracias occur veins of remarkably fine opals, as well as some yielding emeralds. Jasper, asbestos, and cinnabar are likewise obtained. Excellent marble is wrought.

Divisions, Towns, &c.—Honduras is divided into seven departments—Comayagua, which occupies nearly the centre, and contains the capital of the republic: Gracias to the south-west, and Santa Barbara to the north-west of Comayagua, both of which extend to Guatemala, and Santa Barbara includes the coast as far east as Punta de Sal: Yoro, north of Comayagua, extends along the coast from Punta de Sal eastward to Cape Honduras, and contains the port-town of Truxillo: Tegucigalpa lies east of Comayagua, and is the chief mining district and most thickly inhabited department of the republic: on the north-east of it is the department of Juticalpa, which extends to the Mosquito territory: south of Comayagua is Choluteca, which stretches down to the Gulf of Conchagua, where is the little port-town of San Lorenzo, established a few years back in order to give the republic a port of entry on the Pacific. In the interior are few considerable towns; on the coast are only the small port-towns of Omoa and Truxillo.

Comayagua (*Valladolid de*), the capital, is situated in a fine but unhealthy valley, at nearly an equal distance from the ports of Omoa and Truxillo, in 14° 30′ N. lat., 87° 30′ W. long., and contains 3000 inhabitants. The public buildings are a cathedral, several churches, a college, an hospital, &c.

Tegucigalpa contains from 8000 to 10,000 inhabitants, and is the most populous place in Honduras, being the chief town of the great mining district. In its neighbourhood are mines of gold, silver, copper, and iron. It is at a considerable elevation above the sea.

Omoa, on the Bay of Honduras, 15° 38′ N. lat., 88° 5′ W. long., 12 or 15 miles from the mouth of the river Motagua, is a small place inhabited by a few ladinos, but is a good deal frequented; the harbour, which is formed by a small bay, is very good. The goods imported from Europe or America, are sent by barges to Gualán, on the banks of .the Motagua. The town is very unhealthy.

Truxillo, farther to the east, formerly carried on an active trade with Havanna, but it now exports only mahogany and a few hides, with a small quantity of sarsaparilla and tortoise-shell to Belize. The town with its suburbs contains about 4000 inhabitants.

Government, &c.—The government is vested in a president and two chambers. The president is elected by the chambers, and assisted by a council of state consisting of the ministers and some other members. The chambers consist of a legislative assembly of 14 deputies, and a senate of 14 members. The republic has a debt of about 300,000 dollars. We have not a recent return of the revenue. The chief court of justice is the supreme court at Comayagua, which is presided over by three judges. The president is the commander-in-chief of the militia. The established religion is the Roman Catholic, but other forms of worship are permitted. Education is in a very neglected state.

The coast of Honduras was discovered by Columbus in 1502. The Spaniards effected the subjugation of the country a few years later; from which time it remained a part of the Spanish kingdom of Guatemala until the declaration of independence by South America in 1820. Honduras was then comprised in the Mexican empire of Iturbide, on the dissolution of which in 1823, Honduras formed one of the federal states of Central America; but this union was also of short duration, and Honduras then became and has since continued to be an independent republic.

(Juarros, *History of Guatemala;* Haefkins, ***Centraal Amerika;*** Baily, *Central America*, &c.)

HONDURAS, BRITISH, or *Belize*, a British settlement on the east coast of Central America, is bounded N. by Yucatan, W. by Vera Paz, S. by Guatemala, and E. by the Bay of Honduras and the Caribbean Sea. The settlement extends from 15° 54′ to 18° 30′ N. lat., and from 88° to 89° 30′ W. long. The area is about 10,370 square miles, and the population, which consists chiefly of Caribs and negroes, is about 12,000.

The surface is very irregular. In the interior it is greatly elevated, while the coast is for the most part low, and fringed with reefs and small islands, termed keys, which render the navigation very hazardous. The country is watered by numerous rivers, the chief being the Belize, which is navigable for 150 miles from its mouth. The rocks are principally primary and calcareous. The easterly or sea-breezes which prevail during nine months of the year, temper the heat, which however is scarcely ever excessive; the thermometer seldom rises above 83° Fahr. even in the hottest time, and during the wet season it sinks to 60°. In June, July, August, and September heavy and frequent rains fall, and these are the most unhealthy months of the year, disease being engendered by the marsh miasmata arising from the lowlands and swamps. The soil by the coasts and rivers is a rich alluvial deposit, and very fertile. On the higher grounds are extensive forests of mahogany-trees of magnificent growth, and the logwood-tree abounds in the swamps. Cedar and other valuable timber-trees are among the natural products. The plantain is extensively cultivated. Maize, rice, cassava, arrow-root, yams, &c. are grown. Cotton, sugar, and coffee, though little cultivated, succeed well. In the woods the red tiger, the black tiger, the tiger-cat, the leopard, and other wild animals, and game, are found. Turtle abound on the keys.

British Honduras is governed by a Superintendent, and a Public Meeting, consisting of seven magistrates appointed by the inhabitants. The superintendent is immediately subordinate to the Governor of Jamaica, from whom he holds a commission. He is assisted in the administration of government by an Executive Council, consisting of the chief justice, the attorney-general, the officer commanding the land forces, and the public treasurer. An Act of the local legislature has however been passed by which the constitution of the council and assembly is proposed to be altogether remodelled. British Honduras is in the diocese of Jamaica. About 1000*l.* is voted annually by the legislature for the purposes of education.

The principal products of the country are mahogany and logwood, but cochineal, sarsaparilla, indigo, cigars, &c., are also exported, which commodities are altogether the produce of the states of Central America, and are brought to Belize merely in the course of transit to Europe. The total value of the exports in 1851 was 411,443*l.*; in 1852 it was 391,223*l.* The commerce of British Honduras is centred in the capital, and indeed only town of any size, Balize, or Belize, under which it is more fully noticed, and where will also be found mentioned various other facts relating to the settlement. [BALIZE, or BELIZE.]

HONEY-GUIDES. [INDICATORINÆ.]

HONEY-STONE. [MELLITE.]

HONEYSUCKLE, FRENCH. [HEDYSARUM.]

HONKENEJA, a genus of Plants belonging to the natural order *Caryophyllaceæ*, and the sub-order *Alsineæ*. It has 5 sepals, 5 large petals, 10 stamens alternating with glands, 3 styles and valves, and very few large seeds.

H. peploides is a British species found on sandy sea-coasts. It has ovate-acute sessile leaves, fleshy, glabrous, and 1-nerved; the petals obovate; sepals ovate-obtuse, 1-nerved, shorter than the petals; the stems are dichotomous, procumbent, rhizomatous; the flowers proceed from the forks of the stem frequently diœcious; capsules large, globose; seeds few, and large.

HOOPER. [SWANS.]

HOPPER, THOMAS, architect, was born at Rochester, in Kent, July 6th, 1775 or 1776, and, according to a family tradition, was descended from a natural daughter of Richard III. Thomas Hopper, when very young, was placed under his father, a clever measuring surveyor, and it is believed he very soon had the chief duty and responsibility of the business. Thus led to direct his attention to architecture, he became in some degree a self-taught architect; and being about this time introduced to Mr. Walsh Porter, a friend of the Prince Regent, and a sort of authority in matters of taste, Hopper was so fortunate as to please Porter, and was employed by him in extensive alterations and decorations to his house at Fulham, called Craven Cottage. This house became a remarkable specimen of the '*cottage-ornée*' style, afterwards so fashionable, and which Hopper perhaps was the means of introducing. The house contained a 'robber's cave,' entered from the top: an octagonal vestibule, with the roof supported by palm-trees; a 'gothic' chapel with stained glass, and other whimsies; and externally presented the appearance of a thatched cottage, with trellis-work and creeping plants. Here the Prince often supped. Hopper was made known to him, and was employed at Carlton House in some alterations, as well as on the conservatory there—a sort of imitation of Henry the Seventh's Chapel, which was erected at one end of the lower suite of rooms, and used at the fête to the allied sovereigns in 1814. Here supper tables were placed—down their length being a narrow tank for water, in which live fish disported. Hopper's taste, and the art of the day—the character of which last has been sufficiently pointed out above—were suited to one another; and, favourably introduced, and possessing great energy, a wonderful flow of conversation, and high spirits, it is not surprising that, at a time when there were fewer professional architects than there are now, Thomas Hopper should have speedily entered upon a large practice. Amongst the buildings of all kinds which he was employed in either erecting or altering, may be named—Slane Castle, in Ireland, for the Marquis of Conyngham; Penrhyn Castle, near Bangor, North Wales; Gosford Castle, Armagh; Easton Lodge, Dunmow, for Viscount Maynard; Leigh Court, near Bristol; the house at Kimmel Park, near St. Asaph, for Lord Dinorben; one at Amesbury Park, near Salisbury; Danbury Palace, Essex; Gatton House, Surrey; Wyvanhoe Park; Llanover Court, Monmouthshire, for Sir Benjamin Hall; Stansted Park, near Havant, Hants; Margam, in South Wales; Alton Towers, Staffordshire; Rood Ashton, near Trowbridge; and many others of the same class—the works which were of the nature of alterations generally involving complete re-modelling of the structure and of its architectural character. He attempted several different styles—the baronial castellated, then in favour, being of course amongst the number. Penrhyn Castle is perhaps the best exemplification of the latter kind of taste, and is indeed in many respects impressive in effect, and may be regarded as Hopper's best work. A vast amount was expended on it. He designed a baronial castle for the Duke of Atholl, at Dunkeld, in Scotland, which if completed would have rivalled Windsor Castle in extent, though the building never got beyond the foundations. He erected several prisons, amongst them the Essex County Gaol, to which afterwards he made alterations costing 40,000*l.* on its conversion for the cellular system. In London he was the architect of Arthur's Club-House in St. James's-street, the Legal and General Life Insurance Office in Fleet Street, and the Atlas Fire Office in Cheapside. His general manner for such buildings was derived from the class of edifices to which the Banqueting House, Whitehall, belongs. His last work, St. Mary's Hospital, Paddington, which is inferior in character, was designed and superintended by him gratuitously; but in it he met with much vexation and legal expense. He was for many years the county surveyor of Essex, and surveyor to the Atlas Fire Office. He was a competitor for the General Post Office in St. Martin's-le-Grand, when nearly one hundred designs, by eighty-nine competitors, were submitted. Sir Robert Smirke, who had not been a competitor, was ultimately engaged to erect the building; and Mr. Hopper contended that his design had been used, with the omission of some columns and of a few other features; and this, in a letter to Lord Melbourne, in 1839 'On the Building of the Royal Exchange,' he showed, by the aid of plans and elevations, might have been the case. He was also a competitor for the new houses of parliament, and published his designs in folio at some expense. Amongst many designs which he has left, are one for an alteration of the National Gallery, and another for a column of Victory to be erected in India with cannon placed in successive tiers, from the base upwards, of the shaft.

Although not possessing those high qualifications in art and science which the architect now strives to bring to his profession, Hopper's life is not the less an important one in the later history of architecture. He lived to enter the eighty-first or eighty-second year of his age, dying on the 11th of August 1856 at his cottage, which had been built by him, at Bayswater Hill. In life, he possessed a frame which could support almost any amount of fatigue,—and although he was contemporary with the *bon vivants* of the Georgian era, he never drank anything but water. He practised athletic exercises with Jackson the boxer, and was active in command of a company of the volunteers. His features and form have been exactly given by Mr. J. Ternouth, the sculptor, in the relievo on the eastern compartment of the Nelson Column, to the sailor who is supporting a wounded boy. He was always connected with the leading personages of his day, and this circumstance afforded him inexhaustible anecdotes. The Prince Regent would have conferred on him the honour of knighthood, but this he declined, as well as offers from Alexander I., emperor of Russia, and the Duchess of Oldenburg, for him to settle at St. Petersburg. The obituary notice in the 'Builder' (vol. xiv., p. 481)—the facts of which are apparently, like those above, derived from family sources—calls him "a man of mark and power," a conclusion which may help to justify the position which we have given to his name.

HOREHOUND. [Bellota ; Marrubium.]

HORNBLENDE, a Mineral belonging to the group of the Anhydrous Silicates of Magnesia. An account of its general characters and formation is given under Augite. It is subject to numerous varieties differing much in appearance, arising from isomorphism and crystallisation. Alumina enters into the composition of some of them, and replaces part of the other ingredients.

The varieties are divided into light and dark coloured.

To the light coloured varieties belong *Tremolite* or *Grammatite*. It comprises the white, grayish, and light-greenish slender crystallisations, usually in blades or long crystals, penetrating the gangue, or aggregated into coarse columnar forms. It is sometimes nearly translucent. The specific gravity is 2·93.

The light-green varieties are called *Actinolite*. *Glassy Actinolite* includes the bright glassy crystals of a rich green colour, usually long and slender, and penetrating the gangue like tremolite. *Radiated Actinolite* includes olive-green masses, consisting of aggregations of coarse acicular fibres, radiating or diverging. *Asbestiform Actinolite* resembles the radiated, but the fibres are more delicate. *Massive Actinolite* consists of angular grains instead of fibres. The specific gravity is 3·02 to 3·03. [Actinolite.]

Asbestus is also included under this division. [Asbestus.]

To the dark-coloured varieties belongs *Pargasite*, a term which is applied to dark-green crystals, short and stout, of bright red lustre, of which Parga in Finland is a notable locality.

The term *Hornblende* is applied to the black and greenish-black crystals and massive specimens. It contains a large per centage of oxide of iron, and to this it owes its dark colour. It is a tough mineral. Pargasite and Hornblende both contain alumina.

The varieties of Hornblende fuse easily with some ebullition, the pale varieties forming a colourless glass, and the dark a globule more or less covered with iron. Hornblende is an essential constituent of certain rocks, as syenite, trap, and hornblende-slate.

Actinolite is usually found in magnesian rocks, as talc, steatite, or serpentine. *Tremolite* occurs in granular limestone and dolomite ; *Asbestus* occurs in the above rocks, and also in serpentine.

(Dana, *Manual of Mineralogy*.)

HORNBY. [Lancashire.]

HORNSEA. [Yorkshire.]

HORNSEY. [Middlesex.]

HORNSTONE. [Quartz.]

HOUGHTON-LE-SPRING. [Durham.]

HOUNSLOW. [Middlesex.]

HOVINIA, a genus of Plants belonging to the natural order *Rhamnaceæ*. The peduncles of *H. dulcis* become extremely enlarged and succulent, and are in China in much esteem as a fruit, resembling in flavour, it is said, a ripe pear. Some species are astringent.

HOWARD, HENRY, R.A., Professor of Painting in the Royal Academy, was born on the 31st of January 1769. He was a pupil of Philip Reinagle, R.A., and was admitted a student at the Royal Academy in March 1788. As a student his success was very decided ; and it was his fortune, for the first time in the history of the institution, to receive on the same occasion, December 10th, 1790, two of the highest premiums—the first silver medal for the best drawing from the life, and the gold medal for the best historical painting ; and he at the same time received the special commendations of the president, Sir Joshua Reynolds, for the excellence of his historical design. In the following year he visited Italy, and at Rome he and Flaxman pursued their studies in conjunction.

On his return to England Mr. Howard was employed to make drawings for the Dilettanti Society, and designs for book-plates ; he also painted some portraits. His first contributions to the Royal Academy, 'Æneas and Anchises' and the 'Planets drawing Light from the Sun' (1796), were much admired by persons of classic tastes ; and from this time for more than half a century Mr. Howard continued, without a single intermission, to send to each annual exhibition some paintings almost invariably of the classes of which these may be taken as the types. In fact the enormous number of pictures which he executed, though illustrating themes from the Scriptures, and from Greek, Roman, Italian, and English history, poetry and mythology, have all or nearly all the same character, for which perhaps there is no word so descriptive as that of 'academic.' His figures are almost always well drawn ; of elegant proportions ; have the established 'classic' contour and expression, or absence of expression ; are clothed, or partly clothed, in the same conventional 'drapery' which nymphs and goddesses, whatever their position, wear so easily and gracefully in pictures and statues, despite the ordinary laws of gravity, which however may fairly be regarded as not applying to such beings ; and they are so arranged as to afford a pleasing flow of line and an agreeable conformity to the rules of pictorial composition ; while the colouring, if not rich and glowing, is chaste and harmonious. They were in fact good 'academic' pictures, and they are no more. Always strictly attentive to the proprieties, there is nothing in any one of his works, whether it be a 'Venus rising from the Sea,' a 'Love animating the Statue of Pygmalion,' or a cold 'Primeval Hope,' that can by any chance give the slightest shock to the nerves of the most susceptible—who is not shocked by any representation of undraped female beauty. But if his "bevies of fair forms" are never like those of Etty trembling on the verge of the voluptuous, they never like them are buoyant with the exuberance of life and youthful vigour—never exhibit the free abandon of riant enjoyment and unrestrained spontaneous action. They are works to be looked at with a certain quiet admiration of the artist's skill, not to seize the attention and linger in the memory. In a word, they are works of taste, not of genius.

Mr. Howard was elected an associate of the Royal Academy in 1801 ; in 1808 he became an academician ; and in 1811 he was appointed secretary to the Academy, an office he held till his death, though for some years previously its active duties were performed by an assistant. He died on the 5th of October 1847.

The titles of a few of his pictures will sufficiently indicate the range and character of his subjects. Of his scriptural paintings, the most ambitious are 'Christ blessing Little Children,' placed as an altar-piece in the chapel in Little Berwick Street ; 'the Angel appearing to St. Peter in Prison ;' and 'Aaron staying the Plague.' The great bulk of his pictures as already mentioned are however those in which the subjects were chosen with a view to afford the opportunity of painting the nude female form ; and to this class his best pictures belong. The most admired of these is his 'Birth of Venus,' painted in 1829. Others are 'The Marriage of Cupid and Psyche,' 'Proserpine,' and like stock subjects ; but a large number consists of figures floating in the air with such titles as the 'Pleiades,' the 'Solar System,' the 'Circling Hours,' 'Morning,' 'Night,' &c. Besides numerous pictures from Spenser, his favourite poet, Milton, Shakspere (especially the 'Midsummer Night's Dream') &c., he painted many as 'Fairies on the Sea Shore,' with merely fancy titles ; and he also painted many portraits. It deserves to be mentioned as illustrative of his life-long devotion to his art, that not only did he continue to paint pictures for the Academy exhibitions up to the year of his death, but that on the occasion of the first cartoon competition in 1843, he did not shrink from entering the lists, though then seventy-three years of age, and in the rude encounter with the young artists fresh from the schools, his cartoon, 'Man beset by contending Passions,' carried off one of the premiums of 100*l*.

In 1814 Mr. Howard won the prize for a medal for the Patriotic Society, and thenceforward he was generally employed in preparing the designs for the medals and great seals required by the government. He also made numerous designs for works to be executed in silver, chiefly for the house of Rundle and Bridge. Frank Howard, the son of Mr. Howard, is well known as an able designer, and the author of several elementary works on art. To a brief memoir of his father, contributed by him to the 'Athenæum' for November 13, 1847, we are indebted for most of the facts in this notice.

HOWLET. [Strigidæ.]

HOYA, a genus of Plants belonging to the natural order *Asclepiadaceæ*. It has 5-cleft rotate corolla. Coronet of appendages depressed, 5-leaved ; leaflets spreading, fleshy, with the inner angle extended into a tooth lying upon the anther. Anthers terminated by a membrane. Pollen-masses fixed by the base, converging, compressed. Stigma not pointed, or scarcely so. Follicles smooth.

H. viridiflora is a native of Coromandel, Sylhet, and the

Nilgherry Hills. It has opposite, stalked, broad, cordate, or ovate leaves, not sinuate at the base, pointed, membranous, smooth, from 3 to 4 inches long; petioles from 1 to 2 inches long; umbels lateral or axillary, simple, many-flowered. Flowers numerous, green, with pedicles as long as the peduncle. Corolla flat; crown of appendages turbinate, truncate. Anthers reflected over the stigma. Follicles horizontal, obtuse, about 3 or 4 inches long, and 4 inches in circumference. The root and tender stalks produce nausea, and promote expectoration. The leaves peeled and dipped in oil are used by the natives of India as a discutient in the early stages of boils; when the disease is more advanced they are employed in the same way to promote suppuration.

Several species of this genus are cultivated in our gardens on account of their elegant flowers, which, from their curious wax-like appearance, give rise to the name of Wax-Plants.

HUME, JOSEPH, was born at Montrose in the year 1777. His father was the master of a small coasting-vessel, and after his death his widow supported herself by keeping a shop in Montrose. Having received the merest rudiments of education, including Latin and a smattering of accounts, at a school in his native town, he was apprenticed in his fourteenth year to a surgeon. In 1793 he entered the University of Edinburg for the purpose of prosecuting his medical studies; and having taken a medical degree, and passed the London College of Surgeons, he was appointed surgeon to an East Indiaman in 1797. He distinguished himself not only in his medical capacity, but also by acting as purser on his voyage out, and conducting a most complicated business in a very successful manner. On reaching India he mastered the native languages, and, in addition to his functions as an army surgeon, he became Persian interpreter, commissary-general, and pay-master and post-master of the forces in the prize agencies. It is said that he owed the first step of his promotion to his knowledge of chemistry, which enabled him to detect the presence of damp in the government stores of gunpowder on the eve of Lord Lake's Mahratta war. Nothing is more surprising than the amount of hard work performed by the young civilian at this time, and its success enabled him to return to England in the prime of life with a fortune of about 30,000*l*. On returning to England he commenced studying the history and resources of Great Britain, and acquired that insight into the condition of both the government and people which formed the foundation of his subsequent exertions in the cause of reform. In the same spirit he visited a large portion of the Continent, and made a tour through Spain, Portugal, Turkey, Greece, and Egypt, to increase his stores of political experience.

In 1813 he entered parliament under the auspices of the late Sir J. Lowther Johnstone, Bart., as member for Melcombe Regis, which now forms part of the borough of Weymouth, but failed to secure his re-election in the autumn of the same year. In the interval between this date and 1818 he became acquainted with Place, Mill, and other disciples of the school of Jeremy Bentham; and devoted considerable time and energy to the foundation of savings banks and of schools on the Lancasterian system. He was also a candidate—though an unsuccessful one—for a seat at the Board of East India Directors. In 1818 he re-entered parliament as member for the Montrose burghs, for which he continued to sit without interruption until 1830, when he was chosen by the constituency of Middlesex. He represented that county during all the period of agitation which preceded the passing of the Reform Act and down to 1837, when he was defeated, but he was returned through the influence of Mr. O'Connell for Kilkenny. In 1841 he contested Leeds without success; but in the following year was re-elected for his native Montrose burghs, which he represented down to his death, a period of thirteen years.

For many years Mr. Hume stood nearly alone in the House of Commons as the advocate of Financial Reform: indeed in the cause of reduction of taxation and public expenditure no man ever did so much practical good as Joseph Hume, through a long career of perseverance and industry. Disregarding the fashion of the age and the opinions of the world, he adhered in the smallest matters to what he thought just and right. In most of the political and social movements of the last quarter of a century he was an important actor: the working man eats bread which he helped to cheapen, walks through parks which he helped to procure for him, and is in a fair way to attain further educational advantages in consequence of his exertions. He more than once refused to accept office under Liberal governments, and he devoted a part of his own wealth to the social and political objects which he had in view. His speeches delivered in parliament occupy in bulk several volumes of 'Hansard's Debates.' He incessantly advocated reforms in our army, navy, and ordnance departments, of the Established Church and Ecclesiastical courts, and of the general system of taxation and the public accounts. He early advocated the abolition of military flogging, naval impressment, and imprisonment for debt. With little active assistance, he carried the repeal of the old combination laws, the laws prohibiting the export of machinery, and the act for preventing mechanics from going abroad. He was unceasing in his attacks on colonial and municipal abuses, election expenses, the licensing systems, the duties on paper and printing, and on articles of household consumption. He took an active part in carrying Roman Catholic emancipation, the repeal of the Test and Corporation Acts, and in the passing of the Reform Act of 1832. A remarkable passage in his life was his discovery, in 1835, of an extensive Orange plot, commencing before the accession of William IV. An account of this transaction, in all the minuteness of detail, will be found in Miss Harriet Martineau's 'History of the Thirty Years' Peace.'

The health of Mr. Hume began to break soon after the parliamentary session of 1854, and he died at Burnley Hall, his seat in Norfolk, on the 20th of February 1855. At the time of his death he was a magistrate for Norfolk, Westminster, and Middlesex, and a deputy lieutenant for the latter county. As a proof of the general esteem in which he was held, we may add, that in the House of Commons speakers of all parties took occasion to pay a tribute to his character. He married a daughter of the late Mr. Burnley, by whom he left a family of several sons and daughters. His eldest son is Mr. Joseph Burnley Hume, barrister-at-law.

HUMOPINIC ACID. [CHEMISTRY, *S.* 1.]

HUSBAND. [DIVORCE, *S.* 2; SEPARATION, JUDICIAL, *S.* 2; WIFE, *S.* 2.]

HYACINTHE, ST. [CANADA, *S.* 2.]

HYÆNANCHE, a genus of Plants belonging to the natural order *Euphorbiaceæ*. *H. globosa* yields a fruit which is collected by the Cape Colonists, and when powdered is used as a poison for hyænas by being rubbed over meat.

HYDRA (Linnæus), a genus of Polypiferous Animals, including the Fresh-Water *Hydra*, or Polype. It has the following technical definition:—Polypes locomotive, single, naked, gelatinous, subcylindrical, but very contractile and mutable in form; the mouth encircled with a single series of granulous filiform tentacula.

As of all the forms of polypiferous animals the *Hydra* is the most interesting, we give an abstract of their history, from Dr. Johnston's 'British Zoophytes:'—

Leeuwenhoek discovered the *Hydra* in 1703, and the uncommon way its young are produced; and an anonymous correspondent of the Royal Society made the same discovery in England about the same time; but it excited no particular notice until Trembley made known its wonderful properties about the year 1744. These were so contrary to established experience, and so foreign to every preconceived notion of animal life, that by many they were regarded as impossible fancies. Leading men of our learned societies were daily experimenting on the creature and transporting it by careful posts from one to another, while even ambassadors were forwarding to their respective courts early intelligence of the engrossing theme. The *Hydræ* are found in fresh waters only. They prefer slowly-running or almost still water, and adhere to the leaves and stalks of submerged plants. The body is exceedingly contractile, and hence liable to many changes of form; when contracted it is like a tubercle, a minute top or button, and when extended it becomes a narrow cylinder, being ten or twelve times longer at one period than another, the tentacula changing in size and form with the body. On the point opposite the base, and in the centre of the tentacula, we observe an aperture, or mouth, which leads into a wider cavity, excavated as it were in the middle of its body, and from which a narrow canal is continued down to the sucker. When contracted, and also when fully extended, the surface appears smooth and even; but in 'its middle degree of extension' the sides seem to be minutely crenulated, an effect probably of a wrinkling of the skin. The tentacula encircle the mouth and radiate in a star-like fashion; but they seem to originate a little under the lip, for the mouth is often protruded like a kind of small snout; they are cylindrical, linear, or very slightly tapered, hollow, and roughened, at short and regular intervals, with whorls of tubercles, which under the microscope form a very beautiful and interesting object.

Each tentaculum forms a slender membranaceous tube, filled with an albuminous nearly fluid substance, intermixed with some oleaginous particles; and at certain definite places this substance swells out into tubercles or denser wartlike nodules, which are arranged in a spiral line. Every nodule is furnished with several spinigerous vesicles, used as organs of touch, and with a very singularly constructed organ for catching the prey. The organ of touch consists of a fine sac, inclosing another with thicker parietes, and within this there is a small cavity. From the point where the two sacs coalesce above there projects a long cilium, or capillary spine, which is non-retractile and apparently immoveable. Surrounded by these cilia, and in the centre of the nodule, is placed the captor organ, called the 'hasta;' this consists of an obovate transparent sac, immersed in the nodule, with a small aperture even with the surface. At the bottom of the sac, and within it there is a saucer-like vesicle, on whose upper depressed surface is seated a solid ovate corpuscle, that gives origin to and terminates in a calcareous sharp sagitta, or arrow, that can be pushed out at pleasure, or withdrawn, till its point is brought within the sac. When the *Hydra* wishes to seize an animal, the sagittæ are protruded, by which means the surface of the tentacula is roughened, and the prey more easily retained; and Corda believes that a poison is at the same time injected—a conjecture offered to explain the remarkable fact of the almost instant death of the prey. The nodules of the tentacula are connected together by means of four muscular fibres, or bands, which run up, forming lozenge-shaped spaces by their intersections. These are the extensor muscles of the tentaculum. They are again joined together by transverse fibres, which Corda believes to be adductor muscles, and to have also the power of shortening the tentacula. But it may be doubted whether this muscular apparatus is of itself sufficient to effect the wonderful extensibility of these organs—from a line, or, as in *H. fusca*, to upwards of eight inches; and to produce this degree of elongation, it seems necessary to have superadded the propulsive agency of a fluid. Water flows, let us say by suction, into the stomach through the oral aperture, whence it is forced by the vis-a-tergo, or drawn by capillary attraction, into the canals of the tentacula, and its current outwards is sufficient to push before it the soft yielding material of which they are composed, until at last the resistance of the living parts suffices to arrest the tiny flood, or the tube has become too fine in its bore for the admission of water attenuated to its smallest possible stream—how inconceivably slender may indeed be imagined, but there is no thread fine enough to equal it, seeing that the tentacula of *H. fusca*, in tension, can be compared to nothing grosser than the scarce visible filaments of the gossamer's web.

The *Hydra*, though usually found attached, can nevertheless move from place to place, which it does either by gliding with imperceptible slowness on the base, or by stretching out the body and tentacula to the utmost, fixing the latter, and then contracting the body towards the point of fixture, loosening at the same time its hold with the base; and by reversing these actions it can retrograde. Its ordinary position seems to be pendant, or nearly horizontal, hanging from some floating leaf or weed, or stretching from its sides. In a glass of water the creature will crawl up the sides of the vessel to the surface and hang from it, sometimes with the base and sometimes with the tentacula downwards; and again it will lay itself horizontally. Its locomotion is very slow, and the disposition of the zoophyte is evidently sedentary; but the contractions and mutations of the body are very vivacious, while in seizing and mastering its prey it is surprisingly nimble, seizing a worm with as much eagerness as a cat catches a mouse. It enjoys light, and expands more freely under its influence; hence we generally find the *Hydra* near the surface and in shallow water. The *Hydra* are very voracious, feeding only on living animals. In confinement, however, Trembley found they might be fed on minced veal, fish, or beef and mutton. They will sustain long fasts with no other change than a paler colour indicates. Small worms, crustaceans, and insects seem to form a favourite food. Sometimes two polyps will seize upon the same worm, and most amusing is it then to witness the struggle that ensues, sometimes resulting in the swallowing of the weaker polyp by the stronger, which however is soon disgorged with no other loss than his dinner. This is the more curious when contrasted with the fate of the worms on which they feed. No sooner are they seized than they evince every symptom of painful suffering, but their contortions are merely momentary, and a certain death suddenly follows their capture. How this effect is produced is still a matter of conjecture. Worms are in ordinary circumstances most tenacious of life, and hence one is inclined to suppose that there must be something poisonous in the *Hydra's* grasp. To the *Entomostraca* the touch is not equally fatal, their shells evidently protecting them from the poisonous secretion. The *Hydra* is chiefly celebrated on account of its manner of propagation. It is like zoophytes in general, monœcious, and every individual possesses the power of continuing and multiplying its race, principally however by the process of subdivision. During the summer season a large tubercle arises on the surface, which lengthening and enlarging every hour, in a day or two develops in regular succession and in successive pairs a series of tentacula, and becomes in all respects except in size similar to its parent. It remains attached for some time, and grows and feeds, and contracts and expands after the fashion of its parent, until it is at length thrown off by a process of exfoliation or sloughing. They develop with great rapidity in warm weather, and sometimes the young ones themselves breed others, and they again a third or fourth generation before they become separated from the original parent. Trembley found that an individual of *H. grisea* produced forty-five young ones in two months. In autumn the *Hydra* generates by internal oviform gemmules, which extrude from the body, and lie during the winter in a quiescent state, and are stimulated to evolution only by the returning warmth of the spring. Few observations have been made on these ova, so that their structure, source, manner of escape, and condition, are scarcely known.

These are the modes in which the *Hydra* naturally multiplies its kind, but it can be increased by artificial sections of the body in the same manner that a perennial plant can by shoots or slips. If the body be halved in any direction each half in a short time grows to a perfect *Hydra;* if it is cut into four or eight or even minced into forty pieces, each continues alive, and develops a new animal, which is itself capable of being multiplied in the same extraordinary manner. If the section is made lengthwise so as to divide the body into two or more slips connected merely by the tail, they are speedily reunited into a perfect whole, or if the pieces are kept asunder each will become a perfect polyp. If the tentacula are cut away, new ones are quickly produced, and the lopt-off parts are not long without a new body. When a piece is cut out of the body the wound speedily heals, and as if excited by the stimulus of the knife, young polyps sprout from the wound more abundantly; when a polyp is introduced by the tail into another body, the two unite and form one individual, and when a head is lopt off, it may safely be ingrafted on the body of any other which may chance to want one. And the creature suffers nothing itself by all these apparently cruel operations; for before the lapse of many minutes the upper half of a cross section will expand its tentacula and catch prey as usual, and the two portions of a longitudinal division will after an hour or two take food and retain it. A polyp cut transversely in three parts requires four or five days in summer and longer in cold weather for the middle piece to produce a head and a tail, and the tail part to get a body and head, which they do in pretty much the same time. And what is still more extraordinary, polyps produced in this manner grow much larger and are far more prolific in the way of their natural increase than those which were never cut. When such things were first announced, when to a little worm the attributes of angelic beings were assigned, and the wild fictions of antiquity realised, it is not wonderful that the vulgar disbelieved when naturalists, familiar with all the miracles of the insect world, were amazed and wist not what to do.

The following are British species of this genus:—

H. viridis (Polypes Verds of Trembley), is of a grass-green colour. The body cylindrical or insensibly narrowed downwards; tentacula 6 to 10, shorter than the body. It is commonly found in ponds and still waters. The polyps of this species differ from the following, not only in colour, but likewise in their arms, which are much shorter in proportion to their bodies, capable of but little extension, and narrower at the root than the extremity, which is contrary to the other species. Their arms were so short they could not clasp round a very small and slender worm, but seemed to pinch it fast till they could master and devour it, which they did with as much greediness as any. It was first observed in England in the spring of 1743 by a Mr. Ducane of Essex. It appears to be a hardy animal, and is easily kept for a length of time in a phial of water.

H. vulgaris is of an orange-brown or yellowish colour, body cylindrical, tentacula 7 to 12, as long or longer than the body. It is found in weedy ponds and slowly-running waters. This does not exceed *H. viridis* in size, which it resembles also in its habits and form. It is always of an orange-brown or red colour, the intensity of the tint depending on the nature of the food, or the state of the creature's repletion. Every part of the body is generative of young, which may frequently be seen hanging from the parent at the same time in different stages of their growth.

H. attenuata is of a light oil-green colour, the body attenuated below, with pale tentacula longer than itself. It is found in ponds, and in Yetholm Lough, Roxburghshire. This is a larger animal than *H. vulgaris*, and comparatively rare, less sensible to external impressions, and of a more graceful form. Its colour is a pale olive-green, with paler tentacula, which are considerably longer than the body, and hang like silken threads in the water, waving to and fro without assuming that regular circular disposition which they commonly do in *H. viridis*. Dr. Johnston says he has not observed more than one young at a time, which pullulated from near the middle of the body, and after this has attained a certain growth the polyp has the appearance of being dichotomously divided.

H. oligactis (Polypes à Long Bras of Trembley) is brown or griseous; inferior half of the body suddenly attenuated; tentacula several times longer than the body. It is found in still waters in England, rare. In a pond at Hackney, and in a pond at Cranmore, near Belfast, September 1812. The tails of these are long, slender, and transparent, and when placed under the microscope a long straight canal may be seen passing from the body or stomach to an opening at the end thereof; these are rather lighter coloured than *H. vulgaris*, and have seldom more than 6 or 8 arms, but those capable of great extension. It may be worth while to call attention to the remarkable resemblance of the *Hydra fusca* to the *Cucullanus cirratus* of Müller, which is an intestinal worm.

(Johnston, *History of British Zoophytes;* Landsborough, *Popular History of British Zoophytes;* Trembley, *Mémoires pour servir à l'Histoire d'un Genre de Polypes d'Eau douce*, the Hague, 1743; Baker, *Natural History of the Polype.*)

HYDRIDÆ, a family of Snakes belonging to the Colubrine sub-order of Dr. J. E. Gray's arrangement, and the first section of this sub-order, which includes the *Hydridæ* and *Boidæ*. [BOA.] It is thus characterised:—Belly covered with narrow elongate shields or scales, nearly resembling those of the back.

The following is a synopsis of the genera, and a list of the species, compiled from the Catalogue of the specimens of Snakes in the British Museum:—

Hydridæ.—The ventral shields narrow, hexagonal or band-like; the hinder limbs not developed; the eyes and nostrils superior, vertical, the latter valvular, generally placed in the middle of a shield, with a slit or groove to its outer edge; fangs moderate, intermixed with the maxillary teeth; pupil small, round; tail compressed or conical. They live in the sea or salt-water lakes, or in fresh water.

Synopsis of the Genera.

I. Tail compressed (except in *Acrochordus*). Belly keeled, with two rows of small scale-like shields, often united together in a single, rather broad, 6-sided shield.

A. Head shielded to the nape. Nasal shields very large, with a large, operculated, superior nostril in their hinder edge; the frontal shields two pairs, small; loreal shield none; labial shields high, large. *Hydrina.*

These are the true Sea-Snakes. They coil themselves up on the shore, and appear to live on sea-weed, and lay their eggs on the shore. They are often found asleep on the surface of the sea, where they are easily caught, for they cannot descend into the sea without throwing themselves on to their backs. This arises apparently from the necessity of expelling the air from their large lungs. They are often thrown ashore in the surf, and are occasionally carried up rivers by the tide, but they cannot live in fresh water. Their bite is venomous, and they are held in great dread by fishermen wherever they occur, on this account. In spite of their venomous properties, one species at least, the *Hydrus* (*Pelamis*) *bicolor* is said by Cuvier to be eaten at Taheite.

a. Scales square or 6-sided, placed side by side.

* Head elongate, depressed.

1. *Pelamis.*
P. bicolor. Pacific Ocean. For figure see HYDRUS.
P. ornata. Borneo.

** Head moderate, rather compressed; gape moderate.

2. *Lapemis.*—Head moderate, short, rounded in front; dorsal scales square: ventral shield broad, 6-sided.
L. curtus. Madras.
L. Hardwickii. Borneo.

3. *Aturia.*—Head moderate, short, rounded in front; dorsal scales 6-sided; ventral shield 6-sided.
A. ornata. Indian Seas.
A. Belcheri. New Guinea.

4. *Microcephalophis.*—Head small; scales 6-sided; ventral scales keeled.
M. gracilis, the Kadel Nagam. Madras.

b Scales ovate, 6-sided, imbricate, keeled, or with the keel reduced to a tubercle on the centre of the scales; head and gape moderate.

* Labial shields occupying the greater part of the lips; the eyes over the fourth, or rarely over the third, or the fourth or fifth shield; ventral shield united.

5. *Enhydrina.*—Rostral plates narrow, erect; lower linear, sunken; nasal narrowed in front; ventral shield flat; head moderate, short; eyes moderate.
E. Bengalensis. Madras.
E. Valakadyen. Madras.

6. *Hydrophis.*—Rostral broad, transverse; lower triangular; nasal truncated or notched in front; ventral shield flat; head short; eyes small.
H. obscura, the Shootur Sun. Madras.
H. Lindsayii. China.
H. fasciata. Indian Ocean.
H. nigrocincta, the Kerril. Bengal.
H. doliata, the Black-Headed Kerril. Australia.
H. subcincta, Shaw's Chittul. Indian Ocean.
H. sublævis, the Chittul. China and Indian Ocean.
H. mentalis, the Pale Chittul. Indian Ocean.
H. ocellata, the Eyed Chittul. Australian Seas.
A. spiralis, the Shiddil. Indian Ocean.
H. subannulata, the Ringed Sea-Snake. India.
H. aspera, the Rough Sea-Snake. Singapore.
H. cærulescens, the Bluish Sea-Snake. Bengal.

7. *Chitulia.*—Rostral broad, transverse; lower triangular; nasal truncated or notched in front; ventral shields flat: head elongate, depressed; eyes large.
C. inornata. Indian Ocean.
C. fasciata. Indian Ocean.

8. *Kerilia.*—Rostral broad, transverse; lower triangular; nasal truncated in front; ventral shield broad, convex, forming a slight keeled ridge; the hinder ones with a keel on each side; head short, shelving; scales very large, broad, 6-sided; eyes rather large, over third and fourth labial shields.
K. Jerdonii, the Kerilia. Madras.

** Labial shield occupying the front half of the lip; eyes over the fifth or sixth shield; hinder part of the face covered with small scales; ventral scales generally 2-rowed, forming a keeled ridge, some united in pairs into 6-sided shields.

9. *Hydrus.*
H. major, the Sea-Snake. India; Australia.
H. annulatus, the Ringed Sea-Snake. Singapore.

c. Body covered with smooth polished imbricate scales; head as large as the body; ventral shields rather large, transverse, smooth, folded together and keeled.

10. *Tomogaster.*—Head with regular shields; superciliary shields simple; ventral shields entire.
T. Eydouxii. Indian Ocean.

11. *Stephanohydra.*—Head shields numerous; superciliary shields 3 or 4; ventral shields nicked behind.

S. fusca, Jukes's Hypotrophis. Darnley Islands.

B. Head covered with scales, like the body; nostrils surrounded by a small, continuous ring; eyes surrounded by a series of small scales; labial shields small, with a larger series above them; pupil round; ventral shields very small, scale-like, separated on each side of a keeled ridge. The species are all inhabitants of rivers. *Acrochordina.*

12. *Chersydrus.*—Tail compressed, sword-shaped, prehensile; body fusiform, covered with small rhombic scales, with a central tubercular keel.

C. granulatus, the Chersydrus. Madras. For figure see HYDRUS.
C. annulatus. Madras.

13. *Acrochordus.*—Tail conical, tapering, moderate; body fusiform, covered with tricuspid scales.

A. Javanicus. Java.

II. Tail conical, tapering. Belly rounded beneath, with more or less broad band-like shields. Rivers or ponds.

A. Head shielded; tail scaly beneath; abdominal shields flat, small, 6-sided, with a keel on each side, as if formed of two united scales; nostrils in a ring of small scales; scales keeled. *Erpetonina.*

14. *Erpeton.*
E. tentaculus, the Erpeton. [ERPETON.]

B. Head shielded; tail with two series of shields beneath; nostrils between two shields; abdominal shields broad, keeled on each side; scales smooth. *Bitiana.*

15. *Bitia.* Head small.
B. hydroides.

C. Head shielded; scales striated, and keeled or smooth; tail conical, tapering, with two series of shields beneath; nostrils in centre of a large nasal shield, with a groove to the outer side; ventral shields rounded (or rarely slightly keeled on the sides): frontal shields 3, rarely 2 or 4, all small. *Cerberina.*

a. Crown scaly; occipital rudimentary; frontals 4; anterior pair very small.

16. *Cerberus.*—Scales keeled, striated; hinder labial shield low.
C. cinereus, the Raroo Bokadam. India.
C. acutus. Borneo.
C. unicolor. Philippines.
C. australis. Australia.

b. Crown shielded; occipital moderate.

* Head distinct, depressed; frontals 4; anterior pair small; rostral rounded.

17. *Ferania.*—Scales smooth; seventh upper labial low, with a large shield over it.
F. Sieboldii. Bengal.

** Head distinct, depressed; frontals 3; anterior transverse; rostral rounded.

† Fourth and fifth hinder labial shields small or divided.

18. *Homalopsis.*—Scales keeled.
H. buccata. Java.
H. Hardwickii. India.

19. *Phytolopsis.*—Scales smooth.
P. punctata. India.

†† Hinder labial large, like others; scales keeled; rostral rounded.

20. *Uranops.*—Scales truncated, strongly keeled, striated; eye over fourth shield.
U. angulatus. Tropical America.

21. *Tachynectes.*—Scales truncated, strongly keeled.
T. Leopardina.

22. *Tropidophis.*—Scales ovate, keeled, striated; eye over fourth and fifth shield.

T. Schistosus, the Chittee. Ceylon.

23. *Myron.*—Scales ovate, slightly keeled, smooth.
M. Richardsonii. Australia.
M. trivittatus. India.

24. *Helicops.*—Scales ovate, polished; of back and tail keeled.
H. carinacaudus. North America.

††† Hinder labials large, like others; scales smooth; rostral rounded.

25. *Hypsirhina.*—Seventh labial large; eye over fourth and fifth labial; loreal distinct.
H. plumbea. Borneo.
H. Hardwickii. Penang.
H. Aer, the Ular Aer. Borneo.
H. bilineata. China.
H. Chinensis. China.
H. Bennettii. China.

26. *Farancia.*—The seventh labial large; eye over the third and fourth labial.
F. fasciata, the Wampau-Snake. New Orleans.

27. *Hydrops.*—The seventh labial large; eyes over the fourth labial; ventral shield broad; body thick; loreal none.
H. Martii. Brazil.

28. *Hygina.*—The seventh labial large; eyes over the fourth labial; ventral shield narrow; body slender; loreal none.
H. fasciata. Demerara.

29. *Dimades.*—The seventh labial short, small; eye over third and fourth labial; loreal none.
D. plicatilis. New Orleans; North America.

*** Head moderate, depressed; frontal 3; anterior elongate, erect, between the nasals; seventh smooth; rostral rounded.

30. *Fordonia.*—Scales broad, rhombic; ventral shield rounded; loreal none; eye over third labial.
F. leucobalia. Timor.
F. unicolor. Borneo.

31. *Gerarda.*—Scales broad, rhombic; ventral shields rounded; eye over fourth shield; loreal square.
G. bicolor, the Gerard. West Indies.

32. *Hipistes.*—Scales narrow, flattened; ventral shields keeled at each end; loreal square.
H. fasicatus. West Indies.

**** Head indistinct; frontal 4; anterior 4-sided, rather smaller; scales smooth; body cylindrical.

33. *Abastor.*—Body cylindrical; loreal shield none; anterior frontal 4-sided; posterior ocular 2.
A. erythrogrammus, the Striped-Wampum. North America.

34. *Raditia.*—Head small, conical; body subcylindrical: anterior frontal very small, triangular; loreal distinct; posterior ocular.
R. Indica. India.

35. *Miralia.*—Head small, conical; body compressed; frontal plates 2 pairs; loreal none; posterior ocular 2.
M. alternans. Java.

***** Head moderate, depressed; frontal shields, 2, small lateral; rostral shield angular, high, erect, between frontals and nasal.

36. *Ficinia.*—Head small; rostral plate large, produced between the frontal, angular and recurved in front.
F. olivacea. Mexico.

****** Head small; frontal shields 2, transverse, band-like; rostral triangular, subangular.

37. *Prosymna.*
P. meleagris. Guinea.

D. Head covered with small scales; tail with one row of shields beneath; abdominal shield broad, rounded, smooth; nostril in a shield, anterior, sublateral; scales granular, with rows of keeled scales. *Xenodermina.*

38. *Xenodermus.*
X. Javanicus, the Gonionote. Java.

Dr. Gray says, "The separation of the specimens of this family into species and genera is attended with great difficulty; the form and number of the shields of the head, lips, temple, and chin are liable to great variation, not only in the different specimens, but often in the two sides of the same individual. The two ventral series of scales are, in the same specimen, sometimes separate, and at other times united into a shield; and many specimens have a series of small triangular shields on the edge of the lips, between the sutures of the lip-shield, not found in other individuals of the same species.

"The distribution of the colours on the body appears to be one of the most permanent characters of the species; but this becomes less distinct in the older specimens, and is often lost in the specimens that have been carelessly or long preserved in a museum."

The existence of this family of Water-Snakes has undoubtedly given rise to the notion that a large Ophidian, which meets the popular view of a Great Sea-Serpent, exists. In all cases however the reports of the existence of such a creature have been traced to the capture or sight of some other animal, or to the exaggerated representations of some other natural object. The *Hydridæ* amongst the *Ophidia* are of comparatively small size, seldom equalling the *Boidæ* in this respect, and falling far short of the enormous dimensions popularly attributed to the Great Sea-Serpent.

HYDROBORACITE. [MINERALOGY, *S.* 1.]

HYDROCYON, a genus of Fishes belonging to the *Malacopterygii Abdominales*. The species are very numerous. They have the point of the muzzle formed by the intermaxillaries, the maxillaries nearer, before the eyes, and completing the aperture; the tongue and vomer smooth, the jaws with conical teeth, and the large suborbital covers the cheek like an operculum.

A large number of species inhabit Brazil. They are also found in the Nile.

HYDROIDA, a name given to a section of the order *Polypifera*, embracing forms resembling the fresh-water *Hydra* in the simplicity of their organisation. The following is Dr. Johnston's arrangement of the families of British Zoophytes referred to the *Hydroida*:—

* Ovisacs or bulbules naked, bud-like, pullulating from the bases of the tentacula.

Tubularina, Ehrenberg (*Tubularia*, Linnæus; *Tubulariadæ*, Johnston; Les Tubulaires, Van Beneden).

Family I.—Polyps naked, or with only a rudimentary polypidom. *Corynidæ*.

† Polyps naked.

The tentacula scattered. *Clava*.
The tentacula in one row. *Hydractinia*.

†† Polyps with a horny cuticle.

The tentacula with globose tips. *Coryne*.
The tentacula filiform. *Cordylophora*.

Family II.—Polypidom fistular; the tentacula whorled. *Tubulariadæ*.

† The tentacula in a single whorl. *Eudendrium*.

†† The tentacula in a double whorl.

Polypidom rooted. *Tubularia*.
Polypidom unrooted and deciduous. *Corymorpha*.

** Ovisacs in the form of horny capsules or vesicles scattered on the polypidoms, and deciduous.
Sertularina, Ehrenberg (*Sertularia*, Linnæus).

Family III.—Cells of the polyp sessile. *Sertulariadæ*.

† Cells biserial.

Cells alternate, tubular. *Halecium*.
Cells vasiform, everted. *Sertularia*.
Cells conico-tubular, appressed. *Thuiaria*.

†† Cells uniserial.

The branchlets plumose or pectinate. *Plumularia*.
The branchlets whorled. *Antennularia*.

Family IV.—Polype-cells on ringed stalks. *Campanulariadæ*.

Cells alternate, campanulate. *Laomedea*.
Cells irregular, or whorled. *Campanularia*.

*** Polyps propagating by buds and ova, which develop themselves on and in the body of the parent.

Hydrina, Ehrenberg (*Hydra*, Linnæus; *Hydraidæ*, Johnston). One genus only. *Hydra*.

HYDROPELTIDEÆ, *Watershields*, a natural order of Exogenous Plants (*Cabombaceæ* of Torrey, Gray, and Lindley). The species are aquatic plants, with floating peltate leaves. Flowers axillary, solitary, yellow, or purple. Sepals 3 or 4, coloured inside. Petals 3 or 4, alternate with the sepals. Stamens definite or indefinite, hypogynous, arising from an obscure torus. Anthers linear, turned inwards, continuous with the filaments. Carpels 2 or more, terminated by a short style. Ovules orthotropal, pendulous. Fruit indehiscent, tipped by the hardened style. Seeds definite, pendulous. Embryo minute, 2-lobed, inclosed in the fleshy sac of the amnios, at the apex of the nucleus, and external to an abundant fleshy albumen. There can be no doubt of the near relationship of these plants to the Water-Lilies. They are American water-plants, found from Guyana to New Jersey, and also on the coast of Australia beyond the tropics.

Hydropeltis purpurea is said to be nutritious, but slightly astringent. The leaves are employed as a remedy for phthisis and dysentery.

HYDROPHITE. [MINERALOGY, *S.* 1.]

HYDROTALCITE. [MINERALOGY, *S.* 1.]

HYMENOPHYLLEÆ, a family of Ferns including the British genera *Hymenophyllum* and *Trichomanes*. The fronds consist of branched veins, each accompanied throughout by a membranous wing or margin; a cluster of capsules, nearly spherical, is seated on one of these veins which project beyond the edge of the leaf, the cluster being inclosed in a kind of cup-like involucre.

I. *Trichomanes* has thecæ on an elongated filiform receptacle within a cup-shaped involucre of the same texture with the frond.

T. radicans, Babington, the Bristle-Fern (*T. speciosum*, Wildenow), has fronds three or four times pinnatifid, glabrous; segments uniform, linear; involucres solitary, in the axils of the upper segments; setæ at first included, ultimately very prominent. The frond in fact consists of hard wiry branched ribs, each furnished throughout with a rather membranous wing. Rhizome black, downy, very long. Fronds rather triangular, very much divided, from 4 to 8 inches long. Involucres scarcely winged.

This is a very interesting fern, on account of its beauty, its rarity, its susceptibility to injury from exposure when in cultivation, and its entire absence from all European countries or islands, with the single exception of Ireland. In texture as well as in scent it resembles some of the marine *Algæ*, and it has been observed to assume a life-like appearance on being immersed in water after being kept perfectly dry for years. At the present time this plant is to be found nowhere but in Ireland, though formerly it is said to have grown at Bell Bank, in Yorkshire. It has been lately supposed by some botanists that there are two Irish species of *Trichomanes*, the Killarney and the Glouin Caragh plants. Mr. Newman however believes the latter to be merely a variety of *T. speciosum*, and calls it *T. s. Andrewsii*. It differs from the former in having lanceolate fronds and winged involucres. It is found in very damp shady places. No other fern will thrive well in a case with the *Trichomanes*, the treatment required for one being destructive to the other. The *Trichomanes* will live or even grow lazily in a glass with other ferns, but will never attain a vigorous state of growth.

II. *Hymenophyllum* has the thecæ on a narrow subclavate receptacle within a 2-valved involucre of the same texture with the frond.

H. Tunbridgense, the Tunbridge Filmy Fern, has pinnate fronds; pinnæ distichous; segments linear, undivided, or bifid, spinosely serrate; involucre compressed, spinosely serrate; rachis broadly winged. It is slender and delicate, the rhizome very long and thread-shaped. Pinnæ, rachis, and involucres in the same place. Valves of the involucre adpressed throughout the greater part of their length, slightly gibbous at the base. It is found amongst moss and in shady places, on the surface of rocks and stones, in many places in England, Wales, and Ireland. This plant is the *Trichomanes Tunbridgense* of Linnæus, Hudson, and many of our earlier authors.

H. Wilsoni, Wilson's Filmy Fern, has pinnate fronds, pinnæ recurved; segments linear, undivided, or bifid, spinosely serrate; involucre inflated, entire; rachis slightly bordered. It resembles the preceding species, but the pinnæ curve backward and the involucres forward. The valves of the involucre are convex or gibbous throughout, touching only by their edges, which are quite entire. The range of this species seems to be much more extensive than that of *H. Tunbridgense;* it also appears to be a more northern species. and generally to prefer a greater elevation; still the two plants are often intermixed, particularly about the waterfalls in the vicinity of Killarney, and it is frequently very difficult to distinguish the one from the other. (Newman, *British Ferns.*)

HYOSCIAMA. [Chemistry, *S.* 1.]

HYPERURIC ACID. [Chemistry, *S.* 2.]

HYPOXIDACEÆ, *Hypoxids*, a natural order of Endogenous Herbaceous Plants, with a tuberous or fibrous perennial root. Leaves always growing from the root and crown, nowhere else, linear entire, plaited, of a dry texture. Scapes simple or branched, occasionally very short. Flowers complete, hermaphrodite. Perianth petaloid, adherent to the ovary, 6-parted, with the sepals coarser than the petals. Stamens 6, inserted into the base of the segments of the perianth; filaments distinct; anthers turned inwards, 2-celled, erect, opening lengthwise. The number of the plants of this order is very inconsiderable. Those that are known inhabit the Cape of Good Hope, Australia, the East Indies, the tropics of America, and the warmer parts of the United States.

The roots of *Curculigo orchioides* are somewhat bitter and aromatic, and are employed medicinally in India. The tubes of *C. stans* are eaten in the Marianne Islands; those of *Hypoxis erecta* are employed by the aborigines of North America in healing ulcers and against intermittents.

I

IBALIA. [Gallicolæ.]

IBRAIL, IBRAÏLOW, or BRAÏLOW, a large town in Wallachia, is situated on the left bank of the Danube, 15 miles S. from Galatz, 103 miles N.E. from Bukharest, and has about 20,000 inhabitants. It stands nearly opposite the Turkish fortress of Matchin, and is the chief shipping port of Wallachia, whence the corn and other products of that principality are exported. The town has of late years risen rapidly in extent and importance. Its population in 1838 was estimated at only 6000. The harbour, formed by an arm of the Danube, is sheltered by an island. There are extensive granaries and warehouses in the town. Between 600 and 700 vessels enter and leave the harbour annually. Many of the inhabitants are engaged in the sturgeon fisheries of the Danube. In the wars between the Turks and Russians in the 18th century, the town was more than once besieged and taken by the Russians, who burnt it in 1770. After the peace of Kutschuk-Kainardji in 1774, the town was strongly fortified in the European manner; but the Russians took it again in 1828, and demolished its defences. It was restored to Turkey by the treaty of Adrianople.

ICARIAN SEA. [Ægean Sea.]

ICTERIA. [Merulidæ.]

ICTINIA. [Falconidæ.]

IDE. [Leuciscus.]

IDRIALINE. [Chemistry, *S.* 2.]

IERAX. [Falconidæ.]

IGNATIA, a genus of Plants belonging to the natural order *Loganiaceæ*. One of the species of this genus, *I. amara*, yields the St. Ignatius's Beans of India, where, under the name of Papeeta, they are said to be a remedy for cholera. No proof has been afforded of their efficacy in this disease, and Dr. Lindley ('Vegetable Kingdom') says that convulsions and giddiness are known to follow their exhibition when given in an over-dose.

ILICIN. [Chemistry, *S.* 1.]

ILKESTON. [Derbyshire.]

ILMINSTER. [Somersetshire.]

ILSLEY, EAST. [Berkshire.]

IMPERATORIN. [Chemistry, *S.* 1.]

IMPROVEMENTS, PUBLIC. [Public Improvements.]

INDIAN EMPIRE. The British Empire in India now extends from the Indus on the west to the Tenasserim Provinces and the Eastern Straits Settlements on the east, and from the Himalaya Mountains and the frontiers of Nepaul on the north to Cape Comorin on the south. Under the head Hindustan an ample description has been given of the whole of that great peninsula, including the Panjab, Goojerat, and the island of Cutch. Sinde is described separately [Sinde, *S.* 1], as are also the Tenasserim Provinces [Tenasserim], and the Eastern Straits Settlements [Malacca; Penang, Pulo; Singapore].

The administration of British India is now under the Governor General of India in Council (who is Governor of the Presidency of Bengal), the Lieutenant-Governor of Bengal, the Lieutenant-Governor of the North-Western Provinces, the Governor of the Presidency of Madras, and the Governor of the Presidency of Bombay. A Return furnished by the East India Company, and presented to the House of Commons, July 23, 1857, gives the following summary of the areas and population of the various states comprised under these governments:—

BRITISH STATES under the	Sq. Miles.	Population.
Governor-General of India	246,050	23,255,972
Lieutenant-Governor of Bengal	221,969	40,852,397
Lieutenant-Governor of N. W. Provinces	105,759	33,655,193
Governor of the Presidency of Madras	132,090	22,437,297
Governor of the Presidency of Bombay	131,544	11,790,042
Total of British States	837,412	131,990,901
NATIVE STATES included		
In the Presidency of Bengal	515,533	38,702,206
In the Presidency of Madras	51,802	5,213,671
In the Presidency of Bombay	60,575	4,460,370
Total of Native States	627,910	48,376,247
FOREIGN POSSESSIONS.		
French Possessions	188	203,887
Portuguese Possessions	1066	313,262
Total of Foreign Possessions	1254	517,149
Total	1,466,576	180,884,297

The total revenue of British India for the year ended April 30, 1856, was 28,891,299*l.*; the total expenditure was 29,864,090*l.*, showing an excess of expenditure over income of 972,791*l.* The total amount of the public debts bearing interest, April 30, 1852, was 48,014,244*l.*, on which the annual amount of interest was 2,279,931*l.*

The total value of the imports in 1854 from British India into the United Kingdom was 10,672,876*l.*, and the total value of the exports thereto, being the produce and manufactures of the United Kingdom was 9,127,556*l.*, exclusive of exports of foreign and colonial produce valued at 493,753*l.*

Previous to the breaking out of the great mutiny, the army of the British government in India, including her Majesty's troops and the Company's European and native troops of all arms, consisted of 289,529 men; namely, Queen's troops, Europeans, 29,480; Company's troops, Europeans, 19,928; native troops, 240.121. The contingent troops of the native states, commanded by British officers, and available, under treaties, for use by the British government, amounted to about 32,000 men.

The Indian navy consists of about twelve steam-vessels of war and transports, and about the same number of sailing vessels, armed with guns, besides a steam-flotilla for inland navigation.

The history of Hindustan, and the origin and progress of the East India Company are narrated under Hindustan and East India Company. Further historical details are given under Afghanistan, *S.* 1; Sinde, *S.* 1; and Territories of India, *S.* 1; in which last article the narrative is brought down to the date of the treaty of Lahore, March 9, 1846.

We shall now add the additional historical details down to the present time (March, 1858), in the form of a chronological account, arranged under each of the successive years.

1847.

January 13. The Vizier Lal Sing deposed, on evidence of treasonable correspondence with insurgent Sikhs.

August 4. Earl of Dalhousie appointed governor-general.

1848.

April 20. Mr. Vans Agnew and Lieut. Anderson, with a small body of troops, arrived in the city of Mooltan on the 19th of April, accompanied by the newly appointed governor. Mr. Agnew and Lieut. Anderson were murdered on the following day, by order of Moolraj, the ex-governor, who immediately began preparations for a war with the British. Lieut. Edwardes, who was then on the west bank of the Indus, having made a junction with the troops under General Cortland, they descended by the western bank of the Indus, while 10,000 troops sent by Moolraj descended by the eastern bank. Edwardes crossed the Indus with 3,000 irregular troops and about 80 cavalry, but no artillery, in order to make a junction with the army of the Nawab of Bahwulpoor, leaving Cortland to procure boats and bring over the rest of the troops and guns. Before this could be done, the troops of the Nawab were defeated, and Edwardes, with his small body of men, was attacked by Moolraj's force of 10,000 men and 10 guns. Edwardes resisted the reiterated attacks of the enemy, till at length Cortland got over gun after gun, and gradual reinforcements of men. The Sikh forces were then defeated, and fled to the city of Mooltan. This was the battle of Kennyres, June 18, which lasted nine hours.

July. Lieut. Edwardes and the Nawab of Bahwulpoor invest the city of Mooltan.

August 18. General Whish arrives with additional troops before Mooltan, and a bombardment is commenced on the 12th of September.

September 22. General Whish, in consequence of the desertion of Shere Sing with 5,000 troops and a quantity of artillery, is obliged to raise the siege, and take up a position in the vicinity, waiting for reinforcements.

November, December. Various movements by the Sikh forces under Shere Sing and Chuttur Sing, and the British under General Gough and Major-General Thackwell. The Sikhs are driven from an advantageous position at Rhamnuggur by Thackwell, November 2, who again defeats them, December 3, below Vizierabad.

December 27. Reinforcements having arrived, the entrenchments of Mooltan are again attacked.

1849.

January 2. The city of Mooltan taken by storm.

January 13. Battle of Chillianwallah, between the forces under Sir Hugh Gough and the Sikhs. In this battle Sir H. Gough attacked precipitately; and though the enemy suffered great loss and retired, the loss of the British was 2,357, and the Sikhs were still in force, and expecting to be joined by Chuttur Sing with a large force of insurgents from Attock. Sir H. Gough, in his despatch, said the victory was complete; but the Duke of Wellington and the British government thought otherwise, and on the 7th of March Sir Charles Napier was appointed to supersede Sir Hugh Gough as commander-in-chief.

January 22. Practicable breaches having been made in the citadel of Mooltan, and preparations made for storming, Moolraj surrendered himself and the garrison unconditionally.

January 14 to February 16. After the battle of Chillianwallah there were several movements of the Sikh forces and the British.

February 17. General Whish crosses the Chenab, and brings his forces into communication with those of General Gough.

February 21. Battle of Goojerat. By this battle the brave old General Gough retrieved his character and won additional fame. The Sikhs under Chuttur Sing and Shere Sing, were strongly posted at the village of Goojerat, with 60,000 men and 59 pieces of artillery. The British force was 24,000 men and 97 pieces of artillery. The battle lasted from six o'clock in the morning till four in the afternoon, when the Sikhs were in full retreat, which the British cavalry and horse-artillery soon converted into a rout. They were pursued fifteen miles. The two leaders escaped with about 8,000 men into the Salt Range Hills. The final result was that 53 of their guns and all their ammunition and warlike stores fell into the hands of the British, whose loss was only 807 killed and wounded.

March 14. Chuttur Sing, Shere Sing, and the principal chiefs of the Sikhs, together with 16,000 men of the Sikh army, surrender, with all their arms and 41 guns, to Major-General Gilbert, at Rawul Pindee.

March 29. Proclamation by the governor-general, announcing the annexation of the Panjab to the British possessions in India. Dhuleep Sing, the deposed Maha-Raja of Lahore, retires to Poonah, on a pension of 40,000*l.* a year.

May 6. Sir Charles Napier arrives at Calcutta as Commander-in-Chief.

September. Moolraj having been condemned to death in August, for the murder of Agnew and Anderson, is sentenced to transportation for life.

1850.

February 27. Sir Charles Napier, by a general order, disbands the 66th Bengal Native Infantry, for mutiny.

May 25. Embassy from the Raja of Nepaul arrives in England.

July 2. Sir Charles Napier resigns his office of Commander-in-Chief, and arrives in London, March 19, 1851.

1851.

January 28. Death of Bajee Rao, ex-Peishwa of the Mahrattas, at Bithoor. He enjoyed, by treaties, June 13, 1817, and June 1, 1818, a pension of eight lacs of rupees (80,000*l.*) a year. Sreemunt Nursee Punt, Nana Sahib, eldest son of Bajee Rao's brother, was adopted by his uncle as his heir, and on the death of Bajee Rao, claimed the continuance of the pension, which was refused by the Supreme Government of India, and the refusal was confirmed by the Court of Directors.

September 1. Prince of Wales Island, Singapore, and Malacca, formed into a separate government, independent of the Supreme Government of Bengal.

October 29. A British naval force arrives before Rangoon, in consequence of disputes between the government authorities of the Birman Empire and the Supreme Government of India.

1852.

January 4. The viceroy of Rangoon erects stockades and batteries, to prevent the British vessels from communicating with the shore or leaving the harbour. The British commodore destroys the batteries, and forces the passage of the river Irawaddy.

April 5. Martaban stormed by the troops sent from Hindustan.

April 14. Rangoon stormed and captured by General Goodwin.

June 4. Capture of Pegu. Afterwards evacuated.

July 9. Capture of Prome. Afterwards evacuated.

October 9. Prome recaptured.

November 21. Pegu recaptured.

December 3. Pegu invested by a Birmese army. A British force of 2,400 men sent from Rangoon defeats the besiegers, and relieves the garrison.

December 20. A proclamation of the Governor-General of India annexes the province of Pegu, which formed a part of the Birman empire, to the British possessions in India.

1853.

June 20. Proclamation by the Governor-General of India announcing the termination of the war with Birma.

The Charter of the East India Company, granted in 1833, being to terminate in April, 1854, an Act was passed, August 20, 1853, "to provide for the government of India." The following is the substance of the most important clauses:—August 20. Act 16 & 17 Vict. c. 95. 1. Until Parliament shall otherwise provide, the British territories in India are continued under the government of the East India Company. 2. After April 1854 there are to be only eighteen directors of the said Company, any ten of whom are to form a Council. 5. The Crown is to appoint six of the directors. 9. Six of the twelve elected directors must have resided at least ten years in India, as must also (sect. 3) three of the six appointed by the Crown. 30. The person appointed by her Majesty to be Commander-in-Chief of her forces in India is also to be Commander-in-Chief of the Company's forces.

December 11. Death of the Raja of Nagpoor, whose territories were then added to the British possessions in India.

1855.

March 31. Treaty with Dost Mahomed, who is afterwards re-instated on the throne of Cabul.

1856.

February 7. The Governor-General announces by a proclamation the deposition of the king of Oude, and the annexation of the kingdom of Oude to the British possessions in India. The King of Oude is granted an annual pension of twelve lacs (120,000*l.*).

February 29. Vicount Canning assumes office as Governor-General, in place of the Marquis of Dalhousie, who arrives in England, May 13.

For a notice of the dispute between the British and Chinese authorities at Canton, see China, *S.* 2.

1857.

The year 1857 is sadly distinguished by the mutiny of the native army of Bengal. In January, February, March, and April, there were mutinies of single regiments at Barrackpoor, Berhampoor, and Lucknow, which were suppressed; but on the 10th of May the 3rd regiment of Bengal cavalry broke out into open mutiny at Meerut, and was joined by the 11th and 20th regiments of native infantry. After committing murders and appalling atrocities, they marched to Delhi, where they were joined by other native regiments, and where similar acts of barbarity were perpetrated. There the mutineers fixed their head-quarters, and the old King of Delhi was proclaimed Emperor of Hindustan. Other native regiments broke out into mutiny at various places, but were mostly disarmed and dispersed, till the native army of Bengal had ceased to exist, at least as the soldiers of the East India Company.

January 24 to May 6. Mutinies at Barrackpoor, Berhampoor, Lucknow, and Meerut.

May 10, 11. Mutiny at Meerut, and march of the mutineers to Delhi.

May 11. Mutineers arrive at Delhi, and are joined there by three native regiments of infantry and a battalion of infantry. Lieut. Willoughby blows up the magazine, containing large quantities of ammunition, and escapes.

May 12. King of Delhi proclaimed Emperor by the insurgents.

May 13 to May 31. Mutinies at various places.

May 27. General Anson, the Commander-in-Chief, with a body of British troops, arrives at Kurnaul, on the road from Umballa to Delhi, and dies there of cholera. He is succeeded in the command by Sir Henry Barnard.

May 31. Mutiny at Lucknow of three native regiments of infantry and one of cavalry. They are attacked by the British under Sir Henry Lawrence, and dispersed.

June 5. Mutiny at Allahabad. The Europeans secure themselves in the fort, where they are besieged.

June 6. Mutineers under Nana Sahib attack Sir Hugh Wheeler's small force in their entrenchments at Cawnpoor, but are driven back.

June 8. Sir H. Barnard enters the cantonments before Delhi with about 4000 troops. He entrenches himself on a ridge in front of the Cashmere gate of the city.

June 8 to 19. Mutinies at various places.

June 26. Sir Hugh Wheeler having been wounded in making a sally on the 20th of June, died on the 21st; the small force at Cawnpoor surrendered by capitulation to Nana Sahib. On the 17th of June they embarked in boats, but were fired upon, and nearly all murdered.

July 2. Sir Henry Lawrence, wounded by a splinter from a shell which was thrown into the room where he was seated, at Lucknow, died on the 4th of July. He was succeeded by Colonel Inglis in the command of the European force, which maintained itself in the Residency and fort.

July 5. Sir H. Barnard dies of cholera before Delhi, and is succeeded in the command by General Reid.

July 7. General Havelock marches from Allahabad towards Cawnpoor, with a force of 1000 Europeans, and 300 Sikhs.

July 12. General Nicholson, with the Bombay flying column routs the mutineers at Sealcote on his road to join the force at Delhi.

July 16. General Havelock defeats the insurgents under Nana Sahib before Cawnpoor.

July 17. Nana Sahib blows up the magazine, and retires to Bithoor. General Havelock enters Cawnpoor.

July 19. General Havelock attacks Nana Sahib at Bithoor, defeats him, takes 20 guns, and sets fire to the place.

July 22. General Reid, obliged to resign from illness, is succeeded in the command of the force before Delhi by General Wilson.

August 2. The Maha-Raja Gholab Sing dies at Cashmere.

August 10. General Nicholson arrives at the camp before Delhi in advance of his column, which arrives in a day or two.

August 16. General Havelock, operating with his small force against the insurgents between Cawnpoor and Lucknow, gains his ninth victory.

September 14 to 20. General Wilson, having received reinforcements and a siege-train, takes Delhi by assault, the fight being maintained in the city from the 14th to the 20th. On the 21st the British forces had entire possession of the city of Delhi.

September 25. General Havelock, accompanied by General Outram, with 2500 troops, arrives at Lucknow and relieves the Europeans besieged in the Residency, but is unable to force his way back again.

October 27. Sir Colin Campbell, having been appointed Commander-in-Chief, leaves Calcutta on his route to Cawnpoor.

November 3. Sir Colin Campbell arrives at Cawnpoor.

November 13. Sir Colin Campbell, with about 12,000 troops, commences the attack on the rebels at Lucknow.

November 17. Sir Colin Campbell, after a series of operations and some severe fighting, forces his way into the Residency at Lucknow.

Sir Colin Campbell, having remained two or three days, evacuates the Residency at Lucknow, and by a well-devised feint, brings away the whole of the besieged garrison, with all the sick, the women, and children, without the loss of an individual, and the whole are placed in security in the fortress of Alumbagh, about three miles from Lucknow.

November 24. Sir Henry Havelock dies at Alumbagh of dysentery occasioned by fatigue and anxiety.

December 7, 8. The Gwalior contingent force having overpowered the troops under General Windham, and obtained possession of the town of Cawnpoor, Sir Colin Campbell attacks the Gwalior mutineers, and defeats them.

December 10. The defeated Gwalior troops are pursued by General Hope Grant, with cavalry and artillery, and are completely dispersed with the loss of the remainder of their guns and all their baggage, stores, and ammunition.

1858.

In the early part of this year various bodies of mutineers are defeated at different places. In the mean time Sir Colin Campbell at Futtehgur and Cawnpoor, having collected troops to the amount of about 20,000 and about 120 heavy guns, commences the siege of Lucknow on the 1st of March, in connection with the troops of Sir James Outram and other officers, altogether, it is stated, amounting to about 50,000 men.

The last mail from Bombay states that the old King of Delhi has been tried, found guilty, and condemned to banishment.

Lord Palmerston's late government announced the intention to bring a bill into parliament, for the purpose of transferring the government of British India entirely from the East India Company to the British government, and Lord Derby's present government have introduced (March 26, 1858) a bill for the same purpose.

Having now brought down the historical details as far as they are known at the present time (March, 1858), we shall give an account of the chief products of British India, and also of the material progress which has been made there in recent times.

The products of India are as numerous as its surface is diversified and its climate various. The staple products are cotton, indigo, sugar, hemp, flax, oil, opium; maize, wheat, rice, and other cereals; besides which there are tea, spices, gums, dyes, and many articles of minor note.

Cotton is the leading feature of Indian agriculture. There is little land, save that which is sterile, swampy, desert, or mountainous, upon which it cannot be grown. In most village lands upon the plain country, it forms part of a two years' course; and outside the village walls, hand-weavers have been seen from time immemorial, making the coarse cloth universally worn by the natives. The home-consumption of Indian cotton is immense. Geographically its growth is confined to no particular limits in the Indian peninsula, for it is found at Travancore, the southernmost part, on the coasts of Chittagong and Arracan, of the Gulf of Cutch, in the valley of the Ganges, and in the northernmost part of the Panjab. For exportation, its principal localities have been the district of Goojerat, in the Bombay Presidency; of Kandeish, in the kingdom of Berar; from Bundelcund, in the Bengal Presidency; Belgaum, Darwar, and Bellary, in Madras, and from the Panjab and Sinde. More than five million acres are stated in the statistical returns, printed by authority, to be under cotton cultivation in the three Presidencies. The quantity of raw cotton exported to Great Britain in 1854 was 1,042,358 cwts., valued at 1,641,714*l.*; but if, by means of railroads, the great cotton field of Berar, situate within the dominions of the Nizam of Hydrabad, were placed nearly on an equality in point of facility of transport, with the maritime cotton districts, then a breadth of land sufficient for the growth of a quantity perhaps equal to the full demand of Great Britain, might at once be made available.

The foregoing conditions relating to the province and prospects of Berar are partly in course of being fulfilled. When the great Indian Peninsula Railway shall be completed, the cotton of Nagpoor, Hydrabad, and of the Saugor and Nerbudda territories, will have an outlet to the port of Bombay on one side, and to Mirzapoor and the river Ganges on the other; and the railroad which is intended to connect the cities and presidencies of Madras and Bombay, will pass through the cotton districts of Bellary and Belgaum. The cotton of Bundelcund, of the Delhi territory, or of Oude, may be seen to this day, uncleaned and unpressed, passing down the rivers Jumna, the Ganges, and the Indus, in unwieldy country boats, which drift no faster than the current will bear them along. Still more to be deplored are the efforts required to convey it in country carts, or upon the backs of bullocks, from the great cotton-field of central India towards the sea-coast, or to the banks of the Ganges. From Nagpoor and the territories of Hydrabad, two streams of the cotton commerce may be seen struggling along unmade roads, extricated with difficulty from the sands of unbridged rivers, and passing at the rate of 10 to 14 miles a-day, on one side towards Bombay, and on the other to Mirzapore. This state of things it is expected that the railway will remedy; and if one line should not be sufficient, they should be multiplied, until the shipments of cotton from Nagpoor shall be as certain and as cheaply effected as they now are from Calcutta or from the mouths of the Indus.

Great importance is attributed to culture; but the natives of large tracts already employ a mode of cultivating the cotton plant in principle nearly the same as the American, but better suited in some respects to the locality. The great inferiority of much of the Indian article is the result of what befalls it subsequent to its production in the fields—that is, in the way in which it is gathered and stored, and chiefly in the way in which it is separated from the seed, and prepared for the market, as well as in its transmission to market. At the gathering the effort for improvement should commence.

The introduction of improved methods of cleaning and packing is of the first importance. The cultivation has to contend with sundry disadvantages, but these are compensated by the cheapness of the cost of production; this in many parts of India being only 1½*d.* per lb., while in America it is from 50 to 100 per cent. more, ranging from 2½*d.* to 3*d.*

Indigo is one of the principal articles of produce of the Bengal Presidency. It is grown to some extent in the alluvial soil of the North-Western Provinces; but Bengal proper, below the junction of the rivers Jumna and Ganges, is its chief locality. There is a considerable cultivation of the plant in the Madras territory, and in Mooltan, the southernmost district of the Panjab, as well as in Sinde; but in none of these countries has the manufacture of Indigo had the benefit of that European superintendence and skill, which have brought this dye to such perfection as it has attained in Bengal. The manufacturers have attained a degree of skill which, in a climate favourable to the plant, and backed by the cheapness of labour in Bengal, has enabled them to bid defiance even to the more practised manufacturers of the west. The culture and manufacture being established, indigo has continued one of the staple products of Bengal. The quantity imported into the United Kingdom from India in 1854 was 64,964 cwts., valued at 1,546,143*l.*

The *Sugar-Cane* is another of the indigenous productions of India, from whence it has been supplied to other countries, where, especially in the West Indies, it has been brought, by European skill and culture, to yield a far better substance than the sugar of the country from which it was originally derived. Yet there is no reason why India, with regard to this article of commerce, should not compete with any other country in the world. In various parts, it has soils and climate which are capable of producing the cane in the greatest perfection. In the whole of Bengal, in the North-Western Provinces, the Panjab, in the Madras territories, and on the east side of the Bay of Bengal, the sugar-cane is grown with perfect ease and in the greatest abundance. But, so far as observation goes, the method of cultivation of this crop is faulty to a degree, and some of the leading principles of vegetable physiology are set at nought. The cane attains, in some places, a height of eight or ten feet; it has numerous ramifications in its roots, and several long drooping leaves at its upper extremity. Yet these canes are set so close together, that neither air nor light can sufficiently penetrate for the proper development of the plant, and the deposit of the full proportion of saccharine matter which is desired. It may be said of this plant, with regard to both its cultivation and the manufacture of sugar, that there is more room for improvement, as well as greater prospect of success, than with respect to any other agricultural product of India. A few sugar factories, superintended by Europeans, have been established and are successfully worked; but if one tithe of the attention should ever be paid to sugar in the East, which it has met with in the West Indies, the results to India, as well as to England, would be very great. Already it forms an important article of export from British India, the quantity imported into the United Kingdom in 1854 having been 779,189 cwts., valued at 891,708*l.* Samples of East India sugar sent to this country have been pronounced equal to any from the West Indies. But to insure success, as well as to make it profitable, it is necessary to pay as much attention to the culture of the cane as to the manufacture of the sugar.

The true *Hemp-Plant* is common to nearly all Asiatic as well as European countries, but is believed to be of Eastern origin. In Hindustan however, except in some parts of the Himalayas, it is not cultivated for its fibre, but for the intoxicating juice it contains, which is manufactured into the deleterious drug termed Bhang. In almost every part of India it is cultivated and planted widely, for the better production of this substance; but if it were planted thickly, so as to exclude the air and light, and with the object of obtaining a long and pliant fibre, there is no reason to believe that this might not be done with such success, as to form a substitute for the quantities of hemp which we usually receive from Russia, Poland, and Italy. The hemp of Kangra, a district of the Himalayas, north of the Panjab, has recently acquired some celebrity, having proved on trial superior in strength to even the best Russian hemp. There can be no question with regard to the practicability of producing hemp of a quality suited to the European market, over vast tracts of country on the lower slopes of the Himalaya Mountains. It has been stated, on good authority, that Himalayan hemp may be landed in England, including all charges, at from 25*l.* to 31*l.* per ton, and it is said that its value here would be 35*l.*

But there are other fibres considered as substitutes for hemp, which are received from India, and have become most important articles of commerce. These are the Sunn of Bengal, and Jute, and gunny, which is made of jute. These products are from plants totally different from the true hemp, which has just been described.

Sunn, or Indian Hemp, under which name the article is exported from that country, is the produce of a leguminous or podded plant, and has a close resemblance to the Spanish broom, which is a sub-division of that order. It is cultivated everywhere in India for its fibre alone; and with this object, the natives affirm, that the thicker it is grown the better,—"so thick as to prevent the air from passing through it;" which is a proof that, without any acquaintance with the physiological reasons by which the correctness of this system can be shown, they have, by long practice and observation, arrived at the true method of culture. In their treatment of the plant however, after it has come to maturity, they have much to learn, in order that the fibre may be produced in the best state for the markets of Europe.

The fibre of *Jute*, or Jew's mallow, has not been till lately an article of commerce, but for the last seventeen years it has been much employed in our manufactories. In India it has been long employed for making both cordage and cloth. The material is obtained from two distinct plants, one of which appears to abound chiefly in India and China, and is styled Chinese Hemp. The fibre of both however is called *Jute*. The quantity of hemp, sunn, jute, &c., exported from the three Presidencies, but much the largest part from Bengal, amounted in the year 1854 to 570,250 cwts., valued at 209,476*l.*

Flax, or the linseed plant, has been cultivated in India from the earliest time, not for its fibre, but only for its seed, from which the well-known oil is expressed. It is accordingly sown, not thickly together, as is the case with sunn, which is grown for its fibre, but along the margins of fields of other crops, where the sun and air can freely reach it, and increase the secretions upon which the value of the seed depends. But, if in India this plant could meet with some portion of the attention which is bestowed upon it in Russia, Poland, Belgium, Germany, France, Italy, and Ireland, it would, no doubt, be a very important matter for India with respect to its fibre, as it is already for its seed. The quantity of linseed and flax-seed imported from India into the United Kingdom in 1854 was 196,570 quarters, valued at 601,996*l.*

It has been already stated, that the winters of Hindustan, and especially those of Upper India, in the north and north-western provinces, are so temperate as to resemble the autumns of Europe. For a season ranging, according to latitude, from October or November to March and April, all trace of the tropical heats seems to have disappeared, cultivation of nearly all the European types occupies the soil. Abundance of wheat and barley are grown in this interval, being sown towards the conclusion of the rains in August or September, and reaped in April before the heat sets in. The whole face of the country may then be seen as one sheet of golden corn; not a single hedge marks the boundary of one field from another, nor even of the numerous village lands; and on an apparently interminable level plain, there is nothing to arrest the eye over this rich expanse, save the groups of trees which denote the positions of villages or wells. No wheat comes from India to this country; but rice, which is grown in vast quantities as food for the inhabitants, is also exported to the United Kingdom; the quantity in 1854 having amounted to 1,251,325 cwts., valued at 875,927*l.*

Allusion has just been made to the introduction of the *Tea Plant* in India. In 1834 Lord William Bentinck determined upon attempting the cultivation of tea in India. Dr. Royle, who is our informant, in his volume on the 'Productive Resources of India,' says: "A committee were then assembled for the purpose of submitting to Government a plan for the accomplishment of this object." But so far back as the year 1827, Dr. Royle had drawn attention to this matter, and pressed it upon the notice of Government. "The tea plant," he stated, "delights particularly in sheltered valleys, the declivities of hills, or the banks of rivers, where it enjoys a southern exposure to the sun. But it is found also to grow on the rugged tops of mountains; and although it appears to attain the greatest perfection in the mild climate about Nankin, yet it flourishes in the northern latitude of Pekin, and in Japan, as well as about Canton, and these places are comprised within the parallels of 20° and 40° north latitude." Dr. Royle therefore suggested that "in the valleys at the foot of the Himalayas, or at moderate elevations, there was considerable prospect of success in the cultivation of the tea plant; for the different elevations allow of every variety of climate being selected, and the geographical distribution of the plant is sufficiently extended, and the natural sites sufficiently varied, to warrant its being beneficially cultivated. Taking the extreme limit, the Himalayas extend over 45° of longitude, but not making more than 10° of northing in its whole extent. Though variations of longitude no doubt produce difference in climate, yet as this is chiefly influenced by latitude and elevation, it is evident that along the whole extent of this mountainous country, there must be many localities which differ little in latitude and in elevation, and which must consequently resemble each other in climate, and therefore probably also in vegetation." In the hills of Assam, the tea plant was found to be indigenous. Plants also were procured from China, "as well as seeds and cultivators, to carry on the experiment; and it was resolved that when the practicability of producing tea fit for commercial purposes shall have been ascertained, it may be safely left to the enterprise of individuals. This course has been strictly followed." The Court of Directors, and the Government of India, having brought the experiment of the growth and culture of the tea plant to a successful issue, have handed over its further extension to a private company, who are carrying it forward with great advantage.

The receipts and disbursements of this Company, employed in the cultivation and preparation of tea in Assam, for the half-year ending the 31st March 1856, amounted to 19,655*l.*

In the Kungra district, quite at the other extremity of the British territory, still on the lower slopes of the Himalayas, in the Murree Hills, and in Ghurwal, Kumaon, and the Deyra Doon, and Darjeeling, similar successful experiments in tea culture have been made, and annual public sales of excellent tea take place. Its cultivation by the natives has been encouraged by grants of land on favourable terms; but too much care is required to produce a saleable tea, to hope that they will succeed except under European superintendence. It can only, therefore, be expected that tea will be produced over the great extent of the Himalayan range which bounds India on the north, through the agency of commercial companies, like that which has succeeded in Assam. Besides the Assam Company, another has been recently established for the growth and manufacture of tea in Darjeeling, a part of the Himalayas to the eastward of Nepaul.

The total amount of tea imported from India into the United Kingdom in 1854 was 386,221lbs., valued at 24,943*l.*

Only a brief allusion will be made to *Opium;* for although it is an article of great importance to the revenues of India, it is not a free product of its soil. It cannot be cultivated except by permission of the Government, who retain the monopoly of it in their own hands, and discourage, by heavy duties, any extension of its production. In the case of a drug so deleterious and so enervating, the high price which is maintained by these restrictions, is probably a benefit to that portion of the human family which is addicted to its use. The profit realised by the Government by its sale, exceeds three millions sterling. There is one fact in connection with this drug which is worthy of note. The poppy from which it is prepared, does not appear to be indigenous to India. It has been found nowhere in a wild state, but is a plant which is extensively distributed over both the European and Asiatic continents. The success with which it is cultivated in the Bengal Presidency, chiefly in Malwa, and in Central India, is due to the natives alone, unaided by science or European superintendence. The selection of soil and climate under which it has been found most to thrive, with manure and irrigation, seem to be all that has been necessary in its cultivation. Nature does the rest, ordinary care only being necessary, to collect the milk and secretions, which are exuded from the capsules of the plant, and to evaporate the moisture with which it is mixed, till the residue be sufficiently dry and prepared for sale.

With the exception of tin and salt, there can scarcely be said to be any export of mineral substances from India. In 1856, the value of the tin imported into the United Kingdom was 52,120*l.*

Several manufactured metals are specified in the tables of exports from the three Presidencies; but the probability is, that these are chiefly re-exportations of British goods from the ports at which they were first landed to other places on the coast. Neither copper, as a native product, either rough or manufactured, nor iron, lead, nor any other metal except tin, is yet known amongst the exported goods from India. Very extensive deposits, however, of both coal and iron are known to exist; and when these two substances occur together, or in the same country within any moderate distance of one another, to what extraordinary results may they not eventually lead? In Burdwan, a district of Bengal, an inexhaustible field of coal is known to exist, one of the seams of which has a thickness of thirty feet, and the coal-field has been worked for several years. The inland steam navigation of the Ganges has long been supplied, and much of the coal used by sea-going steamers has come from Burdwan; but its price in Calcutta has not always, having reference to quality also, been able to compete with English imported coal. Coal is also found in the valley of the Nerbudda, and in the Tenasserim Provinces; but from neither of these localities has it yet been profitably procured. Vast masses of the iron-ore have been examined and pointed out by many observers. All the agricultural implements of the natives are made with the iron of the country, smelted and worked by their own rude means; and in some places a considerable market for native iron already exists. At Monghyr, on the banks of the Ganges, fire-arms have long been made from the iron of the adjacent hills, and there is an annual export of manufactured iron from that place. The Gwalior iron is well known in the inland trade, so is that of Kangra and Kumaon; and all the large towns are supplied with rough malleable iron in small lumps from one or other of these districts. In the Kumaon Hills, vast beds of hæmatite iron-ore have been recently brought to notice by Colonel Drummond. Unfortunately no coal occurs, nor is likely to be found within any reasonable distance; but abundance of charcoal can be made from the boundless forests with which the lower slopes of the Himalayas and the plains adjacent to the ore are clothed.

There are copper mines worked by the natives in several districts of the Himalayas; but the produce is small, and India has never supplied herself with this metal. Brass vessels are in universal use; but copper, spelter, and manufactured brass are imported annually at the principal ports of the three Presidencies, to a large amount. The natives of Hindustan have neither possessed the capital nor the skill to mine deeply, and to abstract the riches which lie buried in the earth, and of which the scanty produce of their shallow workings are a sure indication.

The southern portion of the Tenasserim Provinces, from the province and latitude of Tavoy, to the Pakchan river, abounds with the ore of tin, which is found in the greatest purity in the beds of streams, and in hills of disintegrated granite on the plain. It is a pure peroxide of tin, requiring the application only of a moderate heat to produce the perfect metal. The quantity hitherto prepared in the British territory, can be regarded only as an indication of what might be obtained if labour and machinery were duly applied to the task. The extent of tin-working which has been carried on in Tenasserim, has not been by the natives of that province, but by the enterprising and more industrious Chinese, whose small and solitary settlements are to be seen dotted here and there in the forests. They have a smelting establishment at the mouth of the Pakchan river, and the tin is carried away in junks to Penang and Singapore.

Salt is an article of manufacture in India almost exclusively for domestic consumption, the value exported being insignificant.

Sufficient has now been said of the most important indigenous products of India, to show in what her real wealth and value to England consist;—above everything, it has been intended to prove that, in comparison with the actual produce of her soil, all else sinks into insignificance when we contemplate the resources, or endeavour to accelerate the material progress of that country.

There is no step which has a more direct bearing on this subject than the irrigation of the land by artificial means. There are traces in various parts of the country of works constructed in ancient times for this purpose. Canals of irrigation were formed either from the head waters of some of the rivers as they issue from the Himalayan range, or lower down, where, at one period of the year, they overflow the adjacent plains. In some of the minor hills the head waters were dammed up and reservoirs formed, from which the discharge could be regulated and distributed when the ground was parched. It has been commonly and with some justice remarked, that to furnish the native cultivator with the command of water is to give him nearly everything he requires to insure his prosperity.

The East India Company, following the example of the Moguls, their predecessors in the government of the country, have greatly extended the means of irrigation in the North-Western Provinces, in the Panjab, and in the Presidency of Madras.

With regard to irrigation canals, the waters of both the Jumna and the Ganges rivers have been freely drawn upon. The country on the right and left banks of the Jumna, from Suharunpoor to Delhi, and branching westward to Hissar, may be said to be secure against drought, cultivation now, over a large surface, being entirely independent of the periodical rains. The Eastern Jumna and the Western Jumna Canals, with their branches, are 580 miles in lineal extent. The volume of water available for irrigation from this river, has been calculated at 2,870 cubic feet per second, and each cubic foot has been found adequate for the annual irrigation of 218 acres of land; but as one-third of a district only is usually irrigated, the remainder bearing crops not requiring irrigation, one cubic foot of water per second will suffice for 654 acres of land, equal to about one square mile, so that the canals of the Jumna are supposed to serve for the irrigation of 2,870 square miles.

The Ganges Canal is a still nobler work. Nearly the whole tract of country comprised between the rivers Ganges and the Jumna, from Hurdwar to Allahabad, is included in this large system of irrigation for the North-Western Provinces. The main line of this canal, which was completed, and received water for the first time in 1854, in 525 miles in length. Its extreme breadth is 170 feet, and its greatest depth 10 feet; and, as truly described by the Lieutenant-Governor, "it is a work which stands unequalled in its class and character among the efforts of civilised nations." When all its branches shall be finished the canal will be about 900 miles in length, and the area which may be irrigated by its waters is stated to be not less than 1,470,000 acres. It is adapted also to navigation. No single canal in Europe has attained to half the magnitude of this Indian work. It nearly equals the aggregate length of the five greatest canals in France. It greatly exceeds all the first-class canals of Holland put together, and it is greater by nearly one-third than the greatest navigation canal in the United States of America. It is one of the greatest triumphs of the engineering art of which any country can boast. Its total estimated cost is 1,555,548*l*., of which 1,400,000*l*. had been expended up to the beginning of the year 1857.

In the Panjab a system of similar canals has been projected and partially commenced, to afford the means of irrigation to the greater parts of the tract of country comprised between the rivers Ravee and the Sutlej. With the branches, the total length when finished will be 450 miles, and the cost 500,000*l*. The head waters, like those of the Ganges and Jumna canals, will be taken from the rivers at a high level, and carried along the slightly elevated ridge which is generally found to exist between two rivers, having a gentle declivity on each side, which favours the system of irrigation best suited to the country. But towards the southern part of the Panjab, at and below Mooltan, and on each bank of the Indus, another description of irrigation canal prevails, which is formed by taking advantage of the annual inundation of those rivers, and leading off bodies of water in channels to considerable distances inland. These canals have existed for long periods, and efforts are now being made to restore and bring them again into extensive use.

In the Madras Presidency another system of canals prevails, which is suited to the features of the country. The tract to be irrigated being narrow, in comparison with the extensive plains of the North-Western Provinces, and the body of available water considerably less, it has been found expedient to throw dams of great length across the channels of the Godavery, the Cauvery, and the Kristna rivers, so as to store up their waters and distribute them at pleasure during the dry season. These works on the Godavery have cost about 230,000*l*., on the Cauvery 50,000*l*., and on the Kristna 150,000*l*.; and, without doubt, the number of the localities are endless, both in that Presidency and in various other parts of India, where similar works might be constructed with the greatest advantage.

Next in degree of importance to the future progress of India, and in a still wider sense than may yet be known, not only with regard to its material interests, but to its social and moral advancement, is the continuous chain of iron roads by which it is hoped, that before many years shall have passed, the whole of the principal and most productive provinces in the Indian Empire will be linked together. Already the natives of every class and caste, contrary to general expectation, unmindful of any prejudices, herding together in the same railway carriage, have seized with avidity the advantages of the locomotive train in Bengal, Madras, and Bombay. The opening of the railway for short distances at Calcutta, and the two other Presidencies, has been hailed with acclamation by the whole people, who flocked from their villages for miles to witness it.

The grand trunk lines now in progress of construction are of great extent. From Calcutta the main line will lead through the entire valley of the Ganges, for a thousand miles to Delhi, with an eventual extension, in the same general direction, across the rivers of the Panjab to Lahore, and perhaps to Peshawur. From Bombay another main line has been commenced, and will stretch nearly across the continent of India at its broadest part, taking the general direction of the Nerbudda Valley, passing by the cotton districts of Kandeish, Saugor, and Bundelcund, branching into the great cotton-field of Central India to Nagpoor, and affording an easy outlet for that valuable product, either to be shipped at Bombay, or for conveyance down the river Ganges, from Mirzapoor to Calcutta. At Mirzapoor a junction will be formed with the Bengal line. There is also a line to the northward of Bombay, in order to bring down the cotton from Baroach, Baroda, and Surat. In Sinde there is a short line undertaken to connect the port of Kurrachee with the

Indus, which seems to be a first step towards a direct railway, or mixed railway and river steam communication, from the Panjab to the sea. In the Presidency of Madras, two trunk lines are projected: one to penetrate the peninsula in a longitudinal direction, and to connect Bombay, passing through some rich cotton ground in Darwar and Belgaum; the other to strike across to the western coast, having its other terminus at Beypoor.

At the beginning of 1857 the number of miles of railway already opened for traffic at the three Presidencies, and the extent of each line actually in a state of progress, are as follows:—

	Main Lines.	Miles Opened.	Miles in Progress.
	From Calcutta to Delhi . .	120	1,100
32 Miles common to both . .	Bombay to Mirzapore .	49	750
	Bombay to Madras . .	71	300
	Bombay and Baroda .	...	150
	Madras to Bellary . .	...	296
	Madras to West Coast .	90	300
	Total . .	330	2,896

When these grand trunk lines of railway shall have been completed, a glance at the map will show that, although the richest districts will have been penetrated, and the principal cities connected, the 2896 miles of which they consist, are but the foundation and groundwork of what will be ultimately required, before it can be said that India is completely provided with railway communication; before, in fact, many of the inlying districts can be supplied with food, when their own internal resources may fail.

Inland steam navigation has existed for several years on the river Ganges, and also upon the Indus; but not by any means to the extent which even the private traffic of Bengal and the Panjab requires.

The ordinary highways of India is a subject which cannot be regarded with much satisfaction. Until the period when Lord William Bentinck governed the country, the subject of roads does not appear to have attracted much attention from the State. The communications of the country were in a most neglected condition, consisting of native wheel-tracks, or little else. Above Allahabad, and in various other parts, so recently as the year 1830, a regiment proceeding in course of relief from one station to another, had to be preceded by a native guide. This is now altered. Roads, even if unbridged and unmetalled, exist in almost every district; and there are three great lines of communication of considerable length; the earliest begun only in 1836, from Calcutta, and recently prolonged to Peshawur: this, however, is not yet complete in parts.

The three grand trunk roads constructed and maintained, are as follows:—

	Length in Miles.	Cost. £	Annual Repairs for Maintenance. £
From Calcutta to Peshawur, when completed . .	1,423	1,423,000	50,000
From Calcutta to Bombay, as estimated . . .	1,002	500,000	35,000
From Bombay to Agra .	734	243,676	5,000
Total . .	3,159	2,166,676	90,000

The average annual expenditure upon public works of all kinds in India during fifteen years, between 1837 and 1852, was 299,732*l*. In this are comprised roads, bridges, embankments, canals, tanks, and all works of irrigation; but since 1852 the outlay has been much greater, including the sums spent upon the Ganges and Panjab Canals, and the guaranteed interest upon Railway Stock, which must be regarded as a contribution to public works.

The electric telegraph, which has been recently established with so much rapidity and success, can scarcely be regarded as bearing so directly upon the wants and welfare of the people, as other public works which have been briefly described. Except inasmuch as it is an aid to good government and to the preservation of peace, the rapid transmission of intelligence from one part of the country to the other, is as yet slightly regarded by the native community, but when traffic shall be accelerated by the railways, it will not be long before the telegraph will be rightly valued. More than 4000 miles of telegraphic wire are now set up in India, and in constant use. The superintendent, Dr. O'Shaughnessy, availing himself of the executive officers of Government throughout the country, to set up the posts and to build pillars for the support of the wires, and with his own trained establishment and materials previously prepared and brought from England, was enabled to complete the communication between Calcutta and Agra, a distance of 800 miles, in the course of five months. In fifteen months, all the lines from Calcutta to Attock on the Indus, from Agra to Bombay, and thence to Madras, extending over 3050 miles of space, were ready for use. Other places more distant have since been embraced in the electric circle, and the average cost of these 4000 miles does not exceed 50*l*. per mile, although the physical obstacles encountered have been unusually great.

INDIAN TERRITORY, United States of North America, an extensive tract of country set apart by the Congress and federal government, for the permanent residence of the various tribes of native Indians removed from the settled states and territories of the Union. It lies generally between 33° 30′ and 39° N. lat., 94° and 100° W. long., but the limits are not very strictly defined. It is bounded S. by Texas; E. by Arkansas and Missouri; and N. by the newly created Territory of Kansas. The area, as given in the 'Report of the Census' of 1850, is 187,171 square miles, but this is considerably more than in previous statements of the area of what is sometimes called the Indian Territory proper, and perhaps includes a portion of the country since appropriated to Kansas Territory. The Indian inhabitants are estimated at from 100,000 to 120,000, four-fifths of whom have been transported from countries east of the Mississippi.

In the south-eastern part of the Territory there is a range of hills of moderate elevation; the remainder is a plain, or at most has a gently undulating surface. A considerable portion of the country is prairie ground, but along the rivers there is a good deal of timber. The country is well supplied with water, having several good-sized rivers running through it or along its borders on their way to the Missouri and the Mississippi. The Arkansas flows through the midst in a south-eastern direction, and receives in its passage numerous tributaries, some of considerable size. The chief of these tributaries is the Canadian River, which also has numerous affluents or 'forks.' The Red River waters the southern, and the Kansas the northern portion of the state: both of these, as well as the Arkansas, are navigable within the territory at certain seasons by steam-boats. The country possesses capabilities for the prosperous maintenance of a large population. The middle, and by far the larger part of the country, appears to belong to the Lower Carboniferous series of rocks. On the east are Upper Carboniferous strata, or coal-measures, a part of the great coal-basin of Missouri and Illinois. The western and north-western districts belong to the Cretaceous group of rocks. On the south is a narrow belt of Lower Silurian rocks, consisting along the Red River of blue limestone, with eruptive rocks. Coal is not the only mineral obtained. Both lead and iron are found; and there are saline springs, from which a large quantity of salt might be manufactured. The climate is generally healthy. The northern parts are subject to keen westerly winds from the Rocky Mountains, and the winters are rather cold; but in the southern parts the winters are mild, and all the plants are cultivable which are raised in other parts of the United States of the same latitude. The soil on the eastern side of the Territory is generally fertile; the northern parts are well adapted for grazing cattle. Maize, wheat, and other grains, produce good crops in almost every place where they have been tried.

As already said, this large tract of country has been appropriated for the permanent residence of the Indian tribes transported from the settled parts of the United States. It need hardly be said that they have not turned to full account the capabilities of the country. But they have shown that they are capable of steady industrial efforts, and they have made very considerable advances in civilisation. Under the guidance of missionaries, who have settled amongst them, and with the sanction and assistance of the Commissioner of Indian Affairs, some of the larger tribes have established regular governments, legislatures, judicial officers, churches, schools, newspapers, &c.; have introduced the manufacture of agricultural implements, cloth, and most articles of ordinary farm and domestic use; cultivate the land with a considerable amount of skill; rear horses and cattle; build houses; and export to neighbouring states maize, cotton, hides, &c. By the treaty of removal and settlement, the federal government furnishes them with blacksmiths, wheelwrights, and some other mechanics, and at their first settlement gave them a stock of cattle, &c. Many of the tribes possess slaves.

The principal Indian tribes settled in the Territory are the Cherokees, who numbered according to the Commissioner of Indian Affairs, about 17,600 in 1853, but whose numbers are usually estimated much higher; the Creeks, who numbered 25,000; the Choctaws, 16,000; the Osages, 4941; the Chickasaws, 4709; the Pottawatomies and Chippewas, 4680; the Pawnees, 4500; the Seminoles, 3000; the Sacs and Foxes, 2373; the Shawnees and Senecas, 1400; Delawares, 1130, &c. The Cherokees occupy a considerable tract lying on the north of the Arkansas River, and adjoining the state of Arkansas, and are the most civilised of all the Indian tribes. [CHEROKEES.] The Choctaws occupy the most southern part of the territory between the Red River and Canadian River. The Chickasaws occupy a part of the same country, and are governed by the same laws. The country of the Choctaws is the most hilly and broken in the Indian Territory, and is well watered by the above mentioned rivers and their tributaries. The Choctaws are extensively engaged in agriculture, raise large quantities of cotton and maize, and have good stocks of horses, cattle, and sheep. On the streams are numerous grist- and saw-mills, and cotton-gins. The houses and farms are well built, and the grounds fenced; the mechanical occupations are chiefly carried on by mechanics provided by the United States' government. The Choctaws have a written constitution and laws. The country is divided into four districts (one of which is occupied by the Chickasaws), each of which elects its own chief every fourth year. A general-council of 40 members is elected annually, who meet in the council-house, and pass all laws, &c., subject to a qualified veto by the chiefs. Trial by jury is established: with appeals to the higher courts. At the head of military affairs is a general elected by the people at large; and there are 32 captains in each district. Numerous missionaries are settled among both the tribes. The Creeks, with whom are united the Seminoles, occupy the country between the tracts of the Cherokees and Choctaws, watered by the Canadian River and the forks of the Arkansas. The country is less fertile than the districts occupied by those tribes, and the Creeks are on the whole a good deal less advanced in civilisation. But they have similar government, organisation, and judicature; they dwell together in towns, and to a certain extent cultivate their land in common. Numerous missionaries are settled amongst them, under whose advice they have built several churches, and established good schools: and altogether the prospect of the future progress of the tribe is spoken of as highly promising. A proposition is said to have been lately made by the executive of the federal government through the Commissioner of Indian affairs, to the Cherokees, Choctaws, and Creeks, offering to form a state out of the territory occupied by them, and thus admit them into the Union as citizens; but the Cherokees, it is said, were unwilling to be placed on the same level with the other tribes not so far advanced in civilisation, and the proposal fell to the ground.

Of the lesser tribes it may be enough to mention that the Shawnees and Senecas are settled in the northern part of the Territory bordering on the Kansas River. They are a frugal industrious people, carefully cultivating their farms, and raising considerable crops of maize, cotton, vegetables, &c., and breeding horses, cattle, and swine. The Osages, Pottawatomies, and Chippewas occupy a tract north of the Cherokees; they are much less advanced in the arts of civilised life, and retain most of their old wandering habits. Their country is not very fertile, and they suffer much from the cold of winter, and from occasional droughts in summer.

(*Statistical Gazetteer of the United States;* Haskel and Smith, *Gazetteer of the United States;* Schoolcraft, *The Red Man of America; American Indians;* Brownell, *Indian Races of North America; Report of the Seventh Census of the United States.*)

INDIN. [CHEMISTRY, *S.* 1.]

INDINIC ACID. [CHEMISTRY, *S.* 1.]

INFLORESCENCE. [INFLORESCENCE.] The following is a survey of the kinds of inflorescence and their names, from Professor Schleiden's 'Principles of Scientific Botany.'

A. The Solitary Flower, as terminal or axillary-flower (Flos Solitarius, terminalis vel axillaris). The latter may be situated in whorls, and then form a Verticil (Verticillus).

B. Simple Inflorescence.

a. Inflorescentia Centripeta.

1. The Capitulum. The undeveloped axis is here usually enlarged upward, with a fleshy or spongy substance, and the more so if the number of flowers is very great. It may be more minutely designated as simple, discoid, cupulate, lageniform, conical, and cylindrical, as it approaches nearer to one or another. The last form then passes gradually into the spadix. Special varieties are :—

* The Calathium (Anthodium, Ehrh.; Flos Compositus, Linn.), a many-flowered capitulum, whose single flowers stand in the axils of more or fewer stunted bracts, and are surrounded with one or more circles of sterile bracts, as in the family of the *Compositæ.*

** The Cœnanthinum, Nees (Hypanthodium, Link.). Exactly like the preceding inflorescence in some *Urticaceæ.* The cup-shape of the peduncle in *Ficus* is no distinction, since it is wanting in *Dorstenia;* and it exists in some *Compositæ;* the same may be said with regard to the sterile bracts, which are as much stunted in *Dorstenia* as they are clearly present in *Ficus.*

2. The Spike (Spica) in very various forms. The kinds are :—

* The Catkin (Amentum), distinguished by the fact that it falls off entire, or by its imperfect flowers. The male inflorescence of *Cupuliferæ, Salicaceæ, Betulaceæ,* and some few other plants.

** The Spadix, a closely crowded spike, or partially a cylindrical capitulum with fleshy peduncle; in *Araceæ,* Maize, and some other Grasses, and in Palms, in the last of which it is often compound (Spadix Ramosus).

*** The Cone (Strobilus or Conus), a cylindrical capitulum or solid spike, on which the individual foliar organs become woody scales; as in the *Coniferæ,* the *Casuarinaceæ,* the *Betulaceæ,* and some others.

**** The Spikelet (Spicula), the simple inflorescence of the Grasses and *Cyperaceæ;* namely, a few-flowered spike, whose flowers have no bracts, surrounded at the basis by one or two sterile bracts (Glumæ).

3. The Umbel (Umbella) in the *Umbelliferæ;* when compound termed Umbellule (Umbellula).

4. The Raceme (Racemus) occurs in very different forms; it is usual to distinguish in it—

The Corymb (Corymbus), a pyramidal raceme.

β Inflorescentia Centrifuga.

5. The Cyme or False Umbel (Cyma), is a corymb with Inflorescentia Centrifuga.

That only singular cases are distinguished in these is a proof of the totally unscientific patching together of our terminology. The compound raceme, the compound umbel, and capitulum, with inflorescentia centrifuga are all called a Cyme (Cyma), which is contrary to the commonest scientific laws. De Candolle has further applied the term Cyme to the inflorescence of the *Boraginaceæ,* which, on account of the peculiar manner in which it unrolls itself, he terms Cyma Scorpioides; and he adds the fiction, that the undermost first-blooming flower is really the terminal blossom, and the second, the terminal blossom of side axis, is developed in a disproportionate degree, &c. From the rolling up there is just as little to be deduced as from the same phenomenon in the leaves of *Ficus* and *Cycadaceæ.* The position of the bracts, as seen in *Cerinthe,* contradicts this fiction; and the history of the development, which can alone determine the point, appears to prove that here a one-sided raceme or spike is present, whose unrolling is only a peculiar situation of the buds.

C. Once-Compound Inflorescence.

a. Pure or Homomorphous.

* Inflorescentia Centripeta.

6. The Spike of the Grasses (Spica), several spikes united in a spicate arrangement, as in the Grasses; the component spikes are termed Spikelets (Spiculæ).

7. The Umbel (Umbella). Umbels united in umbels; the components are termed Umbellules (Umbellulæ).

Sound terminology would have long ago rejected these words, and exchanged them for Spica and Umbella Composita.

8. The Panicle (Panicula); see No. 11.

None of these remaining combinations deserve special names, and may probably be classed among those mentioned under 9 and 11.

** Inflorescentia Centrifuga.

9. The Cyme or False Umbel (Cyma); see No. 5 and No. 14.

10. The Anthela; see No. 16.

β Mixed or Heteromorphous.
* Inflorescentia Centrifuga.

See No. 14.

** Inflorescentia Centripeta.

See No. 11.

D. Many-Times-Compound Inflorescence.

* Inflorescentia Centripeta.

11. The Panicle (Panicula), every many-branched inflorescence; in Grasses universally, and otherwise wholly in developed pedicels.

12. The Thyrse (Thyrsus), a panicle, with very short pedicels; with the exception of Grasses, found almost universally.

Both terms are applied also to once-compound inflorescences. De Candolle uses the term Thyrsus for those in which Inflorescence Centrifuga and Centripeta are mingled; others differently; all arbitrarily.

13. The Anthurus, an inflorescence that has the kind of aspect of that of the *Amaranthus caudatus* or the *Chenopodiaceæ*.

** Inflorescentia Centrifuga.

14. The Cyme (Cyma), also in manifold combinations, in which however we do not consider whether the side ramifications follow the Inflorescence Centripeta or Centrifuga in longer pedicels.

15. The Bunch (Fasciculus), a manifold compound cyme, with short pedicels, and rather crowded.

16. The Anthela, all kinds of inflorescences in the *Juncaceæ* and *Cyperaceæ*.

17. The Glomerule (Glomerulus), many inflorescences that appear almost like a capitulum, and consist only of ill-formed, imperfect flowers, as in some *Chenopodiaceæ*, *Urticaceæ*, and *Juncaceæ*.

We subjoin Professor Schleiden's closing remarks:—

"I leave every one with thinking faculties to draw for himself the sad conclusions which the preceding survey affords; and I think that I have not to defend myself to any one who is acquainted with our literature, against the charge that the foregoing is a frivolous vagary of my humour. Röper first attempted a scientific development of the inflorescence. No one that I know of has followed him. except Lindley. Physiologists seem not to have accounted it of sufficient importance. Systematists have too much to do with their herbaria, and it is much easier to coin a new word than to study minutely the progressive development through a large series of plants. For the sake of those unacquainted with these matters I will insert the following examples:—In *Lotus corniculatus*, Koch ('Syn. Fl. Germ.') has a Capitulum, Kunth ('Fl. Berol.'), an Umbella, Reichenbach ('Fl. Excurs.'), actually a Fasciculus. To *Eriophorum vaginatum* Kunth gives a Spica; Koch, a Spicula. For *Cladium Mariscus* Kunth has Umbellæ Axillares et Terminales; Koch, Anthelæ Axillares et Terminales; Reichenbach, Cymæ Axillares et Terminales; in *Isolepis supina* Koch has Spiculis in Fasciculum aggregatis; Kunth, Spicis Conglomeratis. I have here omitted the French and English botanists, or the matter would have been still more glaring."

INFUSORIA. At the time the classification given under the head POLYGASTRICA was drawn up, the distinctions that limit the vegetable and animal kingdoms were less perfectly understood than at present. One of the first members of this group of organised beings that was withdrawn from the animal kingdom, was the *Desmideæ*, which are now generally recognised as plants. [DESMIDEÆ, *S.* 2.] The group of *Pseudopodia loricata* must also be placed amongst doubtful creations, although many physiologists do not hesitate to group them amongst plants [DIATOMACEÆ, *S.* 2], whilst the groups *Monadina* and *Volvocina* have recently undergone the most searching investigation, with the result that many of these forms are more decidedly vegetable than animal in their character. Some have even gone further than this, and Agassiz in the 'American Journal of Science,' for 1852, thus writes to Mr. Dana:—"You may remember a paper I read at the meeting at Cambridge, United States, in August 1849, in which I showed that the embryo which is hatched from the egg of a *Planaria* is a genuine polygastric animalcule of the genus *Paramecium*, as now characterised by Ehrenberg. In Steenstrup's work on the 'Alternation of Generation' [GENERATIONS, ALTERNATION OF, *S.* 2], you find that in the extraordinary succession of alternate generations, ending with the production of *Cercaria* and its metamorphosis into *Distoma*, a link was wanting—the knowledge of the young hatched from the egg of *Distoma*. The deficiency I can now fill. It is another *Infusorium*, a genuine *Opalina*. With such facts before us there is no longer any doubt left respecting the character of all these *Polygastrica*—they are the earliest larval condition of worms. And since I have ascertained that the *Vorticellæ* are true *Bryozoa*, and botanists claim the *Anentera* as *Algæ*, there is not a single type of these microscopic beings left which hereafter can be considered as a class by itself in the animal kingdom." Few naturalists would perhaps indorse this statement of Professor Agassiz. The *vorticellæ* are not yet admitted as members of the family *Bryozoa*; nor are all the *Anentera* of Ehrenberg regarded indiscriminately as *Algæ*. The passage however indicates the direction in which inquiry is gradually breaking up the great polygastric family of Ehrenberg. It is nevertheless very certain that many of the species enumerated by Ehrenberg are only transitionary forms in which the same being exists. To no one has this department of science been more indebted than to Dr. F. Stein, who in his recent work, entitled 'Die Infusionsthiere auf ihre Entwickelungs-Geschichte untersucht' (Leipsic 1854), has given the result of a long series of investigations on this subject. The following is a summary of Dr. Stein's researches, as recorded in this volume. (It ought however to be premised that Föcke, Dujardin, and Siebold had previously pointed out that the great mass of the Polygastric *Infusoria* were much simpler than Ehrenberg had supposed, and that the internal organs he had described were referrible to the general conditions of unicellular organisms, whether animal or vegetable.)

"In a glass in which were contained a great variety of ciliated *Infusoria*, and among them also numerous individuals of *Euglena viridis*, *Eacus*, and *Edeses*, Dr. Stein remarked, after the lapse of some days, the formation of a thin film on the surface of the water, composed of an interlacement of confervoid filaments and *Oscillatoriæ*. This film swarmed with *Euglenæ*, many of which had lost their beaks, and crawled about with a worm-like movement among the *Confervæ* and *Oscillatoriæ* filaments. Besides these, he discovered, to his great joy, a great many transparent gelatinous or quite soft cysts, which sometimes contained only a single *Euglena* contracted into a globular form; sometimes two of a hemispherical form appressed together. The encysted *Euglenæ* proved to be still living, inasmuch as they moved about in the cysts, and if the cysts were ruptured the previously globular individuals re-assumed their pristine elongated figure, and crawled about in the same manner as the other beakless individuals among the *Confervæ*.

"For what purpose was this encysting? The cyst was evidently intended for something more than a coffin. Farther observations soon showed that the encysting process of the *Euglenæ* had really reference to their multiplication. The process however appeared to be different in *Euglenæ* from that in *Gregarinæ*, inasmuch as in the latter case two individuals are conjoined before the cyst is developed, whilst in the *Euglenæ* the case is formed usually around but one; for where two individuals were found inclosed in a cyst, it was at once apparent that they had proceeded from the division of an originally single individual. Whilst thus investigating the *Euglenæ* his notice was also directed to other forms of *Infusoria* contained in the same water, such as *Paramecium aurelia*, *Prorodon niveus*, and *Holophrya discolor*, the latter two of which species he frequently observed inclosed in well-defined gelatinous cysts; and as these *Infusoria* belonged to quite another principal division of the class, he began to hope that the process of becoming encysted would probably turn out to be of general occurrence in the infusory world.

"This proved to be the case, and the work then proceeds to describe the way in which Dr. Stein was led to detect the connection between *Epistylis plicatilis* with a species of Ehrenberg's genus *Acineta*, an observation which pointed the way in his future researches. One of his earliest additional observations was that of the heterogeneous generation of *Epistylis digitalis*. In this species he traced first the metamorphosis of the *Epistylis* into an *Acineta*; and, secondly, observed in the latter the extraordinary fact of the development and evolution of a *Tricodina*, a discovery which Ehrenberg has attempted to explain by the supposition that the *Tricodina* had been previously swallowed by the *Acineta*. Dr. Stein's important researches are continued through the family of the *Vorticellinæ*, and his observations given upon *Actinophrys*, *Podophrya*, the genus *Tricodina*, and on the nature of the *Opalinæ*, the propagation of the *Chlorogonium euchlorum* and *Vorticella microstoma*, and particularly upon the quiescent condition of the latter *Infusoria*; upon *Spirochona gemmipara* and *S. Schentenii*, and upon the *Acineta* state of *Dendrocometes paradoxus*, *Zoothamnium affine*," &c., &c. ('Quarterly Journal of Microscopical Science,' July, 1854.)

At the present time it would undoubtedly be premature to state that no organisms ought to be referred to Ehrenberg's class *Polygastrica*. It would however be probably better to substitute the term *Protozoa*, to receive organisms having an animal character, and yet presenting the same simple conditions that we find amongst the *Nostochineæ*, and other groups of lowly developed plants. We may state generally that Ehrenberg's *Polygastrica* embrace the following groups of beings:—

1. True plants, as in the *Desmideæ* (*Closterina*), *Volcocina* (*Cryptomonadina*), and some others.

2. Organisms which evidence at present assigns to the vegetable kingdom, as *Diatomaceæ* (*Bacillaria*, *Fragillaria*, &c.), and a large number of the *Monadina* and *Vibrionina*.

3. The ova of *Entozoa*, as *Cercaria* and others, and probably even of higher animals.

4. Minute forms of animals referrible to previously established groups; this seems to be the case with the whole of the *Vorticellina*, which may with more propriety probably be referred to Hydroid than to any other form of polypiferous animals.

5. Dujardin has pointed out the identity between the structure of organisms like *Amœba* with such forms as *Difflugia* and *Arcella*. In all these creatures there is no trace of mouth or digestive cavity, and the entire body is a single cell or an aggregation of cells, which derives its nutriment by absorption from without. Professor Kölliker has recently described the method by which one of these creatures, the *Actinophrys*, takes its food:—

"As regards the vegetable functions," says the Professor, "the mode in which the *Actinophrys* is nourished is one of the highest and most special interest. Although the creature has neither mouth nor stomach, yet it takes in solid nutriment, and rejects what is indigestible. This miracle, for so it may almost be called, is thus effected with minute Crustaceans (*Rotifera*, minute species of *Lynceus*, the young of *Cyclops*, &c.), and the lower *Algæ* (*Diatomaceæ*, spores of *Vaucheria*, *Closterium*, &c). When in its progress through the water it approaches one of these little plants, or when an *Infusorium* has come into proximity with it, both plant and animal, as soon as they touch one of the tentacular filaments, usually adhere to it. Now, as the filament with its prey slowly shortens itself, and the latter approaches the surface of the body, all the surrounding filaments apply themselves upon it, bending their points together so that the captive becomes gradually inclosed on all sides. According to all appearance these filaments also become more or less shortened. In this way the morsel is gradually brought to the surface of the body, the filament by which it was seized, being finally so much shortened as to disappear altogether, and having, as not unfrequently happens, relinquished its hold upon the prey, after the latter has become encompassed by the surrounding filaments. These gradually apply themselves more and more closely together around it, forcing it towards the surface of the body.

"The following proceeding now takes place: The spot of the surface upon which the captured animalcule is lying slowly retracts, and forms at first a shallow depression gradually becoming deeper and deeper, in which the prey, apparently adherent to the surface and following it in its retraction, is finally lodged. The depression by the continued retraction of the substance now becomes deeper; the imprisoned animalcule, which up to the time had projected from the surface of the *Actinophrys*, disappears entirely within it; and at the same time the tentacles, which had remained with their extremities applied to each other, again erect themselves and stretch out as before. Finally, the depression acquires a flask-like form by the drawing in of its margin, the edges of which coalesce, and thus a cavity closed on all sides is formed in which the prey is lodged. In this situation it remains for a longer or shorter time, gradually however approaching the central or nuclear portion, and at last passing entirely into it, in order to await its final destination. In the mean while the external portion of the *Actinophrys* regains in all respects its pristine condition. The engulfed morsel is gradually digested and dissolved, as is readily seen by its change of appearance from time to time. If entirely soluble, as for instance an *Infusorium*, the space in which it is contained contracts as the dissolution of its contents goes on, and finally disappears altogether. Should there be however an indigestible residue (a membrane composed of cellulose, a portion of chitine, a shell of a *Lynceus*, or case of a rotifer, &c.), a passage for its exit is formed, and it is expelled by renewed contractions of the homogeneous substance, and in the same direction, or nearly so, as that which the morsel followed in its introduction. The passage and the opening through which the expulsion was effected disappear again without leaving any trace."

In the *Actinophrys* we have an animal closely resembling the creature which inhabits the shell of the large family known as *Foraminifera*, and Dujardin suggests that the loricated forms of *Difflugia* and *Arcella* are transitions to the more decided forms of *Foraminifera*. Hence he proposes to include several forms of Ehrenberg's *Infusoria*, with the *Foraminifera* or *Polythalamia*, under the term *Rhizopoda*. Little therefore is left us to say of what may be regarded as true *Polygastrica*. They all appear to have a distinct mouth or entrance to the cavity of the body, and this is usually surrounded by vibratile cilia, as is seen in *Monas atomos* and *Leucophrys patula*. These cilia apparently bring the food to the mouth of the animal. An anal orifice is described by Ehrenberg in the majority of species. When finely divided soluble colouring-matter as carmine or indigo (a writer in the 'Microscopical Journal' recommends the red pigment which lines the cornea of the common house-fly) is introduced into the water in which they are contained, the transparent body of the animalcule is speedily seen to be studded with coloured globules, consisting of an aggregation of the particles of colouring-matter. Ehrenberg regarded these globules as distinct sacs, which he supposed were given off from a central intestinal canal, as seen in *Leucophrys patula*. Regarding these sacs as so many stomachs, he gave them the name of *Polygastrica* (many-stomached). It is however still a question as to whether in any case these masses are contained in a distinct sac. The whole body of the animalcule is often covered with vibratile cilia, and it is to the constant action of these organs that the varied movements of these animalcules are due. The movements thus effected are perfectly automatic, and in no way connected with any intelligent consciousness. All the movements of these animals are not due to cilia, as the whole of the tissue of the animal is observed to contract in *Amœba*, *Amphileptus*, and the stalk of the *Vorticellina*.

Although Ehrenberg has described a complicated apparatus for reproduction, no instances of conjugation are recorded amongst the true *Polygastrica*. Their modes of multiplication are by fission and gemmation. In a large number of cases a simple division of the unicellular organism into two equal parts takes place. This process goes on so rapidly that, according to Ehrenberg, a single *Paramecium* could produce 268,000,000 of cells in a single month. From analogy we must suppose this process would not go on continually, and, as in plants, we must regard the separate cells thus produced as belonging to the same individual. Further observation is probably only needed to demonstrate the existence of a union of two cells—a sperm cell and a germ cell—as is now known to be almost universal in the vegetable kingdom. In the account above given of Stein's researches it will be seen, that it is not improbable that one of the modes by which these beings are enabled to spring suddenly into existence, is the production of winter-eggs, or reproductive bodies of a kind that will resist the influence of an absence of moisture from the spots in which they ordinarily abound.

The true *Polygastrica* seem universally diffused. Wherever organic matter exists in a decomposing state, there they abound. They exist in incredible numbers in the waters of the ocean, in rivers, lakes, ponds, pools, and ditches. They are found in the secretions of the higher animals, and even in man. Wherever the organic elements, carbon, hydrogen, nitrogen, and oxygen, are capable of uniting to form water, carbonic acid, and ammonia, there they may be expected to be found. The composition of the liquids in which they are found, seems to determine the forms they assume. One set of forms inhabits salt water, another fresh. Every mineral spring has its peculiar inhabitant. The sulphureous springs of the Pyrenees, the chalybeate waters of the Rhine, the siliceous, calcareous, and aluminous waters of Europe, all contain them. They are found with the red snow of the Alps and the poles, and with the *Conferva thermalis* of the hot springs of Aix and Baden. They are always accompanied by plants. Perhaps it would be wrong to call any beings animals that are not found feeding on plants, as it seems to be a law of organic existence that plants should subsist on mineral matters, and animals on organised matters.

What are the uses of these beings? To this question Professor Owen gives the following reply: "Consider their incredible numbers, their universal distribution, their insatiable voracity, and that it is the particles of decaying vegetable and animal bodies which they are appointed to devour and assimilate. Surely we must in some degree be indebted to those ever-active invisible scavengers for the salubrity of our atmosphere. Nor is this all: they perform a still more important office in preventing the gradual diminution of the present amount of organised matter upon the earth; for when this matter is dissolved or suspended in water, in that state of comminution and decay which immediately precedes its final decomposition into the elementary gases, and its consequent return from the organic to the inorganic world, these wakeful members of nature's invisible police are everywhere ready to arrest the fugitive organised particles and turn them back into the ascending stream of animal life. Having converted the dead and decomposing particles into their own living tissues, they themselves become the food of large *Infusoria*, as the *Rotifera*, and of numerous other small animals, which in their turn are devoured by larger animals, as fishes; and thus a pabulum, fit for the nourishment of the highest organised beings, is brought back by a short route from the extremity of the realms of organic matter.

"There is no elementary and self-subsistent organic matter, as Buffon taught; the inorganic elements into which the particles of organic matter pass by their final decomposition, are organically recomposed and fitted for the sustenance of animals through the operations of the vegetable kingdom. No animal can subsist on inorganic matter. The vegetable kingdom thus stands, as it were, between animal matter and its ultimate destruction; but in this great office plants must derive most important assistance from the Polygastric *Infusoria*. These invisible animalcules may be compared, in the great organic world, to the minute capillaries in the microcosm of the animal body, receiving organic matter in its state of minutest subdivision, and, when in full career to escape from the organic system, turning it back by a new route towards the central and highest point of that system."

INGHIRAMI, CAVALIERE FRANCESCO, a distinguished Italian archæologist, was born in 1772, at Volterra in Tuscany. From the completion of his education he devoted himself with unwearied diligence to the study of ancient art. He wrote several papers in the artistic and antiquarian journals, which secured him a high place among the Italian art authorities; but the work which acquired for him a European reputation was the splendid publication entitled 'Monumenti Etruschi,' of which the first part appeared in 1821, and which was finally completed, in 6 vols. 4to, in 1826. This great work was intended to comprise a complete survey of all the existing remains of ancient Etruria; and it has formed the great treasury of all subsequent writers on Etruscan antiquities and the Etruscan people. His other more important works are—'Lettere di Etrusca Erudizione,' 8vo, 1828-30; 'Galleria Omerica,' 3 vols. 8vo, 1829-31, a work intended to illustrate the 'Iliad' and 'Odyssey' by the monuments of antiquity; 'Pitture di Vasi Fittili esibite dal Cav. F. Inghirami,' 4 vols. 4to, 1835-37, in which it was his avowed object to illustrate the mythology and the history of the ancients; and 'Storia della Toscana, in Sette Epoche distribuita,' 16 vols. 12mo, 1841-43, the last two volumes being devoted to the bibliography and index. He also wrote many memoirs and papers on particulars in archæology and history in the 'Archivo Storico Italiano,' &c. Cavaliere Inghirami was for several years keeper of the Laurentine Library at Florence. He died on the 17th of May 1846.

INGLIS, SIR ROBERT HARRY, Bart., many years M.P. for the University of Oxford, was the only son of Sir Hugh Inglis, Bart., formerly chairman of the East India Company. He was born in 1786, and received his early education at Winchester, and Christchurch, Oxford. Soon after taking his degree, he became private secretary to the late Viscount Sidmouth, and was appointed by him one of the commissioners for settling the affairs of the Carnatic. In 1824 he entered parliament as member for Dundalk, a borough at that time in the patronage of the Earl of Roden. In 1826 he was elected for Ripon, the representation of which borough he resigned in the spring of 1829, in order to contest the University of Oxford against the late Sir Robert Peel, when the latter accepted the Chiltern Hundreds on introducing the Roman Catholic Relief Bill. From that time he continued to represent the University until January 1853, when he retired from parliamentary life, and was sworn a member of the Privy Council. His public life was devoted to the cause of Church and State, upon which question he inherited the ancient opinions of Lords Sidmouth and Liverpool; he steadily opposed the Repeal of the Test and Corporation Acts, the Roman Catholic Relief and Reform Bills, and the admission of Jews into parliament, and every measure which he religiously thought would tend to unchristianise the legislature. On these points his opposition was strong and consistent, though to a certain extent characterised by partiality and prejudice. He took an active part in the management of the religious societies of the Established Church, and also of the learned societies of the metropolis. In private life he was highly respected as an amiable and accomplished gentleman. He died in Bedford Square, London, May 5, 1855.

INGROSSING, is no longer an offence either at Common Law or by Statute. (7 & 8 Vict. c. 24.)

INJUNCTION, in Chancery. One of the recent improvements in the procedure of the Courts of Equity, consists in the abolition of the distinction between Common and Special Injunctions. An injunction is not now obtainable as it was formerly, merely as a matter of course. Sufficient *primâ facie* grounds must be stated in all cases before it will be granted, thus in effect making all injunctions proceed on special grounds.

INJUNCTION, at Law. The Common Law Procedure Act, 1834, among other improvements, has enabled the Superior Courts of Common Law to grant writs of injunction after action brought, in order to restrain the repetition or continuance of the wrongful act complained of, the suitor in this way avoiding the necessity of a resort to the Court of Chancery. This process is, it will be observed, of very limited application, an injunction being generally sought to prevent an injury, and not the repetition of one.

INNS OF COURT AND CHANCERY. A Report on the present state of those societies was laid before Parliament in 1856, by certain Commissioners appointed to examine into the nature of the legal education thereby afforded. This Report being however in many respects erroneous and incomplete, founded on imperfect information, and unsatisfactory in its conclusions, nothing has as yet been done towards carrying out the recommendations of the Commissioners.

INOSITE. [Chemistry, *S.* 2.]

INSOLVENCY. [Cessio Bonorum, *S.* 2.]

INSOLVENT. The Commissioners of the Court for the Relief of Insolvent Debtors no longer make circuits through England, to hear the petitions of prisoners confined for debt in the country districts. This branch of the jurisdiction of the Insolvent Court is now exercised by the County Court Judges, to whom the petition and schedule of the prisoner are for that purpose transmitted. The County Court Judge exercises the same authority as the Court in London, his decision being final and conclusive. (10 & 11 Vict. c. 102.) See also Protection Acts, *S.* 2.

INTESTINES. The structure of the coats of the intestines has been most carefully observed by means of the microscope. The minute structure of the intestines corresponds to a considerable extent with what is met with in the stomach. There are however differences of structure especially in the mucous coat of the intestines. We shall describe first the muscular structure, and in doing this we shall follow Professor Kölliker in his 'Manual of Human Histology.'

The muscular coat of the smaller intestines is somewhat thicker in the duodenum and the upper portions, than in the lower; it has in general a thickness of $\frac{1}{4}'''$—$\frac{1}{8}'''$, and is composed only of longitudinal and transverse fibres. The former are always less developed, and do not form a continuous layer, since they are very few or entirely absent along the attachment of the mesentery; they are usually most distinct upon the free border, though even here they may be readily torn away with the serous membrane, so as at once to leave the second layer exposed. The latter is complete and continuous, consisting of circular bundles, which not uncommonly anastomose at very acute angles.

In the large intestines the longitudinal fibres are reduced to the three ligamenta coli, muscular bands of 4'''—6''', or even 8''' broad, and $\frac{1}{3}$'''—$\frac{1}{2}$''' thick, which commencing upon the cœcum are united upon the sigmoid flexure into a single longitudinally fibrous layer, thinner than in the small intestines, and more especially developed in the duplicatures, which are known under the name of the plicæ sigmoideæ. All the fibres belong to the smooth or non-striated system of muscular fibres. Many of them present knot-like enlargements and frequently zig-zag flexures, which produce the transversely striated appearance of the entire bundles of such muscles so frequently met with in spirit preparations. The arrangement of the fibre-cells in the different strata is simply this, mutually applied in their length and breadth, and coherent:—They are united into thin muscular bands, which when invested with a coating of connective tissue, and frequently also united into secondary bundles, constitute the thicker or thinner muscular tunics of the different regions; which, again are surrounded and separated from the contiguous parts by considerable layers of connective tissue.

Blood-vessels are very abundant in the smooth muscles; and their capillaries, of 0·003'''—0·004''', constitute a characteristic network with rectangular meshes. Nothing is known about the lymphatics; nor are the relations of the nerves yet ascertained, except that Ecker has observed the division of fine nervous tubules in the muscular tunics of the stomach of the frog and rabbit.

The mucous membrane of the small intestines is thinner than that of the stomach, but more complex in its structure, inasmuch as besides the tubular, or Lieberkühnian glands it presents a great number of permanent folds and villi, also imbedded in its substance, peculiar closed follicles, the so-called solitary and Peyer's glands, and, in the submucous tissue of the duodenum, Brunner's glands. The mucous membrane consists of connective tissue which is internally homogeneous, or indistinctly fibrillated: except where certain glands exist there is but little submucous tissue, so that it is pretty closely connected with the muscular tunic. Upon the inner surface of the mucous membrane there rests a cylinder-epithelium, whilst externally towards the submucous tissue it is bounded by a layer of smooth muscles discovered by Brücke, which measures at most 0·0177'''. They are disposed longitudinally and transversely, but in man their slight development renders it often very difficult to discover them.

The villi of the small intestines are small whitish elevations of the innermost portion of the mucous membrane, readily distinguishable with the naked eye, and which distributed upon and between the valvulæ conniventes through the whole extent of the small intestines, from the pylorus to the sharp edge of the ileo-cœcal valve, are set so close together as to give the mucous membrane its well-known velvety appearance. They are most numerous (50 to 90 upon a square line) in the duodenum and jejunum, less so in the ileum (40 to 70 upon a square line). In the duodenum they are broader and less elevated, resembling folds and laminæ $\frac{1}{10}$'''—$\frac{1}{4}$''' in height, $\frac{1}{6}$'''—$\frac{1}{3}$''' or even $\frac{3}{4}$''' in breadth. In the jejunum they appear for the most part to be conical and flattened; frequently they are even foliated or cylindrical, clavate, or filiform, the three latter forme predominating in the jejunum. The length of the villi is from $\frac{1}{5}$'''—$\frac{1}{3}$''', the breadth from $\frac{1}{8}$'''—$\frac{1}{10}$''', or even $\frac{1}{25}$''', the thickness in the flattened forms $\frac{1}{20}$'''.

The villi are composed of two portions, a deeper coat belonging to the mucous membrane, and an epithelial superficial coat. The contour of the former, or villus proper, is similar to that of the entire villus; it is simply a solid process of the mucous membrane containing blood-vessels, lymphatics, and smooth muscles, whose matrix, through which a variable number of roundish nuclei are scattered, in general exhibits no morphological peculiarity more decided than that of the mucous membrane itself, yet must most undoubtedly be regarded as a metamorphosed connective tissue without any intermixture of elastic tissue. The blood-vessels of the villi are so numerous that when well injected those whose epithelium has been detached become coloured throughout; and in living animals, or in those which have just been killed, each villus if viewed from above appears as a red dot surrounded by a clear ring. In man every villus contains a close network of capillaries of 0·003'''—0·005 , with rounded or elongated nuclei, which lies immediately beneath the homogeneous external layer of the matrix, and is supplied by one, two, or three small arteries of 0·01'''—0·016'''. The blood is usually carried back directly into the larger trunks of the submucous tissue by a vein of 0·022''', which does not arise as in animals, by the arching round of the artery, but proceeds from the gradual confluence of the finest capillaries. The relations of the lacteals in the villi of man, have not hitherto been perfectly made out; for although the majority of investigators are inclined, like the older observers, to suppose that they commence by one or two cœcal branches, yet recently several observers have contended for the view that they originate in a filiform manner. On this subject Professor Kölliker remarks that in the human subject he has never succeeded in meeting with villi distended with chyle, and in empty ones, he has been unable to obtain any decisive evidence; on the other hand, in animals, he feels certain that in many cases only a single lacteal, which has a cœcal and frequently enlarged end, and whose diameter is much greater than that of the capillaries, traverses the axis of the villus. He says he believes that all the narrow cylindrical and filiform villi will be found to present this condition, but that, on the other hand, the number and mode of origin of the lacteals may possibly be different in the broad and foliaceous forms.

In addition to these organs the villi also contain, as Brücke discovered a short time ago, a thin layer of longitudinal smooth muscles, situated more centrally round the lacteals; these however are not always distinct in man, they produce contractions of the villi, which are very evident immediately after death, and which, according to Brücke, are also perceptible in the living animal. They have in all probability an important influence over the propulsion of the chyle, and of the venous blood in the villi—always supposing that there is no objection to the assumption that they perform repeated contractions during life. Nothing is known of nerves in the villi. The epithelium of the villi and of the rest of the surface of the mucous membrane, although it is very intimately united with the deeper-seated parts during life, only becoming detached accidentally or by disease, separates very readily in the dead subject, and can only be observed in perfectly fresh portions of intestine. It consists everywhere of a simple layer of cylindrical cells slightly narrowed below of 0·01'''—0·012''' in length and 0·004''' in breadth, whose contents are usually nothing but fine granules, and an oval, clear, vesicular nucleus, provided with one or two nucleoli. During life, these cells, which agree in all their chemical characters with the deeper cells of the oral epithelium, are so intimately united, that even after death their contours in a longitudinal view, are at first either not at all or only indistinctly distinguishable, though on the surface they have the appearance of a beautiful mosaic. The cylinders only become quite distinct when they are either spontaneously or artificially detached, a process which usually takes place in such a manner that they hang together in continuous portions, all the cells covering a villus sometimes coming off together like the calyptra of a moss.

The addition of water to these cells produces a separation of the cell contents from the broad end, giving rise, in separate cells, to the appearance of a membrane thickened upon one side, and, in series of cells or entire villi, to that of a peculiar structureless coat, like the cuticle of plants; by its long action, however, or by that of the intestinal fluids, the bursting of the cells produces apertures in them, or they become distended into large pyriform clear vesicles.

We may here refer to the changes which the epithelial cells and the villi in general undergo during digestion. The most striking circumstance is the occurrence of fat-globules in different parts of the villi, which may always be observed during the formation of a fatty milk-white chyle. The succession of the morphological steps is as follows:—The fat contained in the chyme at first enters only isolated epithelial cells in different regions of the villi, so that in each we soon observe a large ovate shining drop.

The number of these fat-cells rapidly increases, and then the villi acquire a very peculiar appearance, often as if beset with pearls, from the irregular alternation of cells filled with fat, and consequently bright and shining, with those which are empty and pale. In the end all the cells become filled with these drops, and the epithelium appears quite dark by transmitted, but whitish by reflected light, giving its aspect to the whole villus.

With the repletion of the entire epithelial covering of the villus, absorption commences, but up to this time nothing has entered the lacteals. This however soon takes place, and the first indication we observe is the breaking up of the large drops of fat in the cells into many tolerably minute fatty molecules. When this has occurred, these drops penetrate by degrees from all sides into the parenchyma of the villus itself, fill it more and more, and at last enter the central lacteal, whose whole length they eventually occupy. In the mean while, fresh fat has been continually passing in from the intestinal canal, not in the form of large drops however, but henceforward in small molecules or drops of the same kind as those which were at first developed secondarily in the cells. On the other hand, at a subsequent period, we not uncommonly meet in the interior of the villi with large round drops, which appear especially inclined to form considerable accumulations at their apex. In man the process is probably the same as in animals. These observations demonstrate that fatty matters are absorbed as such, and are not saponified; on the other hand, it cannot at present be certainly stated how it is possible that they penetrate the membrane of the epithelial cells, the parenchyma of the villi, and the walls of the lacteals.

The whole process may be compared to the imbibition of an emulsive fluid, such as milk, by a porous body; and the fatty molecules of the chyme are probably absorbed simply in consequence of their being carried along with its fluid part. While digestion is going on, we frequently find the whole parenchyma of the villi densely filled with small nuclei, here and there surrounded by cell-membranes—elements which are never entirely absent in a villus, but are at other times far fewer, and particularly are not to be distinguished in its interior.

The small intestines contain two kinds of true glands; 1, tubular glands, which are disposed over the whole mucous membrane; 2, racemose glands, in the submucous tissue of the duodenum.

The Racemose Glands, or as they are commonly named, after their discoverer, Brunner's Glands, form, at the commencement of the duodenum, upon the outer side of the mucous membrane, a continuous layer, which is best developed and thickest close to the pylorus, where it constitutes a considerable glandular ring, and extends about as far as the aperture of the biliary ducts. If the two layers of the muscular tissue be dissected off a stretched or distended duodenum, the glands may readily be recognised as yellowish flattened bodies of ⅐'''—1½''' (on the average ¼'''—⅓'''), with their angles rounded off, which inclosed within a little connective tissue, lie close to the mucous membrane, and send short excretory ducts into it. In their minute structure Brunner's glands, the terminal vesicles of which measure 0·03'''—0·06''', even 0·08''', agree perfectly with the racemose glands of the mouth and œsophagus. Their secretion is an alkaline mucus, in which no formed elements are contained, having no digestive action upon coagulated protein compounds, and probably merely subservient to mechanical ends.

The Tubular, or Lieberkühnian Glands (cryptæ mucosæ), are distributed over the whole small intestines including the duodenum as innumerable straight narrow cœca, which occupy the entire thickness of the mucous membrane, and are frequently slightly enlarged at their extremities, though hardly ever dichotomously divided. The best idea of their number is obtained by viewing the mucous membrane either from above or in vertical section, under a low power. In the latter case we see the cœca standing close together, almost like palisades; in the former we observe that the glands do not occupy the whole surface, but only the interspace between the villi; here however they exist in such numbers as to leave no intervals of any width, the mucous surface between the villi appearing pierced like a sieve. Even on Peyer's patches, and over the solitary follicles, these glands are to be met with; but in man they leave those portions of the mucous membrane which lie immediately over the centre of the follicles free, and therefore are arranged like wings around the follicles.

The length of the Lieberkuhnian glands equals the thickness of the mucous membrane and varies from ⅙'''—¼'''; their breadth is 0·028'''—0·036''', that of their aperture, 0·02'''—0·03'''. They are composed of a delicate homogeneous membrana propria, and of a cylindrical epithelium, which even during chylification never, like that of the intestine, contains fat; their cavity is filled during life by a clear fluid secretion, the so-called intestinal juice, which however becomes rapidly changed after death, or on the addition of water, so that the glands appear to be filled with cells, or with a granular mass.

The most important of the closed Follicles are Peyer's patches (glandulæ agminatæ). They are rounded flattened organs, invariably situated along that surface of the intestine which is opposite the mesentery; they are most distinct upon the inner surface, where they appear as rather depressed smooth spots, without any very sharp definition, but they are also recognisable from the exterior by the slight elevation to which they give rise; by transmitted light they look like mere opaque portions of the membrane. These patches are usually the most abundant in the ileum, but they are not uncommonly to be met with in the lower part of the jejunum; occasionally they exist in the upper portion close to the duodenum, and even in the inferior horizontal portion of the duodenum itself. Ordinarily there are 20 to 30 of them; but when they are found higher up there may be as many as 50 to 60; but they are always most closely set in the lowest portion of the ileum. The dimensions of the separate patches are in general the larger the closer they are to the cœcum; their length is usually 5'''—1½'', but may diminish to 3''', and increase to 3''—5'', or even 1'; their breadth varies from 3''' to 5''', or 9'''. Where the patches lie the valvulæ conniventes are usually interrupted; in the jejunum however these folds are also to be met with upon the Peyer's patches and in the ileum; rows of closely-set villi often take their place. More minutely examined, every Peyer's patch is seen to be an aggregation of closed follicles of ⅕'''—⅓'''—1''' in diameter, either rounded or slightly conical towards the intestinal cavity, which lie partly in the mucous membrane itself, partly in the submucous tissue; and are on the one side not more than 0·02'''—0·03''' distant from the mucous surface, while on the other they are in immediate contact with the muscular tunic, which is here somewhat more closely united with the mucous membrane.

Viewed from the interior of the intestine their most striking feature in man is the presence of many small rounded depressions ⅕'''—⅓'''—1''' apart, which corresponds with the separate follicles, and whose floor is indeed rendered slightly convex by the latter, but which present no villi whatever. The remainder of the patch is occupied by common villi, or by reticulated folds, and by the apertures of the Lieberkühnian glands; the latter are disposed around the slight elevations produced by the follicles in circlets of 6 to 10 and more apertures, the coronæ tubulorum of authors.

The Solitary Follicles (glandulæ solitariæ) resemble the separate elements of Peyer's patches so closely in size, contents, and general structure, that there is no reason for considering them as distinct, particularly as the number of follicles is subject to all possible varieties, and since, in animals at least, we find Peyer's patches with 2—3—5 follicles. In man, as all writers justly agree, their number is exceedingly inconstant; sometimes not one can be found, whilst in other cases the whole intestines, as far as the margins of the ileo-cæcal valve, is thickly beset with them: or, lastly, they may occur in the ileum and jejunum, but in no very great number. Their entire absence must probably be considered abnormal, since they are constant in newly born children, being more abundant in the jejunum than in the ileum. The milliary vesicles however, which are often met with in immense quantities in the small intestines and stomach in catarrhal affections of the alimentary tract, may very probably be entirely or partially pathological, since the occurrence of such follicles has been demonstrated in other organs also (in the liver according to Vorhow). The solitary follicles have the same structure as the elements of the patches, only they occur also in the mesenteric border, and support villi upon their intestinal surface, which is usually somewhat convex.

Professor Kölliker expresses himself as decidedly opposed to the notion that the follicles of Peyer's patches have any apertures. Of their functions he says: "They and the follicles of the intestine in general appear to me to be closed glandular organs, analogous to the splenic follicles, the tonsils, and the lymphatic glands, which contain peculiar elements and a vascular network. In these a constant development of cells takes place, and at the same time substances are elaborated from the plasma, supplied by the blood-vessels, and perhaps also from matters not of a fatty nature, absorbed from the intestine, a part of which in all probability is at once taken up by the internal blood-vessels, while the larger proportion is excreted, and absorbed by the lymphatics."

The structure of the mucous membrane of the large intestines agrees so closely with that of the small intestines, that it need not be described separately. With the exception of the rectum it has no proper folds, for the transversely fibrous muscular layer also enters into the plicæ sigmoideæ. The villi are absent from the edge of the ileo-cœcal valve. The glandular organs are Lieberkühn's glands and solitary follicles. The latter are arranged close together in the processus vermicularis, and are very frequent in the rectum and cæcum, and are also usually more abundant in the colon than in the small intestines. [DIGESTION; FOOD; STOMACH; BILE; LIVER.]

INULIN. [CHEMISTRY, *S.* 1; TISSUES, ORGANIC, *S.* 1.]

INVERKEITHING. [FIFESHIRE.]

INVERURY. [ABERDEENSHIRE, *S.* 1.]

IODOFORM. [CHEMISTRY, *S.* 1.]

IOLITE, a Mineral, also called *Dichroite* and *Cordierite.* It belongs to the group of anhydrous silicates of alumina. It crystallises in rhombic and hexagonal prisms, and usually occurs in 6- or 12-sided prisms, or disseminated in masses without distinct form. The cleavage is indistinct; but the crystals are often separable into layers parallel to the base. The colour is of various shades of blue—often deep blue in the direction of the axis, and yellowish-gray transversely. The streak is uncoloured. Lustre and appearance much like that of glass. Transparent to translucent. It is brittle, and has a hardness of 7 to 7·5. Its specific gravity is 2·6 to 2·7. A specimen from Connecticut, United States, had the following composition:—

Silica	48·3
Alumina	32·5
Magnesia	10·0
Protoxide of Iron	6·0
Protoxide of Manganese . .	0·1
Water	3·1
	——100

Before the blow-pipe it fuses with difficulty to a blue glass resembling the mineral. It is distinguished by this property from blue quartz, for which alone it could be mistaken.

Iolite is found at Bodenmais in Bavaria, Arendal in Norway, Cabo de Gata in Spain, Tunaberg in Finland, also in Greenland, Ceylon, and the United States. It is occasionally employed as an ornamental stone, and when cut it presents different shades of colour, hence one of its names, Dichroite (διχροια). Iolite refers to its violet colour (ἰόεις).

When Iolite is exposed to the air and moisture it undergoes a gradual alteration. It absorbs water, and becomes converted into a hydrate. It then assumes a foliated micaceous structure resembling talc. Hydrous *Iolite*, *Chlorophyllite*, and *Esmarkite* are names that have been given to altered Iolite, and *Fahlunite* and *Gigantholite* have probably the same origin.

IPHÆROCERA. [BORBORUS.]

IPS, a genus of Insects belonging to the order *Coleoptera*, to the section *Pentamera*, and the family *Empidæ*. The body is of an oblong-oval form and depressed, with the third joint of the antennæ longer than the second, and the club large and rounded. The species are generally found under the bark of decayed trees. They are chiefly confined to Europe. The British species, of which there are four or five, are rare.

IRAWADDI. [BIRMA.]

IREBY. [CUMBERLAND.]

IRELAND. [CENSUS OF 1851, *S.* 2.]

IRIDIOCYANOGEN. [CHEMISTRY, *S.* 2.]

IRIDOSMINE. This name is given to a compound of the metals Iridium and Osmium, found in the platina mines of Russia, South America, and the East Indies. The crystals are hexagonal prisms of a pale steel-gray. It occurs in flat grains. Their composition varies. One variety contains rhodium. They are distinguished by the odour of osmium.

IRON, OXALATE OF. [MINERALOGY, *S.* 1.]

ISABEY, JEAN-BAPTISTE, an eminent French miniature painter, was born at Nancy, on the 11th of April, 1767. Having received elementary instruction in art under Claudot and Dumont, he, in 1790, entered the atelier of David, with a view to becoming an historical painter. But he commenced his professional career by taking portraits in black crayons, a style which in his hands, by a free use of the stump, produced very pleasing effects; and becoming extremely popular, was usually called by his name. One of his most successful pieces in this manner was a portrait of Napoleon I. in the garden of Malmaison, the engraving from which, by Lingé, had a great run. This style was however soon abandoned by Isabey, who, having resolved to try whether, by carrying the principles of high art into miniature-painting, he could not elevate that branch of art in public estimation, executed in 1802 a piece of unusual size, containing numerous small figures, of 'Le Revue de Premier Consul dans la cour des Tuileries.' It caught the public taste, and established the painter's reputation, as the first in his line. From that time Isabey was the most fashionable miniature-painter of the day. Whilst Napoleon I. was a plain officer of artillery, Isabey had been on terms of friendship with him, and when the empire was founded Isabey continued in favour, and was appointed miniature-painter in ordinary to the emperor. In this capacity he painted many miniature-portraits of Napoleon I., the empress, the young king of Rome his son, the members of the Bonaparte family, and the favourite courtiers and generals. Among the most famous of the imperial pictures was one on a large slab of porcelain, representing Napoleon I. and the most illustrious of his generals, and known as the 'Table des Maréchaux.' Besides the portraits, he executed several court and ceremonial pieces, one of which, a 'Visite de l'Empereur à la Manufacture d'Oberkampf à Gouy,' was greatly admired. He was likewise entrusted with the direction of works relative to the coronation of the emperor, when he was named officer of the Legion of Honour.

On the first abdication of Napoleon I., Isabey accompanied the empress Marie Louise to Vienna, where he painted a large tablet of 'One of the Conferences at the Congress of Vienna,' chiefly remarkable for the faithful likenesses of the numerous important personages assembled. On Napoleon's return from Elba, Isabey repaired to Paris, and propitiated the emperor by presenting him with a miniature of his son, which he had just painted at Vienna. The restoration of the Bourbons brought no loss of fortune to Isabey; but a picture which he exhibited at the Salon in 1817 of 'A child playing with Flowers,' caused some 'sensation' among the Parisians, from the child, who was holding up a bunch of forget-me-nots, bearing a striking resemblance to the young Napoleon. The 'Constitutionel' having ventured to make a pointed allusion to the likeness, received a warning from the police. Isabey soon after accepted an invitation to the court of St. Petersburg, where he painted the emperor Alexander, the empress, the grand-dukes Nicholas and Michael, and many of the magnates of the court. On his return to Paris he painted the portrait of Louis XVIII., and as long as he continued to paint he found ample occupation; his sitters, it is said, having included most of the sovereigns, as well as a large proportion of the most distinguished personages, of Europe. Isabey survived till the 18th of April, 1855. He may be said to have formed a new school of miniature-painters in France. His likenesses have much character, and are generally esteemed faithful. His style is marked by force as well as delicacy, but almost necessarily from the numberless works he executed, also by a good deal of mannerism.

ISARIA, a genus of *Fungi*, belonging to the division *Trichosporei*, and the tribe *Isareii* of Léveillé. It is characterised by a compound, solid, capitulated, or elongated receptacle. The species are found parasitic upon caterpillars and the larvæ of various insects. Robin enumerates the following species:—

I. Eleuteratorum has been found upon the *Carabidæ* in the autumn of the year.

I. floccosa, upon the larvæ and chrysalides of *Bombyx Jacobæa.*

I. strigosa, upon the chrysalides of *Noctua Upsilon.*

I. arachnophila, upon small spiders belonging to the genus *Geometra*, in the autumn.

I. leprosa, on the chrysalides of *Noctua instabilis.*

I. Tartarica, observed by Robin upon an unknown spider, in the autumn.

I. crassa, upon decaying chrysalides.

I. sphecophila, upon a dead hornet.

I. exoleta, upon the larva of a moth.

I. Aranearum, an American species, found on spiders in Carolina.

I. Sphingum, also found in America, upon the caterpillars of the silk-worm moths.

I. gigantea, found upon a Mygale in the island of Cuba.

(Robin, *Histoire Naturelles des Végétaux Parasites.*)

ISATIC ACID. [Chemistry, *S.* 2.]
ISATIN. [Chemistry, *S.* 2.]
ISATINIC ACID. [Chemistry, *S.* 2.]
ISATYDE. [Chemistry, *S.* 2.]
ISERINE. [Titanium.]
ISLEWORTH. [Middlesex.]

ISMAÏL, a strongly fortified town of Turkey, in the province of Silistria, is situated on the left bank of the northern or Kilia arm of the Danube, 20 miles east from the mouth of the Pruth, and about double that distance from the Black Sea, in 45° 21′ N. lat., 28° 50′ E. long., and has about 20,000 inhabitants. It was taken by storm by the Russians under Suwarroff, Dec. 22, 1790, when the Turkish garrison numbering 30,000 men were put to the sword; the Russians lost 20,000. Under the Turks Ismaïl was important, not only in a military but in a commercial point of view; it contained 17 mosques, a large number of khans and bazaars, and many splendid houses. On its capture by the Russians all was put to fire and sword, and the town remained in a ruinous condition till 1812, when it was ceded to Russia by the treaty of Bukharest. Since then it has been rebuilt, and now contains about 2300 houses and 12 churches. The Kilia arm of the Danube is navigable for steamers and for vessels of considerable burden, of which about 150 enter the harbour of Ismaïl annually, and are chiefly engaged in the corn trade. There are remains of a fine Turkish palace in the town. Ismaïl is now chiefly of importance in a military point of view, and the Russians rendered its defences very strong. It was restored to Turkey after the late war in the Crimea, by the new adjustment of boundary consequent on the treaty of Paris of 1856.

ISONANDRA, a genus of Plants belonging to the natural order *Sapotaceæ*. It is distinguished by the stamens being all fertile, and twice as numerous as the lobes of the corolla.

I. Gutta (Hooker), the Gutta-Percha Tree, has its leaves on long stalks, obovate-oblong, with a short point golden beneath; flowers axillary, fascicled; stamens 12. This tree is a native of the Malayan Archipelago.

The substance yielded by this tree, and designated by the name of Gutta-Percha (pronounced 'Pertsha') is, like Caoutchouc, a carburet of hydrogen, and isomeric with that substance, and possesses a great number of the properties which characterise India-Rubber [Caoutchouc], but exhibits certain special properties which admit of its being applied to particular uses to which caoutchouc is not adapted. Gutta-Percha possesses as great an indestructibility by means of chemical agents as caoutchouc. It has an intermediate consistence between that of leather and wood; it is capable of being softened by heat, and of regaining its primitive consistency on cooling. It is therefore at the same time capable of taking and of retaining the most delicate impressions. The important uses to which it has been latterly applied are only the forerunners of those to which it will be adapted hereafter, provided a scarcity of this precious material (which unfortunately is produced in much less quantities than India-Rubber, and in localities much more circumscribed) does not present an obstacle to it.

Whilst the plants which furnish caoutchouc abound in the whole of the territorial zone which extends between the tropics, the *Isonandra Gutta* is the only tree which yields Gutta-Percha. It grows scarcely anywhere except in certain parts of the Malayan Archipelago, and up to the present time has been almost exclusively obtained from Singapore. It was brought for the first time into England in the days of Tradescant, as a curious product, under the name of Mazer-Wood; and subsequently it was frequently brought from China and other parts of the East, under the name of India-Rubber, in the form of elastic whips, sticks, &c. In 1843 Doctors D'Almeida and W. Montgomery drew particular attention to it, together with its various singular properties, its easy manipulation, and the uses for which the Malays employed it. The most common employment of it was for whips; and it was by the introduction of a horse-whip made of this substance, that its existence was for the first time known in Europe. The specimens of the products of the East Indies, shown in the Great Exhibition of 1851, proved that the natives of the country in which the *I. Gutta* grows know also how to appropriate it to the manufacture of different kinds of vases, and that European industry has little more to do than to imitate their processes.

The importation of Gutta-Percha into England, where the employment of this substance first drew attention, was in 1845 only 20,600 lbs.; but in 1848 it had increased to above 3,000,000 lbs.; and during the following years the importation has amounted to a much larger quantity, and one which begins to cause some apprehension as to the possibility of the supply sufficing for the requirements of the novel uses in store for it in the future. It is true that during its use Gutta-Percha is but little consumed, and the waste from the articles in this material, submitted to a proper softening, can be made to serve new uses; nevertheless its constantly increasing consumption, added to the barbarous manner in which the product has hitherto been extracted, may well justify some apprehension.

During the first few years of the employment of Gutta-Percha it was the custom to cut down the tree for the purpose of obtaining the juice, which, left to itself, very soon allowed the Gutta-Percha to separate and coagulate of its own accord. There is reason to hope that European industry will soon be embarked in the cultivation of this product, and that the Niato (which is the name that the Malays give to the tree which produces Gutta-Percha), multiplied by means of a regular culture, naturalised in other countries than those to which it is indigenous, and worked by regular incisions, which will only take from the tree a portion of its juice without hindering its development, will be the means of furnishing at a low price a substance which is destined to render notable services to industrial and domestic economy.

The Gutta-Percha which arrives in Europe in the form of lumps of some pounds weight is far from being pure. The natives of the Malayan Archipelago make no scruple of introducing into it stones, earth, &c.; the presence of which in the interior of these blocks renders a purification indispensable, which purification however is capable of being attained without much manipulation.

Indestructible by water, and at the same time a bad conductor of electricity, Gutta-Percha has been found available for inclosing the metallic wires employed in the electric telegraph; and the use of this substance may certainly claim its share in the success of the submarine telegraph, by means of which London and Paris and the other great cities of Europe are now brought within a few minutes of each other.

It may be conceived to what a variety of forms a substance can be turned which, becoming soft without adhering at the temperature of boiling water, regains at the ordinary temperature the slight elasticity and the consistence of leather.

ITACONIC ACID. [Chemistry, *S.* 1.]
ITCH-MITE. [Acarus.]
IVINGHOE. [Buckinghamshire.]

J

JACK, a common name of the Fresh-Water Pike. [ESOX, *S.* 1.]

JACK-TREE. [ARTOCARPUS.]

JACOB'S LADDER. [POLEMONIUM, *S.* 1.]

JAMAICINE. [CHEMISTRY, *S.* 2.]

JANIPHA, a genus of Plants belonging to the natural order *Euphorbiaceæ*. It has monœcious flowers; calyx campanulate, 5-parted; petals wanting; stamens 10 in the male flowers, filaments unequal, distinct, arranged round a disc. In the female flowers the style is one; stigmas 3, consolidated into a rugose mass; capsule 3-coccous.

J. Manihot (*Jatropha Manihot* of Linnæus) is a native of Brazil. It has an oblong tuberous root, as big as a child's head, full of a wheyish venomous juice. The stems are white, brittle, having a very large pith, and several knobs sticking out on every side like warts, being the remains of the foot-stalks of the leaves, which have dropped off, usually 6 to 7 feet high, with a smooth white bark; branches crooked, and have on every side near their tops leaves irregularly placed on long terete petioles, broadly-cordate in their outline, divided nearly to their base into 5 spreading lanceolate entire segments, alternate at both extremities, dark-green above, pale-glaucous beneath; the midrib strong, prominent below, and there yellowish-red: from it there branch off several oblique veins, connected by lesser transverse ones; stipules small, lanceolate, acuminate, caducous; panicles, or compound racemes, axillary and terminal, 4 to 5 inches long, bearing sometimes all male or female flowers, at other times these are mixed on the same peduncle; pedicels with small subulate bracts at their base. Male flowers smaller than the female. Calyx purplish on the outside, fulvous-brown within, cut about half-way down into five spreading segments; disc orange-coloured, fleshy, annular, 10-rayed; stamens 10, alternate with the lobes of the disc; filaments shorter than the calyx, white, filiform, free; anthers linear, oblong, yellow. Female flowers of the same colour as the male, deeply 5-parted; the segments lanceolate, ovate, spreading; disc an annular orange-coloured ring, in which the purple ovate furrowed ovary is imbedded; style short; stigmas 3, reflexed, furrowed and plaited, white; capsule ovate, 3-cornered, 3-coccous; seeds elliptical, black, shining, with a thick fleshy funiculus. The expressed juice is dangerously poisonous. Fecula of the root harmless when separated from the juice and exposed to heat. It is called Cassava—a principal article of diet in South America. The nutritious substance known as Tapioca is the Cassava differently prepared and granulated. These preparations are obtained by crushing the roots after the bark has been removed, and straining off the water, when the mass is gradually dried in pans over the fire.

JARROW. [DURHAM.]

JASMINUM, a genus of Plants belonging to the natural order *Jasminaceæ*. It has a tubular 5 or 8-cleft calyx; a 5 or 8-parted corolla; stigma 2-lobed or bifid; berry didymous, having one of the lobes usually abortive: seeds without albumen. The species are usually twining shrubs. Leaves simple or compound; petioles articulated; flowers white or yellow.

J. Sambac, Single-Flowered Arabian Jasmine, is a twining plant; the leaves almost sessile, membranous, from cordate to oblong, acute or obtuse, glabrous; berries globular; branches, petioles, and peduncles downy. It is a native of the East Indies. The flowers generally form small trichotomous umbellets, white and fragrant. The berries are black. A perfume, known as Oil of Jasmine, is obtained from this species.

J. angustifolium, Narrow-Leaved Jasmine, is a native of the Coromandel coast. It is a twining bright plant, with ovate or oblong leaves, smooth, of a shining deep-green colour. The flowers are large, white, with a faint tinge of red, star-shaped, having a peculiar but very pleasing fragrance. The bitter root of this species, ground small and mixed with powdered *Acorus Calamus* root, is considered in India as a valuable external application in cases of ringworm. The plant being constantly covered with leaves of a bright deep-green, sometimes as small as those of Box, render it always beautiful, and well adapted for screening windows and covering arbours in warm climates.

J. officinale, Common Jasmine, is a native of the South of Europe. It has opposite leaves, pinnate; leaflets ovate-acuminate; buds erectish. The plant is glabrous, the branches angular. Calycine segments 5, subulate: corolla white, 4 or 5-cleft, sweet-scented; the terminal leaflet is the longest. The Common Jasmine has been a favourite wall-shrub from time immemorial. Its native country, as well as the date of its introduction, are unknown. Gerarde in 1597 says it was in common use for covering arbours. There are golden and silver-edged leaved varieties of the Common Jasmine, as well as a double-flowered variety.

J. grandiflorum has opposite pinnate leaves, leaflets bluntish, the outer ones 3 to 5-confluent, buds horizontal. It is a native of the East Indies, and greatly resembles *J. officinale*, except in the size of the leaflets, and in the exterior ones being confluent, and the flowers larger and reddish underneath. Both this and the former species yield the true essential oil of jasmine of the shops.

The leaves of *J. undulatum* are slightly bitter. The root of *J. pubescens* is thought to be elexiteric.

JATROPHA, a genus of Plants belonging to the natural order *Euphorbiaceæ*. It has monœcious flowers; a 5-parted or lobed calyx; corolla 5-parted or absent; stamens 8 or 10, with unequal monadelphous filaments; styles 2, bifid or dichotomous; capsule 3-coccous.

J. Curcas, Physic-Nut, is a very common small tree, or bush, on the coast of Coromandel. The bark is smooth and light ash-coloured; leaves scattered, stalked, broad, cordate, 5-angled, smooth, about 6 inches each way; petioles round, smooth, 4 to 6 inches long: stipules absent; panicles terminal or from the exterior axils cymose, bearing many small yellow flowers. The male flowers at the extremities of the ramifications on short articulated pedicels, and the female ones in their divisions with their pedicels not articulated. Bracts, a small one below each subdivision of the panicle, and generally one pressing on the calyx; calyx 5-leaved; corolla 5-petaled, campanulate, somewhat hairy; disc of 5 glandular bodies round the base of the filaments; filaments 6, the central one very thick, columnar, the 5 exterior ones filiform towards the base, adhering to the central one, all erect, and a little longer than the calyx; anthers 10, sagittate, equal: 5 supported by the large general filament, and 1 by each of the others. The leaves are rubefacient and discutient; warmed and rubbed with castor-oil, they are applied by the natives of India as poultices. The seeds are violently emetic and drastic; their expressed oil is reckoned a good application in itch and herpes, and also, a little diluted, in rheumatism. The milky juice is considered detergent and healing: it dyes linen black. The oil, boiled with oxide of iron, forms a varnish used by the Chinese for covering boxes. In large doses the seeds are energetic poisons.

J. glauca is found in Arabia Felix. It has leaves from 3-5-lobed, mucronate serrate, toothed; petioles naked; stipules palmate, with setaceous branched divisions, glandular at the apex. The seeds yield a stimulating oil recommended by the Hindoos as an external application in cases of rheumatic and paralytic affections.

J. glandulifera is a native of the East Indies. The leaves about the extremities of the branchlets are alternate, petioled, and generally palmate; the lobes from 3 to 5, oblong, serrate, with each serrature ending in a short green glandular-headed bristle; stipules bristly; many-cleft, each division ending in a glandular head; panicles terminal, about as long as the leaves. Male flowers most numerous and terminal, small, of a pale yellowish-green colour. The female flowers few, and subsessile in the divisions of the panicle. The pale or whey-coloured thin juice which exudes from a fresh wound is employed by the Hindoos as an escharotic to remove films from the eyes.

J. multifida is a native of tropical America. It has palmate 11-lobed smooth leaves, the segments wedge-shaped and pinnatifid; stipules setaceous, multifid; flowers corymbose, scarlet, with coloured pedicels. The seeds are one of the best of all emetics and purgatives, acting briskly, but without inconvenience; their effects are readily stayed by the administration of a glass of good white wine.

2 U

J. Manihot is now referred to the genus *Janipha*. [JANIPHA, *S.* 2.]

JAY, REV. WILLIAM, was born on the 8th of May 1769 at Tisbury, Wiltshire. His father, who was the son of a small farmer, worked as a stone-cutter and mason, and young Jay's first employment was that of mason's boy. While still young he was placed under the tuition of the Rev. Cornelius Winter of Marlborough Academy, an institution connected with the Congregational body, in which young men were trained for the ministry. His abilities soon became known, and he began to preach before he was sixteen years of age. For about a year he officiated as the minister of Lady Maxwell's Chapel at the Hotwells, Clifton; and on January 31st, 1791, he was settled as pastor of the church assembling in Argyle Chapel, Bath, a position which he maintained for the long period of sixty-two years. Mr. Jay retired from the pastorate in January 1853, and died on the 27th of December in the same year, at the age of eighty-four. His reputation as a preacher was very high, and was by no means confined to his own denomination, that of the Independents. His published sermons have had very extensive circulation, and many a congregation throughout the kingdom has often listened to Jay's sermons without knowing to whom they were primarily indebted for the instruction they were receiving. That which made his pulpit addresses so useful also in the family, and so well adapted for reproduction in other pulpits, was their simplicity of style, combined with a clear and methodical statement of the lessons sought to be conveyed. The effect of his own ministrations was much enhanced by his earnestness of manner, and by a full command of his excellent vocal powers. Mr. Jay's regular congregation was large, and visitors to Bath usually repaired to his chapel to hear him preach. He generally made an annual visit to London and to the coast, and in the metropolis and elsewhere he attracted crowded congregations. When he had completed fifty years of his ministerial labours his people held jubilee services, in connection with which, at a public breakfast in the Assembly Rooms on the 2nd of February 1841, a handsome piece of plate and a purse containing 650*l.* were presented to Mr. Jay. Besides his sermons, of which several editions have been published, Mr. Jay wrote an 'Essay on Marriage;' 'Memoirs of the Rev. Cornelius Winter;' 'Memoirs of the Rev. John Clark;' 'Lectures on Female Scripture Characters' (published since his death); and an 'Autobiography,' from which and other sources a memoir of Mr. Jay was prepared by the Rev. Dr. Redford and the Rev. J. A. James, and published in 1854. A uniform edition of Mr. Jay's works was published under the author's superintendence in 1845-49 in twelve volumes, post octavo.

JEFFREY, FRANCIS, was born in Edinburgh, on the 23rd of October 1773, in the upper part of a house now marked No. 7, Charles-street, George-square. His father, George Jeffrey, was one of the depute clerks of the Court of Session; his mother, Henrietta Loudoun, was the daughter of a Lanarkshire farmer. They had a rather numerous family, Francis being the eldest son, though not the eldest child. In the year 1781 he was sent to the High School of Edinburgh, where he was for four years under the care of one of the under-masters, Mr. Luke Fraser—a worthy man, whose celebrity depends on his having, in three successive classes, three pupils no less famous than Walter Scott, Jeffrey, and Brougham. Jeffrey's class-fellows, while he was under Mr. Fraser, used afterwards to remember him as "a little clever, anxious boy, always near the top of his class, and who never lost a place without shedding tears." From Fraser's class, he passed, in regular course, in the year 1785 to that of the rector, Dr. Adam, the author of the 'Roman Antiquities,' and noted alike for his scholarship and the simple integrity of his character. Jeffrey, as well as Scott, used afterwards to speak with the highest respect of this good old man. It was in the winter of 1786-87, while still attending Dr. Adam's class, that Jeffrey, then a boy in his fourteenth year, saw the poet Burns. He was walking along the High Street, when he was attracted by the appearance of a man on the pavement, who, from his dress and manner, seemed to be from the country, but in whose looks otherwise there was something uncommon. It was Burns, then on his first visit to Edinburgh; and as "the little black fellow was gazing at him, some one standing at a shop-door near said to him "Ay, laddie, you may weel look at that man; that's Robert Burns!" Jeffrey never saw Burns again; but be used to dwell with pleasure on the incident.

In the winter of 1787, Jeffrey (his mother being then just dead) was sent to the University of Glasgow; his father for some reason or other preferring that university to the University of Edinburgh. Here he attended the Greek classes under Young, the logic class under Jardine (then recently appointed, but already with something of that reputation as a teacher which he afterwards maintained and increased), and the moral philosophy class, then taught by a Professor Arthur, the successor of the philosopher Reid. That he did not also attend the law class, then taught by the able and speculative Millar, is accounted for by the fact that his father, who was a strict and rather gloomy man, was a bigoted Tory, and likely to regard the teaching of a Whig like Millar with suspicion. Jeffrey's class-fellows at Glasgow remembered him afterwards as being there one of the cleverest of the younger students, somewhat 'petulant' in his manners, and conspicuous for a little black moustache which he persisted in wearing on his upper lip in spite of remonstrance and ridicule. It was in the debating societies of the college however that he first broke on his companions of that day in the full display of his superiority. He was even then a fluent and rapid speaker, a ready and ingenious writer, and a merciless critic of the essays and opinions of others. It was at this time also that he commenced the habit of serious and versatile reading, and of note-taking and essay-writing for the purposes of private culture. This habit he kept up assiduously after his removal from Glasgow back to Edinburgh in the year 1789. In his little room in his father's house in the Lawnmarket, he read and wrote continually, filling quires of manuscript with notes and abstracts from books and miscellaneous dissertations of his own. His biographer Lord Cockburn gives a list of 31 different manuscript essays on literary and metaphysical topics, all written by him between November 1789 and March 1790. About the same time he attended the Scotch law and the civil law classes in the University of Edinburgh. In 1791 he went to Queen's College, Oxford, intending to complete his studies there. While at Oxford he was very solitary and melancholy; he disliked the place; and after nine months was overjoyed to leave it. "Except praying and drinking," he wrote to a friend during his stay at Oxford, "I see nothing that it is possible to acquire in this place." On his return to Edinburgh, in July, 1792, his friends found that his stay at Oxford had altered him in at least one thing: he now no longer spoke in his former natural Scotch accent, but in a sharp, and, as some thought it, an affected English style of pronunciation. "Jeffrey," Lord Holland used afterwards to say, "had lost his broad Scotch at Oxford, but he had gained only the narrow English." Very soon however his friends, who knew his real intellectual force and the genial goodness of his heart, became reconciled to his new style of speech; and Lord Cockburn certifies that to his latest years, Jeffrey had never really forgotten his native Doric, but could talk broad Scotch, and mimic even the provincial dialects of his countrymen when he chose. He had a strong relish, too, for Scottish anecdotes and humours. For a while after his return from Oxford, it seemed uncertain whether he might not be called upon by his father to give up the law, and become a merchant; but the legal profession was at last definitely resolved on. In 1792-93 he again attended the law classes of Edinburgh University under Professors Hume and Wyld, as also the class of history under Alexander Tytler. Strange to say, he did not attend Dugald Stewart—Stewart's Whiggism being an objection in his father's eyes. On the 12th of December 1792 he became a member of the famous Speculative Society, then at the height of its fame; and here he first formed the acquaintance of Scott and many other young men of the Edinburgh set, who afterwards rose to distinction as lawyers, literary men, and statesmen. For several years Jeffrey was one of the ornaments of this society, reading essays in his turn, and figuring with peculiar eclât in almost every debate. Indeed, it used afterwards to be said of Jeffrey, as well as of Horner and Brougham, that never in their most glorious days did they speak better than they did when young members of the Speculative. Already in these debates, Jeffrey, despite the Toryism of his father, was a Whig of the keenest and most pronounced order. Meanwhile he continued his habits of various though desultory reading, and of incessant composition in private on all sorts of subjects. He had even a dream at this time that he was born to be a poet; and he wrote, his biographer tells us, a great quantity of verse. Of this verse Lord Cockburn says, from inspection, that though "viewed as mere literary practice it is rather respectable," it could never have been accepted as poetry. He adds that in one constitutional quality of the poet, Jeffrey was certainly highly endowed—the love of external nature and the delight in beautiful scenery. On the 16th of December, 1794, Jeffrey was called to the Scottish Bar. It was the time when Scotland was politically stagnant under the so-called Dundas reign; when the whole country was managed by corruption and patronage; when such a thing as the free expression of political opinion by meetings or through the press was unknown; when three-fourths of the entire million and a half who then constituted the population of Scotland were Tories, at the absolute bidding of Dundas; and when such few leading Whigs as there were in Scotland were chiefly to be found in Edinburgh, where they were watched and laid under a kind of social ban. Of these Whigs the most zealous were lawyers, bold enough to avow their principles even at the expense of the hostility of the Bench, and the loss of all hope of preferment. The party however was increasing; and year after year young lawyers of talent were attaching themselves to it. Among these young Whig lawyers, beating their heels idly in the Parliament House with no chance of briefs, and amusing themselves by social meetings at each other's lodgings and by essays and debates in the Speculative, Jeffrey was confessedly one of the chief, if not *the* chief. His prospects of practice were so small that for a time he had ample leisure for reading and literature. He began to contribute to the 'Monthly Review' and other periodicals; and for a time contemplated the pursuit of literature professionally. In 1800-1 he attended Dugald Stewart's lectures on political economy. At last, in November 1801, his talents as a pleader had procured him an income verging upon 100*l.* a year; and on this, with what other resources he had, he ventured to marry his second cousin, Catherine Wilson, of St. Andrew's. The young couple took up their residence in a modestly furnished third story of the house No. 18, Buccleugh-Place; and it was here, at a convivial meeting of Jeffrey, Sidney Smith, Horner, and Brougham, that the 'Edinburgh Review' was projected. Smith was the originator of the idea, but the others immediately concurred, and Constable, a rising bookseller, became the publisher. The first number of the new journal saw the light on the 10th of October, 1802; that number and two more were edited by Smith; but, on Smith's return to London, the entire management devolved on Jeffrey.

The great fact in Jeffrey's life, and that which makes his name memorable in the literary history of Britain, is that for a period of twenty-six years (1803-1829) he was the editor of, and one of the principal contributors to, the 'Edinburgh Review.' With the history of that journal, his career is identified, and it became what it was under his hands. To use Jeffrey's own phrase, it stood on two legs—the one leg being the criticism of current literature; the other being Whig politics. Both as a literary critic and as a politician, Jeffrey was the soul of the 'Review.' To enumerate his articles in both capacities; to estimate the vast influence exerted by the 'Review' during his management, on the contemporary literature and contemporary politics of Britain; to revive the numerous controversies both literary and political, in which the 'Review' was engaged; or to reconsider the right and the wrong of its literary judgments, in particular, on the distinguished poets of the period, such as Scott, Byron, Southey, Coleridge, Wordsworth, &c., is here unnecessary. All this belongs to the well-known literary history of the first quarter of the present country. Suffice it to say, that Jeffrey's honesty in the expression of his opinions was never doubted; and that, where he was wrong, it was because his judgments, though honestly given, were limited by the essential nature of his own intellect. As a literary critic, he proceeded on what has been called "the beauty and blemish" principle of reviewing; that is, it was his regular habit first to state in clear, sharp, opinionative language what he considered the 'beauties' of a poem or other work, and then, as a necessary drawback, to append a list of the 'blemishes.' And, although in following this method, he undoubtedly remained constitutionally insensible to the higher poetry of Wordsworth and his kindred consociates, he unquestionably exercised a healthy influence on the many by his chastisements. Where he praised, he praised heartily; and it is to his credit that, if his negative judgments have not been always ratified, his favourable decisions generally have. In politics there is now less question as to the value of his influence in promoting what was on the whole good and useful. He was uniformly on the side of progress and improvement; and, though he never was a Democrat, nor what would now be termed a Radical, but only a moderate Whig, his fighting, in his earlier days, was uniformly uphill. It is significant of the adaptation of his writings, both literary and political, to the purposes of rapid immediate effect, that, when a selection of his essays from the 'Edinburgh Review' was published in four volumes in 1843, the work did not take such rank in our permanent literature as has been accorded to the similar collections of the essays of Macaulay, Sidney Smith, Carlyle, and others.

To return to Jeffrey's life, apart from the 'Review:' his professional practice rapidly increased, as his powers as a lawyer found opportunities of displaying themselves. In some respects he was without a rival at the Scottish bar—combining good knowledge of law with singular perspicuity and ingenuity, and a rapid, fluent, and brilliant style of eloquence. As a speaker, he was so rapid, that once, at Glasgow, the defendant in a libel case, where he was conducting the prosecution, after listening to his torrent of words, declared that, by calculation with his watch, "that man had actually spoken the English language twice over in three hours." Jeffrey's triumphs as a pleader, both in criminal and civil cases, were numerous; but nowhere was he more successful, or more in his element, than at the bar of the General Assembly of the Scottish Church, at its annual meetings in May, when he was usually retained in important ecclesiastical cases. With his gradual increase of practice his wealth increased correspondingly, till at last he was in the receipt of a handsome annual income. But his wife did not live to share the full flush either of his fame or his fortune; she died in 1805: and it was while he was on a visit to London in 1806, to distract his mind from this calamity, that the famous 'leadless' duel between Jeffrey and Moore took place at Chalk Farm—occasioned by Jeffrey's notice of Moore's early poetry, and immortalised by Byron's reference to it in his 'English Bards and Scotch Reviewers.' Byron, Moore, and Jeffrey were all afterwards the best of friends; and both the duel and the satire were laughed over among them. With Scott also, notwithstanding that their original political differences were somewhat intensified by Scott's secession from the 'Edinburgh Review' to aid in founding the 'Quarterly' in 1809, Jeffrey always remained on terms of personal friendship; and nowhere were Scott's novels more cordially welcomed and praised than in the 'Edinburgh.' At length, after remaining a widower eight years, Jeffrey married again. His second wife was an American lady, Miss Charlotte Wilkes, the daughter of Mr. Charles Wilkes of New York, and the grand-niece of Wilkes the notorious politican. He had met this lady during a visit of her family to Britain; and, in order to marry her, he undertook a voyage to America in 1813. During his brief stay in America, he saw some of the most important men in the United States, and formed an acquaintance with American society and American institutions. After his return, he and his wife resided for some time in the new town of Edinburgh: but ultimately he removed to Craigcrook, a beautiful little property at the foot of the Corstorphine Hills, about two miles from Edinburgh, the old turreted mansion of which, and the wooded grounds, were much improved by him in subsequent years. The vicinity of the place to Edinburgh made it perfectly convenient for his professional engagements; and till the time of his death he here received as his guests his professional and other friends, and all strangers of distinction who visited Edinburgh. The elegant hospitalities of Craigcrook were proverbial; and the house and grounds retain their associations with Jeffrey, as Abbotsford is associated with the name of Scott. Here Moore sang his songs under the roof of his former adversary, and here, in later days, Dickens formed that acquaintance with the venerable critic which ripened into so strong a friendship.

In the year 1821, Jeffrey was elected Lord Rector of the University of Glasgow. Whig politics were by this time in the ascendant in Scotland; and Jeffrey, as the Whig leader, took his part in the public meetings and other demonstrations which heralded the approach of the era of Reform. Having been chosen Dean of the Faculty of Advocates in 1829, he deemed this office incompatible with the editorship of the 'Review,' which accordingly he resigned into the hands of Mr. Napier. He still took an interest in the 'Review' however; and at a considerably later period, when his son-in-law, Mr. Empson, succeeded Mr. Napier as editor, it was his delight to revise proofs and correct articles, as his son-in-law's deputy. In the meantime however he had passed through new phases of his life. In 1830 he was elected a member of the first parliament of William IV., being returned for the Perth, Forfar, and Dundee district of burghs. In March 1831 he was unseated on petition, but was immediately returned again by Earl Fitzwilliam for the borough of Malton. He represented this borough till 1832, taking part in the Reform debates; and in the end of that year he was returned to the first reformed parliament for the city of Edinburgh, along with Mr. Abercromby, the speaker (now Lord Dunfermline). He remained in parliament till 1834, and was Lord Advocate of Scotland under the Grey government. His parliamentary success however did not answer the expectations that had been formed from his fame as a critic and a forensic orator; and he seems himself to have welcomed the change when, in 1834, he was raised to a vacant judgeship on the Scottish bench, and so relieved from the cares of parliament. Scottish judges have the courtesy-title of 'Lord;' and hence Jeffrey was thereafter distinguished as Lord Jeffrey, though still legally only Francis Jeffrey, Esq. As a judge, he had a very high reputation for soundness, conscientiousness, and rapidity. He was noted for a habit of interrupting pleaders when they wandered, so as to bring them back to the point; and so long as he was in the second division more business was sent before him than before any other judge. He continued in the discharge of his duty almost to the last, dying in his seventy-seventh year, after a short illness, at Craigcrook, on the 26th of January 1850. In the relations of private life, Lord Jeffrey was a singularly affectionate and amiable man, soft-hearted to a degree which surprised those who, till they saw him, had figured him only as a sharp and severe critic. A very genial impression of him in this respect is to be gathered from the selections from his correspondence published by his friend Lord Cockburn, as an appendix to his Biography, in 1852.

JEFFREYSIA, a genus of *Mollusca* belonging to the family *Littorinidæ*, established by Mr. Alder, and named after Mr. Jeffreys of Swansea. The species were originally referred to *Rissoa*. Forbes and Hanley give two species, *J. diaphana* and *J. opalina*, as inhabiting British seas.

JELLALABAD, Afghanistan, is situated in 34° 26′ N. lat., 70° 36′ E. long., in the valley of the Cabul River, on its right or southern bank, at a nearly equal distance from Cabul and Peshawer. Though the river begins to be navigated by rafts at this place, Jellalabad does not appear to be a commercial town. The ordinary population is between 2000 and 3000, but this is much increased in the winter season. The houses are low, and the streets narrow. The town was occupied by the British during the Afghan war, 1839-42. General Sale held it under great disadvantages against Akbar Khan, who besieged the place with a large force in January 1842. At the conclusion of the war the British forces under General Pollock left Jellalabad in October 1842, first destroying its mud walls, and the fortifications which had been erected for its defence.

JERROLD, DOUGLAS. With the higher order of minds every surrounding circumstance, especially of their earliest years, is education. The education of the child Douglas Jerrold was within the verge of a theatre; the education of the boy was on the deck of a man-of-war; the education of the youth was in a printing-office. We can trace the fields of observation in which the dramatist, essayist, and journalist gathered his materials, and in which his habits of thought and study were formed. Douglas Jerrold was born in London, on the 3rd of January 1803. His father was manager of the Sheerness Theatre: the "many-coloured life" of the drama was thus familiar to him in his first years; and those who know how strong are the impressions which an intelligent child thus receives will understand the influence of this experience upon the pursuits of the man. But the boy was surrounded by grand and most attractive realities: the docks and the arsenal of Sheerness—ships coming home to refit after tedious cruises—sailors who could talk of the Nile and Trafalgar. The lad, delicate, sensitive, was smitten with a passion for the life at sea; and, his wishes prevailing, a midshipman's appointment was obtained for him from Captain Austen, brother of Miss Austen, the novelist. At the end of the war he quitted the service, and another calling had to be chosen. He was apprenticed to a printer in London. The labours of a printer's apprentice are not ordinarily favourable to intellectual development; the duties of a compositor are so purely mechanical, and yet demand such a constant attention, that the subject-matter of his employ can rarely engage his thoughts. It was not in the printing-office that the mind of Douglas Jerrold was formed, although the aspirations of the boy might have thought that there was the home of literature. He became his own instructor after the hours of labour. He made himself master of several languages. His "one book" was Shakspere. He cultivated the habit of expressing his thoughts in writing; and gradually the literary ambition was directed into a practicable road. He was working as a compositor on a newspaper, when he thought he could write something as good as the criticism which there appeared. He dropped into the editor's letter-box an essay on the opera of 'Der Frieschütz,' which performance he had witnessed with wonder and delight. His own copy, an anonymous contribution, was handed over to him to put in type. An earnest editorial "notice," soliciting other contributions from our "correspondent," &c., was the welcome of the young writer, whose vocation was now determined. His first dramatic production, 'Black-Eyed Susan'—the most popular drama of modern times, or of any time—was written before Mr. Jerrold had attained his twenty-first year. It was produced at the Surrey Theatre, with a success which Elliston, the manager, very unequally shared with the struggling author. It deferred the ruin of Drury Lane Theatre for a season. The original 'William' boasted, a year or two ago, that he had appeared in the part seven hundred times. 'The Rent Day' followed this first triumph. Jerrold was now the most popular dramatist of the period; and he continued to write for the stage till within the last few years of his life. Equally a master of wit and of pathos, all his plays have a decided originality; they are thoroughly English. His serious dramas are built upon English home affections. The joys and griefs of his scenes are not the tawdry sentimentalities and extravagant passions of adaptations from the French—gaudy exotics, which flower for a little while under artificial cultivation, and then are thrown away as worthless weeds. Jerrold's comedies are also as thoroughly English in their characterisation and their language: they have the true ring of the old national currency of wit and humour and keen satire; but they require excellent actors and intelligent audiences, and, according to some authorities, these requisites for a high drama are passing away. In our day the gratification of the eye, in preference to every other faculty, has degraded even Shakspere from a poet to a showman; and this false taste naturally extends to other walks, to make exaggeration the great requisite of the dramatic artist. Mr. Jerrold's most successful plays, in addition to those we have mentioned, were 'Nell Gwynne,' 'The Prisoner of War,' and 'The Housekeeper;' and amongst his comedies we may especially mention 'Time works Wonders,' and 'The Bubbles of the Day.' Of the latter there has been recently published a German translation, executed with remarkable spirit and fidelity.

A portion of Mr. Jerrold's dramatic works, with the more important of his stories and miscellaneous writings, were collectively published in eight volumes. Here we find the 'Men of Character,' originally published in 'Blackwood's Magazine;' 'Clovernook,' which appeared in 'The Illuminated Magazine;' 'St. Giles and St. James,' written for 'Jerrold's Shilling Magazine;' 'The Story of a Feather,' and 'The Caudle Lectures,' which gave such an impulse to the popularity of 'Punch.' For this famous journal he wrote regularly from the second number. In this constant round for thirty years of a very peculiar form of literary labour, where the strongest effects are produced by epigrammatic terseness, we trace a life of unremitting industry, combined with very rare natural gifts improved by diligent cultivation. The flippant satirist—and we have many such amongst the young race of periodical writers—who pours out his invectives without impartial observation or accurate knowledge, belongs only to the passing hour. Jerrold's satire has always a foundation of truth and earnest purpose, and therefore it lives. In his most ephemeral writings we may trace that wide acquaintance with the best literature which is somewhat too much despised by those who believe that a brilliant writer, to use a familiar phrase, can make everything out of his own head. For the last four or five years of his life Mr. Jerrold was the editor of 'Lloyd's Weekly Newspaper'—a journal of so enormous a circulation that its conduct involved a serious moral responsibility. Whatever objection there may have been to the strongly expressed opinions, the invective, or the sarcasm of this paper under his management, it never aimed at popularity by false and dangerous doctrines upon the great principles of society and government. Its success, compared with its previous position, is one of the many proofs that the largest number of readers are not to be propitiated by what has been falsely considered as essential to popularity—to write down to an imaginary low intellectual standard. Douglas Jerrold died June 8, 1857, at his residence, Kilburn, near London. The amount derived from some performances in honour of his memory was invested for his widow and daughter. A pension of 100*l.* has also been granted to Mrs. Jerrold.

JERVINA. [CHEMISTRY, *S.* 1.]

JET. [COAL, *S.* 2.]

JOHANNOT, TONY, was born at Offenbach, November 9, 1803, and, with a brother, Alfred, has been long known in England as a designer of book-engravings. Like his brother, Tony commenced his professional career as an engraver. His first painting was exhibited at the Exposition of 1831, 'Un Soldat buvant à la porte d'une Hôtellerie.' Like his brother he looked to English as well as French history and literature for subjects for his pencil. Among his chief pictures are enumerated the 'Chanson de Douglas' (1835); 'La Sieste' (1841); 'André et Valentine' (1844); 'Bataille de Fontenoy,' now at Versailles; 'Petits Braconniers' (1848): and 'Scène de Pillage' (1851). Though on the whole less successful than his brother as a painter, when, like him, he turned to designing for the wood-engraver, he proved at least equally happy; and as his life was more prolonged, he enjoyed greater opportunities of displaying the versatility of his pencil. Among the more important of his book illustrations may be mentioned 'Werther,' the designs for which he etched himself; Molière's works; 'Manon Lescaut;' 'Jerôme Paturot;' the Romances of George Sand; the 'Vicar of Wakefield;' Sterne's 'Sentimental Journey,' &c. His illustrations, though not unfrequently a little exaggerated, and sometimes verging on caricature, are almost always characteristic, and full of knowledge and refinement, rendering the works he illustrated among the very best examples of their class. He died suddenly from an attack of apoplexy, August 4, 1852.

JOHNSTON, JAMES F. W., late Professor of Chemistry in the University of Durham. He was born at Paisley, about the year 1796. His father subsequently removed to Manchester, and afterwards returned again to Scotland, residing at Kilmarnock. During this time the education of young Johnston depended chiefly on his own efforts; he was however so successful that he was enabled to obtain his own livelihood by giving private instruction to pupils in the University of Glasgow. In 1825 he removed to Durham, where he opened a school. In 1830 he married the daughter of Thomas Ridley, Esq., of Park-end. By this marriage his circumstances were so much improved that he gave up his school, and determined to put in execution a plan he had long conceived of devoting himself to the study of chemistry. He accordingly repaired to Sweden, and became a pupil of the celebrated Berzelius. He made so much progress in his chemical studies, and became so well known as a chemist, that on the establishment of the University of Durham he was invited to take the readership in chemistry and mineralogy. This took place in 1833, whilst he was yet pursuing his studies on the Continent, and the chair was not occupied till he returned to fill it. On his return, he took up his residence at Edinburgh, and devoting himself to the department of agricultural chemistry he became appointed chemist to the Agricultural Society of Scotland. On the dissolution of this society, he left Edinburgh, and resided permanently in Durham. He now occupied himself principally with the production of works on the relation of chemistry to agriculture. In this he was very successful, and few writers have been more extensively read in this department of literature. His 'Lectures on Agricultural Chemistry and Geology' are an able exposition of the application of the principles of chemical and geological science to the art of agriculture. He also published a 'Catechism' on the same subject, which at the time of his death, in 1855, had gone through thirty-three editions, and has been translated into almost every European language. He had travelled in America, and was well known as an agricultural chemist in the New World; and his works there have as large a circulation as in his own country. His experience of America he gave to the world in a work entitled 'Notes on North America,' in which he discusses many of the important agricultural questions connected with the resources of that great country. He was an eminently popular writer and teacher, and all his writings exhibit an enthusiasm which renders them attractive even to the unscientific reader. One of the most popular and the last of his works was his 'Chemistry of Common Life,' which has had a vast circulation, and done much for diffusing a knowledge of the principles of chemistry involved in the ordinary occupations of human beings. In some parts of this work he has unintentionally fallen into error; and it is perhaps only right to state here that the remarkable statement made in that work with regard to arsenic-eating amongst the inhabitants of Styria and other parts of Europe, has been recently shown to be without foundation. This work originally appeared as a series of magazine articles. Professor Johnston contributed to the 'Edinburgh Review' and other journals. He has also published many papers in the Transactions and Proceedings of scientific societies. In the summer of 1853 he was travelling on the Continent in his usual health, when he was suddenly seized with spitting of blood, which terminated in a rapid decline, and he died at Durham on the 18th of September of that year. He was made a Fellow of the Royal Society in 1837, and was a member of other learned societies.

JOINT-STOCK COMPANIES. The great alteration in the principles which have influenced modern legislation with reference to Joint-Stock Companies calls for some repetition of what has been already stated with reference to them. [BANK, BANKER, BANKING; PARTNERSHIP.]

These Companies are distinguished from other Corporations by being associated, not for any public or administrative purpose merely, but for carrying on a trade or business with a view to individual profit. They possess other peculiarities equally deserving of notice.

This system of association, which has received such gigantic development in modern times, is by no means of recent origin. Institutions founded on the same principle as the trading guilds of the middle ages seem to have existed among the Saxons; and soon after the conquest we find companies of different trades established in the various seaports and other towns of importance in the kingdom. These fraternities generally became in course of time chartered corporations; each possessing the exclusive privilege of following the particular occupation which it professed to protect. After the Reformation they mostly became merged in the municipal corporations, the franchises of which could in many cases be enjoyed by those only who were *free* of one of the companies into which the community was divided. In this position they remained until the Municipal Corporation Reform Act. Besides these guilds, or companies, other trading associations sprung up from time to time. The general company of Germans, called also the Merchants of the Hanse, dates from 1220, and became in the fifteenth century the Company of the Steelyard. In 1505 the 'Merchant Adventurers of England, for trading in woollen cloths to the Netherlands,' obtained a charter of incorporation, prohibiting the former from interfering with them, and the Steelyard Company seems thereafter to have gradually declined. In 1553 was established the 'Merchant Adventurers for the discovery of lands, countries, isles, &c., not before known by the English,' which resulted in the establishment of a trade with Russia. This company subsequently obtained several Acts of Parliament, and still elects its officers. The Turkey Company, the African Company, the Eastland Company, the East India Company, were all chartered monopolies; but the Hudson's Bay Company alone remains on this ancient footing.

Soon after the Revolution, the principle of association began to be applied to a variety of purposes besides those of foreign adventure. Numerous projects were started, the execution of which could not be compassed by private means, but which it was thought might be attained by raising capital on the joint-stock principle. Hence arose, in the early part of the eighteenth century, the speculative mania, remembered in connection with the famous South Sea Company; of which we have seen counterparts more than once in our own times. To meet the evils occasioned by this novel development of the associative tendency, the 'Bubble Act' (6 Geo. I, c. 18), was passed, declaring all companies which presumed to act as corporate bodies, and to pretend to raise transferable stock, public nuisances, and the promoters of them punishable accordingly. This statute was directed not so much against the offence of acting as a corporation without authority, as with a view to prevent the frauds of unprincipled adventurers, who proposed schemes merely as baits to extract money out of the pockets of the thoughtless. Such an object, however, is not to be effected by mere legislation. The gambling in stocks and shares which seems to be periodically revived among us, and which, in 1719, produced the 'Bubble Act,' came to an end during the crash following the wild speculation which led to the statute; but the Act, nevertheless, had some effect in restraining for the future projects of a similar character to those against which its provisions were directed.

During the last century a large number of useful public undertakings, such as the making of canals, bridges, harbours, docks, and the like, have been carried into effect by companies formed on the joint-stock principle, and incorporated by Acts of Parliament; and more recently our gigantic system of intercommunication by railway has been obtained in a similar way. In these undertakings, the assistance of the legislature was necessary, not so much to give a corporate existence to an association of capitalists, as to enable the company to carry out its project by the compulsory purchase of property, and to make by-laws binding on the public for protecting the rights of the corporation. These companies, like the old trading associations, partake of the advantages derived from incorporation; advantages in which mere associations of individuals joined together to promote such common objects cannot possibly participate. A mere assemblage of adventurers cannot, for instance, by any agreement among themselves, sue or be sued in the name of any one of their body, or of any officer they may select for the purpose; they are liable, on the contrary, to the same laws as ordinary partnerships, and each individual is responsible to his last shilling for the acts and omissions, the contracts and debts, of the body generally. To facilitate the operations of such associations, various statutes have been passed; but owing to the fluctuation in opinion regarding the true policy to be pursued, the legislation relating to them has not been altogether consistent.

The original mode of forming a joint-stock company was by means of a deed of settlement, which constituted trustees of the partnership property, directors of its affairs, auditors of its accounts, and other officers, defined the number of shares into which the capital was divided, and the form and mode of transferring them, and laid down rules for periodical meetings of the shareholders. In the absence of legislative interference, the rights and liabilities of the members of such bodies, in relation to the public, were the same as those of other members of ordinary partnerships; their rights and liabilities *inter se* depended on the provisions of the deed of settlement. The difficulties which were soon found to arise, in carrying on the business of such undertakings, induced the earlier joint-stock companies to obtain private Acts of Parliament, which usually enabled the company to sue and be sued in the name of the Secretary or some public officer appointed for the purpose, and almost invariably concluded with a proviso that nothing therein should tend to *incorporate* the partnership; for one effect of incorporation would have been to destroy the individual responsibility of the members for the acts of the association, which the Legislature, until quite recently, most carefully retained. As joint-stock companies, however, increased in number and in usefulness, the cost and trouble necessary to obtain a private Act of Parliament were felt to be extremely burdensome; and the attention of Parliament being called to the subject, it was thought expedient by the Legislature to empower the Crown to grant to joint-stock companies such powers as were likely to be most useful to them, without, however, conferring all the incidents of a corporation. The first attempt at legislation in this direction was the statute 6 Geo. IV. c. 91, which enabled the Crown, in any charter of incorporation thereafter to be granted, to provide that the members should be individually liable for the debts and engagements of the corporation. This Act proving inoperative, another mode of proceeding was tried by 4 & 5 Will. IV. c. 94, which enabled the Crown to grant to joint-stock companies the privilege of sueing and being sued in the name of any of their officers. This Act was soon repealed, and another attempt made in the same direction by 7 Will. IV. and 1 Vict. c. 73. At length the 7 & 8 Vict. c. 110 was passed, for the registration, incorporation, and regulation of all future joint-stock companies not requiring nor obtaining a charter or Act of Parliament. This statute introduced a system of public *registration*, by which the company became *incorporated*, for the purpose of carrying on the business for which it was formed, according to the provisions of its deed of settlement; but every shareholder remained liable individually for the debts and contracts of the company, and might be proceeded against as though he were not a member of the corporation. Banking companies were excepted from this statute, the 7 & 8 Vict. c. 113 being passed for their special regulation.

A great many joint-stock companies were formed, and by registration obtained the corporate privileges, which they were now enabled to do; but before long the affairs of several became involved; and the difficulties which then presented themselves in attempting to adjust the rights and liabilities of the shareholders led to the Winding-up Acts, 11 & 12 Vict. c. 45, and 12 & 13 Vict. c. 108, which for several years exercised the acumen of the Judges of the Court of Chancery, in a series of hopeless attempts to interpret and follow out their provisions. The effect of the flood of litigation carried on under these Acts was to throw a very strong light upon the principles of legislation applicable to joint-stock companies; and the knowledge was purchased at an enormous expense, which has recently led to the repeal of the Registration and Winding-up Acts, and to a total remodelling of the law regarding these associations. This has been effected by the statute 19 & 20 Vict. c. 47, which provides for the registration, under the provisions of these Acts, of all companies previously registered under the former statute. The Act itself has been amended by 20 & 21 Vict. c. 14.

The principle of limited liability, or the restriction of the responsibility of each member to the amount of the capital subscribed by him, which had long been conceded to companies incorporated by Act of Parliament, without baneful effects to the commonwealth, has been at length extended to all joint-stock companies coming within the operation of these Acts. which choose to adopt their provisions, on the simple condition of obtaining registration and conforming to a few simple rules, whereby the personality of the company is defined. From its operation are excepted all companies established by Act of Parliament, royal charter, or letters patent, all banking or insurance companies, and associations engaged in mining in the Stannaries, where companies with a limited liability may be formed conformably to certain local customs, which are generally known as the *Cost-Book System*.

There now exist, therefore, four classes of joint-stock companies.

1. Trading companies incorporated by special Acts of Parliament. This class includes railway, dock, harbour, and canal companies, many insurance companies, and a vast number of other bodies engaged in every species of profitable employment. Formerly each company thus incorporated was governed by the peculiar provisions of the Act which it obtained; but in order to introduce uniformity, a general Act, applying to all future companies, was passed under the title of 'The Companies' Clauses Consolidation Act,' 8 & 9 Vict. c. 16. This statute contains a complete code for the regulations of the proceedings, the transfer of the shares, and the general management of companies incorporated by Act of Parliament. 'The Lands' Clauses Consolidation Act,' 1845, was passed at the same time, consolidating all those provisions which it had previously been necessary to insert in the special Act of any company, which required powers of acquiring land compulsorily for the purposes of the undertaking.

The peculiar character of railway undertakings rendered necessary 'The Railways' Clauses Consolidation Act,' 1845; which lays down regulations as to the construction of railway works, the amount and mode of enforcing the payment of tolls and fares, and the making of by-laws for the conduct of their business, which are binding upon all persons whatsoever.

2. A second class of joint-stock companies are the very few established under the statute 1 Vict. c. 73, or the preceding Act, 6 Geo. IV. c. 91, which have been already referred to.

3. Banking companies formed since 1844 form a distinct class. They were until recently regulated by the statute 7 & 8 Vict. c. 113, but must now be registered under 'The Joint-Stock Banking Companies' Act,' 1857, which preserves the individual liability of the partners, and contains provisions for the company being wound up. Banking companies constituted previous to 1844, may avail themselves of the advantages of the statute, by being registered under its provisions.

4. The last class of trading corporations are the registered joint-stock companies, regulated by the Joint-Stock Companies' Acts, 1856 and 1857, under which seven or more

persons may, by subscribing a memorandum of association, and otherwise complying with the requisitions of the statute in respect of registration, form themselves into an incorporated company, with or without limited liability.

This registration is obtained by delivering to the registrar of joint-stock companies a memorandum of association, stating certain particulars in a prescribed form. Upon registration being effected, the subscribers, together with such persons as from time to time are admitted to be shareholders in the company, become a body corporate, having a perpetual succession and a common seal, and power to hold lands to a certain extent, and with consent of the Board of Trade to any extent whatever.

The company may hold itself forth to the public as one of which the members are liable either with or without limit, according as the founders of it choose to adopt the principle of limited liability or not. Where the liability of the shareholders is limited by the memorandum of association, the word '*limited*' must be the last in the registered title of the company, and must be inseparably attached to its name.

The statute requires that a register of shareholders shall be kept; and that this list be annually revised, and a copy furnished to the registrar of joint-stock companies. This copy is open to public inspection, so that all the particulars of importance respecting the company can be at any time ascertained by persons dealing with it.

The affairs of a registered company are also liable to examination by the Board of Trade; while the statutes contain a complete code of regulations for winding up a company unable to meet its engagements, or which it is thought desirable to wind up for other reasons. Directors, who declare a dividend when the company is insolvent are jointly and severally liable to the extent of the dividend, for all the debts of the company; and every person concurring or carrying on the business of the company when the number of the partners is less than seven, is severally liable for its debts.

This species of corporation may be dissolved by being wound up, either voluntarily or compulsorily. A voluntary winding up may take place: 1. Whenever the period, if any, fixed for the duration of the company expires, or the event, if any, occurs upon which it is to be dissolved: 2. Whenever the company has passed a special resolution requiring its winding up.

A company may be wound up compulsorily: 1. By virtue of a special resolution to that effect: 2. Whenever it does not commence business within a year of its incorporation, or suspends business for a year: 3. Whenever the shareholders are less than seven in number: 4. Whenever the company is unable to pay its debts: or, 5. Whenever three-fourths of the capital have been lost or become unavailable.

A company is to be deemed unable to pay its debts: 1. Whenever a creditor for 50*l.* has served a demand of payment, and the company has for three weeks neglected to pay the claim, or to secure or compound for it to the satisfaction of the creditor: and, 2. Whenever an execution is returned unsatisfied, in whole or in part.

The proceedings take place in the case of companies whose liability is unlimited in the Court of Chancery; in the case of companies with limited liability in the Court of Bankruptcy. (Blackstone's 'Commentaries,' Mr. Kerr's edition, vol. i. p. 526.)

JOSÉ, SAN. [California, *S.* 2.]

JOUY, VICTOR-JOSEPH-ETIENNE DE, was born in the hamlet of Jouy, near Versailles, in 1769. When only thirteen he accompanied the governor of French Guyana as sous-lieutenant to that colony, but remained there scarcely a year. He returned to Versailles, continued his education for two years, and then left France a second time for the French East Indian possessions as an officer in the Luxembourg regiment. In 1790 he was again in France, joined the revolutionary party, and rapidly attained military promotion, but during the Reign of Terror became suspected, and fled to Switzerland. On Robespierre's fall in July 1794 he returned to Paris, was placed on the staff of the army of Paris under General Menou, and contributed to the triumph of the Convention in the streets of that city on the 21st of May (2nd Prairial) 1795. Very shortly afterwards he was arrested; then released, and sent as commander to Lille; then again arrested on an accusation of being in communication with Lord Malmesbury the English minister, but acquitted and restored to his functions. Disgusted however with these repeated prosecutions he resolved to abandon his military career; he therefore solicited his discharge, which he obtained together with a pension for his good services and wounds. He was now thirty years old, and after a few months' service in a civil capacity at Brussels, he took up his abode at Paris and devoted himself to literature. His first efforts were some vaudevilles, written in conjunction with Messrs. Delonchamp and Dieulafoy; but his first great success was the opera of 'La Vestale,' the music by Spontini which gained him admission to the Academy in 1815. This was followed by several other operas, among which were 'Les Amazones,' with music by Mehul, and 'Les Abencerrages,' with music by Cherubini, which still retain possession of the stage. He also wrote comedies, both in prose and verse, with considerable success; and several tragedies, of which 'Sylla' obtained a marked success. The work however on which his reputation mainly rests is 'L'Hermite de la Chaussée d'Antin,' a series of essays on men and manners in France, which first appeared in the 'Gazette de France,' in 1813-14, and were afterwards collected and published in five volumes, 12mo, 1815. They were considered in France as the successful rivals of the English 'Spectators,' 'Guardians,' and 'Ramblers.' They no doubt have considerable merit, the style is easy, the observation acute, the description animated, and the characters often drawn with much quiet humour. They may exhibit some resemblance to the essays of Addison or Steele, but none whatever to those of Johnson. They display with sufficient accuracy the surface of society, but they have little depth. Some attempts are made at the pathetic, but they are rather maudlin. They were however very successful in France, and the author followed up his success by the 'France Parleur,' 'L'Hermite de la Guyane,' 'L'Hermite en Province,' the last a collection by several writers, but all infinitely inferior to the first. 'L'Hermites en Prison,' however, and 'L'Hermites en Liberté,' written in 1823 and 1824, in conjunction with M. Jay, were of a better kind, and were received with much applause by the liberal party in France. M. Jouy has also written on political economy, and likewise two novels, 'Cecil,' and 'Le Centenaire,' in 1827 and 1833. He edited for some time the 'Journal des Arts,' and he contributed innumerable articles to various newspapers and journals. He died at Paris in October 1846.

JUDICIAL COMMITTEE. The appellate jurisdiction of the Judicial Committee of the Privy Council has been already mentioned. [Delegates, Court of, *S.* 2.] It only remains to be added that besides its authority in ecclesiastical, admiralty, and colonial causes, the Judicial Committee has been recently constituted the Court of Appeal from the judgments of the Court of Probate. It also decides on applications for the confirmation and extension of patents; and the republication of books, which, after the death of the author, the proprietor of the copyright has refused to publish.

JUDICIAL SEPARATION. [Separation, Judicial, *S.* 2.]

JUDSON, ADONIRAM, founder of the American Baptist Mission in Birma, was born August 9, 1788, at Malden, Massachusetts, where his father was a Congregationalist minister. Having passed through the classes of Brown University, where he took honours, he entered the Andover Theological Seminary; and whilst there, a sermon by Dr. Claudius Buchanan, which he chanced to meet with, turned his thoughts towards the missionary service in India. Some fellow-students, to whom he communicated his views, became similarly impressed, and they eventually formally stated to the college authorities their desire to devote themselves to the missionary office. There was then no missionary society in America, but the council referred the matter to a general committee, who resolved that it was advisable to institute a 'Board of Commissioners for Foreign Missions.' Whilst this board was in process of organisation, young Judson proceeded in 1811 to England, to consult with the directors of the London Missionary Society. On his way the vessel in which he had embarked was captured by a French privateer and carried into Bayonne, but Judson was released, after a short detention, at the intercession of some of his countrymen. In London, he received only qualified promises of aid, but the American board, though as yet without funds, resolved to found a mission in Birma, to which they appointed Judson and three other young students as missionaries.

Having on the 5th of February 1812 married Miss A. Hasseltine, he, twelve days after, embarked with his young wife for India. Four months later they landed at Calcutta, where they met with a warm welcome from Dr. Carey and the Serampore missionaries, but the Bengal government peremptorily ordered Judson and his companions to return to America by the same ship in which they had arrived. Judson however was not disposed to give up his purpose so easily. He accordingly took a passage to the Isle of France, proceeded thence to Madras, and from there to Rangoon, in Birma, where he arrived July 14, 1813.

Before leaving Calcutta, Mr. Judson, whose views on the subject of baptism had undergone a change, was, with his wife, re-baptised by immersion by Dr. Carey. He in consequence resigned his connection with the Board of Missions; and when he landed at Rangoon to commence his missionary work he was unconnected with any society, and without any means of future support. He addressed himself however without delay to the task of acquiring the Birmese language, unaided by dictionary or grammar, whilst the native he engaged as a teacher knew not a word of English. By persevering labour he in some two or three years was able to speak the language with some degree of readiness. The Baptists of America, on hearing of his devotion, had promptly formed a missionary society to support him, and sent him out some assistants, one of whom was a printer. The Serampore missionaries presented a printing-press and a fount of Birmese type. Mr. Judson, now not only engaged in preaching and personally instructing the natives, but desirous to benefit those whom his voice could not reach, drew up in Birmese a 'Summary of Christian Doctrine,' which was the first work issued from the Rangoon press; and portions of scripture and several tracts followed. As soon as the mission was fairly at work Mr. Judson made visits to other Birmese towns, and to Ava, where he had an interview with the king; and, having obtained permission set about establishing schools, in which Mrs. Judson, who had also mastered the language, was a very earnest and successful helper. The mission was going on favourably, when the sovereign of Birma provoked the English to declare war. Rangoon was made a point of attack by the British forces; but before they arrived, Mr. Judson, with the other missionaries, was seized and put into prison. There he remained for several months, subjected the greater part of the time to the most cruel treatment; but at length, when the success of the English was beyond question, he was employed to act as translator for the Birmese, and Mrs. Judson was sent to the British camp to mediate. A treaty of peace being signed, Mr. Judson and his companions were permitted to resume their labours. He returned to Rangoon; and there, worn out with toil and anxiety, the companion of his early dangers and the sharer of his labours died, October 1826, during his absence in Ava. Some eight years later he married a second wife, the widow of a fellow-missionary named Boardman.

From an early period Mr. Judson had regarded the translation of the Scriptures into Birmese as the great work of his life; and, after having been for several years engaged upon it, he at length, January 31st, 1834, had the happiness to complete his task. He lost no time in putting it to press, and by the end of 1835 the printing was finished of the first edition, in 3 vols. large 8vo. But he soon became convinced of its many imperfections, and he at once set about thoroughly revising the whole, with such assistance as he could obtain. This revision was completed in the autumn of 1840, and immediately printed in a thick 4to volume. It has since undergone careful correction by various Oriental scholars, and now holds a high place among the translations of the Scriptures into the eastern tongues. Almost as soon as the printing of this revised edition of the Bible was finished, with characteristic energy Judson commenced at Moulmein, whither he had removed, the preparation of a Birmese Dictionary. But his own ill-health interrupted the work, and the health of his wife failing also, he determined to return to America, in the hope that their native air might restore their vigour. Mrs. Judson died off St. Helena (September 1st, 1845), but he arrived in safety at Boston a month afterwards. His reception by the various religious societies in America was of the most enthusiastic kind. Special services were everywhere got up, and enormous crowds of persons assembled to greet him. His stay however was but brief; he had determined to return, and if possible, end his days in Birma. But he did not return alone. Anxious to find some one qualified to write a memoir of his second wife (a memoir of the first had already been written), he was introduced to an accomplished young lady, Miss Chubbuck, whose writings under the pseudonym of Fanny Forester, had had an unusually large amount of popularity in religious circles; and she not only undertook to write the life of the second Mrs. Judson, but soon consented to become the third. They were married in June 1846; in July they embarked at Boston, and in December they landed at Moulmein. The mission was now in a flourishing state, and Judson felt that he might devote himself to the easier task of supervision, and to the completion of his Dictionary. Of this he was permitted to see the first part printed in 1849, but he did not live to complete it. His health failed, and he was directed to proceed to the Isle of Bourbon to recruit. He embarked, but grew rapidly worse, and died at sea on the 12th of April 1850. His 'Burmese and English Dictionary' was completed from his papers by Mr. E. A. Stevens, and printed at Moulmein in 1852. It is regarded as a work of great value, and is in fact the only Dictionary that has been compiled of the Birmese language. With his Birmese Bible it formed a vast work for one individual to accomplish, in the midst of labours so many and so exhausting as those of the founder and director of an Indian mission. As a Christian missionary, Mr. Judson is regarded with the greatest respect by all sects among his countrymen, and also in England, though of course with especial reverence by the Baptists.

Several Lives of Mr. Judson have been published, of which the chief are those by Clements, Gilette, and Wayland. Memoirs of each of his wives have also been published: one, 'Lives of the three Mrs. Judsons,' having passed through several editions. Each of these ladies was an authoress. Besides various papers for the Birmese converts, the first Mrs. Judson wrote a 'History of the Burman Mission;' the second wrote poetry; and the third, besides her 'Memoirs of Mrs. Boardman Judson,' wrote, as Fanny Forester, the 'Records of Alderbrook,' a work very popular in America, and more than once reprinted in England; 'The Great Secret;' 'Missionary Biography;' 'The Kathayan Slave,' &c. She died June 1, 1854.

JUGLANS. [WALNUT-TREE.]

JULIS, a genus of Fishes belonging to the family *Labridæ*. The head is smooth; cheeks and gill-covers without scales, the lateral line bent suddenly downwards when opposite the end of the dorsal fins. In other respects this genus resembles *Labrus*. [LABRIDÆ.] An example of a very beautiful species of this genus, known under the name of the Rainbow-Wrasse, was described by Donovan as taken off the coast of Cornwall. It is the *J. Mediterranea* of Risso, the *J. vulgaris* of Fleming and Cuvier. This fish is most remarkable for its varied colours. Its back is greenish-blue; the longitudinal band is orange; beneath that are lilac-coloured bands on a silvery ground; the head is varied with brown, yellow, blue, and silver; the dorsal fin orange, with a purple spot on the membrane connecting the three spinous rays. (Yarrell, *British Fishes*.)

JUNCUS, a genus of plants belonging to the natural order *Juncaceæ*. This genus is distinguished by its inferior perianth, composed of 6 glumaceous leaves; its 3-celled 3-valved capsules, the seed-bearing dissepiments of the valves being in their middle. The species are numerous, and are found mostly in moist boggy situations in the colder parts of the world: several are however inhabitants of tropical regions.

J. effusus, the Soft Rush, and *J. conglomeratus*, the Common Rush, are used in many parts of the country for plaiting into mats, for chair-bottoms, and for constructing small toy-baskets. The wicks also of the candles known as rush-candles are made from the pith, or more properly speaking the softer inner portion of the stem of the same species, which is chiefly composed of cellular tissue. The species is cultivated in Japan like rice entirely for making floor-mats.

Rushes of various kinds form frequently very troublesome weeds in agriculture. They grow best on rich land that is wet and cold. They must be destroyed by covering them over with dry materials of various kinds, as ashes, lime, and drift from roads; but the best mode of getting rid of them is to fork them up by the roots in the summer, and after letting them lie for a fortnight or three weeks to dry to burn them. This however will be found only a temporary mode of getting rid of them unless the ground on which they grow is well drained.

JUNGMANN, JOSEF, an eminent Bohemian lexicographer and bibliographer, was born at Hudlitz, near Beraun, on the 16th of July 1773. His father was a peasant, who specially occupied himself with the management of bees, and Jungmann, who early showed a literary turn, had much to struggle with in devoting himself to his favourite pursuits. His example appears to have produced an effect on others of the family, for Antonin, a younger brother, became a physician, and Jan a priest. The German language was introduced into the schools of Bohemia in 1774, and Jungmann, though from his name he was evidently of German descent, and though, as his after life evinced, he had talents for acquiring languages, seems to have felt as a peculiar hardship the necessity he was under of obtaining a mastery of German. He made it the main business of his after life to restore and promote the study and cultivation of the Bohemian language, which, in his boyhood, was almost abandoned to the use of the peasantry, and which, owing in a considerable degree to his exertions, is now the ordinary language of Bohemian authors, who were formerly accustomed to employ either German or Latin. He studied first at Beraun, and then at the University of Prague; and in the year 1799 obtained an appointment as teacher of grammar at the gymnasium, or grammar school, of Leitmeritz, where he devoted part of his leisure to giving gratuitous instruction in Bohemian. While at Leitmeritz he translated several specimens of English poetry—Pope's 'Eloisa,' and 'Messiah;' Goldsmith's 'Edwin and Angelina;' Gray's 'Elegy in a Country Churchyard;' and above all the 'Paradise Lost,' which was completed about 1804, but not published till 1811, and which came to a second edition in 1843, in the 'Nowoceská Biblioteka,' a collection of the Bohemian classics. In 1815 he was transferred to Prague as professor of Latin at the grammar school of the Old-Town, of which, in 1834, he became the prefect, or principal. In 1840 he was chosen rector of the university, an office which was delivered to him by his brother Antonin, who had occupied it the year before, while his brother Jan read high mass as part of the ceremonies. Antonin, who has written several medical works in Bohemian, has also published an essay on the Sanscrit language, and Jan is likewise an author in the native tongue. In 1845 the infirmities of age compelled Josef to retire from the management of the gymnasium, but he was still occupied with correcting works for the press at the time of his death, on the 16th of November 1847. He had for several years been an object of affectionate veneration to the Bohemian public.

Jungmann is the author of two works which are certain to preserve his name. One, the 'Slownik Cesko-Nemecky,' the great Bohemian Dictionary, in five quarto volumes, comprising at least four thousand pages of close print in double columns, is a stupendous monument of zeal and diligence, which the Bohemians proudly place by the side of Johnson and Adelung. The only other dictionary of a Slavonic language which can be compared to it is the Polish of Linde, which is indeed more rich in points of derivation and comparison. In conformity with its title, 'Bohemian-German Dictionary,' equivalents to the Bohemian words are given in German in this elaborate work, but the main mass of information which it contains is only accessible to the Bohemian scholar, and even the Preface is given solely in Bohemian. This dictionary, which passed through the press between 1835 and 1839, was published at the expense of the Bohemian Museum, and in an imperial decree which was issued soon after its appearance, it was directed that the orthography adopted by Jungmann should be taken as a standard in the schools of the country. The triumph however was a short-lived one, for already in 1842 the Museum had adopted another system of orthography, to which Jungmann was obliged to conform in other works issued under its auspices, hoping, as he tells us in his 'History of Bohemian Literature,' that this new system might be the last. This 'History' is his other great labour, and it is a most useful compilation to all who take interest in a curious branch of literary research. The first edition, which was issued in 1825, was out of print for several years before the appearance of the second, which Jungmann was engaged upon at the time of his death, and which was published in 1849. It is not so much what its title indicates as a complete Bohemian bibliography. The narrative portion, which is somewhat dry, hardly occupies a tenth part of the work, the remainder is a complete and minute enumeration of every book in the Bohemian language, printed or manuscript, of which Jungmann could acquire information, from those of the earliest period, the manuscripts discovered by Hanka, to the year 1846. He even had the patience to form a list of the separate articles in periodicals, so that, with the assistance of very copious indexes, a reader may ascertain in a few minutes, which of the works of Dickens, Scott, and Shakspere were translated into Bohemian by the year 1846, who were the translators, and when the versions appeared. The miscellaneous writings of Jungmann were collected in one volume, and published by the Bohemian Museum in 1841. They mainly consist of translations from English, French, and German, but there are some essays on the favourite subject of his native language, which are curious in matter and animated in manner.

JUNOT ANDOCHE, DUC D'ABRANTES, was born at Bussy-les-Forges, on the 24th of September 1771, according to the Duchess's 'Memoirs,' whilst all the biographical dictionaries fix the date in October of the same year. He had begun to study for the law, when the political events of 1791 induced him to enlist in the battalion of volunteers raised in the department of the Côte-d'Or: he soon distinguished himself, and his fellow-soldiers made him a sergeant on the field for one of his acts of daring. In that grade he was serving at the siege of Toulon, when Bonaparte, not yet a general, commanded the artillery, and having discerned the soldierly qualities of Junot, attached him to his person. The capture of the place raised the commandant to a general of brigade, when Junot was made a captain, and became the first aide-de-camp to General Bonaparte. For nearly two years he continued the sole aide-de-camp of General Bonaparte; he is even said to have shared his purse with his superior officer during the few months that he remained unattached, prior to the 13th Vendemiaire (October, 1795).

He accompanied Bonaparte to Italy, in 1796, and was present at Lodi, Arcola, Castiglione, and Lonato, at which last battle he was badly wounded. In 1799, he took part in the campaign in Egypt, when at the combat of Nazareth, with a troop of three hundred horse, he held a body of several thousand Mussulmans in check, till Kléber came to his relief. He greatly assisted Bonaparte on the 18th Brumaire, in overthrowing the Directory. For this timely service, he was made Commandant of Paris, in 1800; married to Mademoiselle du Permon (whose family had long been connected with that of Bonaparte) on the 18th October of the same year; and created a general of division in 1801. In 1804 he was appointed Governor of Paris. On the 1st of February, 1805, he received the title of colonel-general of hussars, besides being decorated with the grand eagle of the Legion of Honour. He was likewise sent on several missions to the Court of Lisbon, his part of ambassador being suddenly changed at last into that of aggressor, when the good understanding between France and Portugal had ceased, in 1806. Junot then took forcible possession of Portugal, and held his ground there for nearly two years, when Sir Arthur Wellesley's victory at Vimiera, on the 21st of August 1808, and the conclusion of the Convention of Cintra, nine days after the battle, was followed by the evacuation of Portugal by the French army, and Junot's return to Paris. He had already received his title as Duc d'Abrantes; but from this period he lost all favour with Napoleon, having no chief command entrusted to his orders. In 1812 he was directed to join the grand armée, and the 8th corps was ostensibly placed under his command, but the orders from Berthier were transmitted rather to his lieutenants than to himself, and the only time his name was mentioned in a bulletin, he was reflected upon as having shown "a want of resolution." Under this reproach his spirit sank; he was refused employment in the campaign of 1813, and shortly afterwards was attacked with mental disease. In this state he was conveyed to the house of his father, at Montpelier, on the 22nd of July 1813; the following day he threw himself out of a window, broke one of his thighs, and it became necessary to amputate the leg. He died on the 28th.

Laura Permon, Duchesse d'Abrantes, was born at Montpelier, November 6, 1784, and was only sixteen when married to Junot, in 1800. She was a woman of great frankness of speech, and equally remarkable for the prodigality of her expenditure. As a consequence she made enemies at court, during her husband's life, and when his death and the fall of Napoleon had turned the tide of her fortune, she had no savings to support herself and family. She therefore had recourse to her pen for her subsistence. She wrote many tales and novels; but her principal work was her 'Mémoires au Souvenirs historiques sur Napoleon,' published in 1831. As these memoirs contained many incidents relating to the early life of the French emperor, its success was universal throughout Europe. The Duchesse d'Abrantes died in extreme poverty on the 7th of June 1838.

JUSSIEU, ADRIEN DE, son of Antoine Laurent de Jussieu, was born at Paris on the 23rd of December 1797. He was educated for the medical profession, but devoted himself to the study which had rendered his father famous, and became his successor in his chair of botany, and the inheritor of his virtue and talents. Adrien de Jussieu wrote no great work, but his communications to scientific journals, monographs, scientific biographies, &c., were very numerous. Among the more important of his writings may be named his 'De Uphorbiacearum Generibus,' &c., 1824; 'Sur les Plantes du Chili;' the 'Flora Basiliæ Meridionalis,' written in conjunction with M. Auguste de Saint-Hilaire; his contribution to the 'Cours Elémentaire d'Histoire Naturelle' of M. Milne-Edwards, &c. M. Adrien de Jussieu was chosen in 1831 a member of the Académie des Sciences, of which he was president the year of his death. He died on the 29th of June 1853.

JUSTICES, LORDS, OF APPEAL IN CHANCERY. These judges, who are two in number, were created by the statute 14 & 15 Vict. c. 83, to assist the Lord Chancellor in the determination of appeals from the Master of the Rolls and Vice-Chancellors. They possess besides an original jurisdiction, so that when all the appeals are disposed of, they may hear causes in the first instance. The Lord Chancellor may sit with them, or separately as a Court of Appeal. In Bankruptcy the Lords Justices constitute the Court of Appeal; in matters of lunacy they have, under the sign manual, the same authority as the Lord Chancellor.

JUSTICES OF THE PEACE. The authority of Justices of the Peace in petty sessions has been considerably extended of late years, especially with reference to juvenile offenders and persons guilty of petty larcenies. These cases may now be summarily dealt with by two magistrates, or one stipendiary magistrate, instead of being sent for trial by a jury, the punishment of the offender in no case however exceeding six months' imprisonment, with or without hard labour. Assaults on females or male children under fourteen may likewise be inquired into in a summary way, and the offender if convicted sentenced to a similar punishment. (Blackstone's 'Commentaries,' Mr. Kerr's edition, vol. iv., pp. 245, 333). Two magistrates in petty sessions, or one stipendiary magistrate, have also recently received authority to grant orders protecting the earnings of a married woman, who is deserted by her husband, from him or his creditors (20 & 21 Vict. c. 85, s. 21.)

JUVENILE OFFENDERS. [Justices of the Peace, *S.* 2.] Numerous statutes have been passed of late years with the view of providing for the effectual reformation of criminal children; but the law is still in a transitional if not experimental state. Criminal Courts are now however enabled to sentence juvenile criminals to confinement in reformatories, which the magistrates of counties and districts are enabled to provide for this purpose, the parents being compellable, if able, to provide for their maintenance and education. The progress of public opinion and of legislation on this subject of deep interest and of national importance will be found traced in a work recently published by Mr. M. D. Hill, the Recorder of Birmingham, which is devoted to an account of the means to be taken for the repression of crime.

K

KAFFRARIA. [Caffraria.]

KAFFRARIA, BRITISH. This name is applied to a dependency or military possession, recently annexed to the Cape Colony in South Africa. The annexation arose out of the Kaffir War of 1847. For twenty years before that date the settlers in the Albany district of the Cape Colony, being near the eastern frontier, were often exposed to irruptions from the Kaffirs. Successive governors of the colony—Sir B. D'Urban, Sir. P. Maitland, and Sir H. Pottinger—had endeavoured in vain to suppress these inroads. In 1847 Sir H. Smith subdued for a time the Kaffirs, but their deep-seated resentment against the white settlers broke out again with great force in 1850. On the last day of that year Sir H. Smith issued a proclamation from King William's Town establishing martial law in the colony, and ordering all colonists between the ages of 15 and 20 to rise *en masse* to defend the frontier against the Kaffirs. The British troops suffered much annoyance and loss in the harassing bush-warfare which ensued. On the 8th November, 1851, in an encounter with the Kaffirs in the Waterkloof, Lieutenant-Colonel Fordyce and several officers and men of the 74th regiment were killed, and a considerable number wounded; the Kaffirs escaping unhurt. In January 1852 Major-General Cathcart replaced Sir H. Smith. On the 20th December General Cathcart defeated the Basitos, a Kaffir tribe, on Berea Mountain in the Orange Sovereignty, shortly after which three chiefs named Macomo, Sandili, and Kreili submitted to the British, and the war was virtually at an end. A treaty of piece was ratified at a conference between the General and the Kaffir chiefs held near King William's Town on the 9th of March, 1853. This war cost England about a million and a half sterling. The country called British Kaffraria is a large district eastward of Cape Colony, over which the British government hold a kind of sovereignty or protectorship, the precise character of which has not been very clearly defined. British military posts are maintained at various points over the area. The district is divided into counties. Buffalo River is considered the harbour. A town called London is to be established at the mouth of Buffalo River.

KALE, or KAIL, SEA. [Crambe.]

KAISARIYEH, a town in Asia Minor, is situated in a plain to the north of the Erjish-Dagh (the ancient *Argæus*) in about 38° 41′ N. lat., 35° 25′ E. long., and has a population variously estimated at 25,000, 40,000, and 50,000, consisting of Turks, Greeks, and Armenians. The plain is laid out in corn-fields, and screened on the east and west by low hills covered with gardens and vineyards, and the whole neighbourhood abounds with volcanic deposits. The town is surrounded by an old walled moat, and further defended by an old citadel partly in ruins. The houses, which are from 8000 to 10,000 in number, are built of stone and lime, but many of them have a cracked and dilapidated appearance caused by the frequent earthquakes. The streets are narrow and dirty, the squares and market-places also abound with filth; and the naturally healthy climate is poisoned by the absence of all sanitary arrangements. The bazaars are extensive and well supplied with European manufactured goods, woollens, silks, hardware, iron, &c. The Armenian merchants display their wares in a large place called the Vizir Khan; these consist of hardware, snuff-boxes, glass beads, Red Sea shells for ornamentation, paper, cards, padlocks, &c. Of native articles exposed for sale the chief are yellow berries, which are grown in the plains of Cæsarea, wool, gall-nuts, goats'-hair, tragacanth, cotton, skins, furs, sultana raisins and other fruits, madder and other dyestuffs. Among the principal structures in the town are the mosques, the convent of Siddi-Battal, and some mausoleums. The Armenians have a bishop and two churches in Kaisariyeh; the Greeks also have a church. The manufactured products of the town are chiefly yellow marocco leather, cotton stuffs, and cotton-yarn.

Kaisariyeh in site and sound is identical with the ancient *Cæsareia*, the capital of Cappadocia, which was originally called *Mazaca*. The plain in which it stands is watered by the Melas, now called the Kara-Su, which was dammed up by king Ariarathes to form a lake a little above its entrance into the Halys (not Euphrates as erroneously stated by Strabo). Mazaca was called also *Eusebeia*, and numerous coins with this epigraph have been found on the site. It was taken by Tigranes, and its inhabitants carried off to his new capital Tigranocerta. When Cappadocia was made a Roman province in the reign of the emperor Tiberias, Mazaca was named Cæsareia. It became a place of great importance in the later times of the empire. When taken by Sapor in the reign of Valerian (about A.D. 259) it had a population of 400,000. In the reign of Justinian the walls were repaired. There are many ruins and heaps of rubbish of ancient structures about the town. Cæsareia gave title to a Christian bishop from an early period of the Church; it is the birth-place of St. Basil the Great, who became bishop of Cæsareia, A.D. 370.

(Strabo; Suidas; Eutropius; Hamilton, *Researches in Asia Minor; Dictionary of Greek and Roman Geography.*)

KAKODYLE. [CACODYL, in CHEMISTRY, *S.* 1.]

KAMMERERITE. [MINERALOGY, *S.* 1.]

KANDY. [CANDY.]

KANE, ELISHA KENT, M.D. of the United States Navy, was born February 2, 1820, in the city of Philadelphia. He was a son of Judge Kane, of Philadelphia, and the eldest of seven children. He was educated at the University of Virginia, and studied medicine in the University of Pennsylvania, where he graduated with honours as M.D. in 1842. He was almost immediately afterwards appointed Surgeon to the American Mission to China. He visited the interior of the island of Ceylon, and availed himself of the facilities afforded by his position to explore the Philippines, which he accomplished chiefly on foot, and made charts and maps which are still preserved. He descended into the great crater of Tael, in the island of Luzon. The descent had only once before been attempted by an European, and was unsuccessful. Dr. Kane was lowered into the crater by means of a rope formed of bamboos, and reached ground at a depth of more than 200 feet. He then detached himself from the rope, and clambering downwards dipped his specimen-bottles into the smoking lake. In returning, the hot ashes charred his boots; and owing to their giving way under his feet, he fell repeatedly before he was able to get back, and fasten the rope round his body, by which he was at length hauled up nearly insensible. After remaining some time in China, he traversed a part of Hindustan. He afterwards proceeded to Egypt, where he examined the interesting antiquities of the Upper Nile, but unfortunately lost his journals and other papers in the river as he was returning; and being attacked with violent fever, narrowly escaped death. He afterwards went to Greece, and ascended to the top of Mount Helicon. Subsequently he sailed to the west coast of Africa, examined the slave-marts, and intended going to the kingdom of Abomey, but was unable to accomplish this purpose owing to another attack of dangerous fever, from the effects of which he suffered during the remainder of his life. After his return to America he was engaged in the war with Mexico, where he distinguished himself by his skill and bravery, and was severely wounded at the battle of Nopaluca.

Dr. Kane was engaged in the American coast-survey of the Gulf of Mexico, when he received a notice by telegraph, May 12, 1850, of the intended expedition in search of Sir John Franklin, by means of two vessels furnished by Mr. Grinnell of New York, and fitted out at the expense of the government of the United States. He immediately hastened to New York, and on the 22nd of May the two vessels, the Advance and the Rescue, sailed from the harbour of that city. Dr. Kane was attached to the expedition as senior medical officer, on board the Advance, under Commander De Haven. The expedition left Baffin's Bay, on its return, September 6, 1851, and after a favourable passage of twenty-four days reached New York. Dr. Kane published 'The U. S. Grinnell Expedition in search of Sir John Franklin, a Personal Narrative by Elisha Kent Kane, M.D., U. S. N., with Illustrations,' 8vo, 1853, London and New York. Before he had completed the preparation of this work for the press, Mr. Grinnell of New York, in conjunction with Mr. Peabody of London, prepared a second searching expedition, in the Advance, which was placed under the command of Dr. Kane, and sailed from New York on the 31st of May, 1853. The Advance sailed up Baffin's Bay, and through Smith's Strait, and reached 78° 43′ N. lat., the highest latitude attained by any of the expeditions, except that of Parry in his attempt to reach the North Pole. The Advance was frozen up during twenty-one months, provisions became scarce, and the supplies were at length exhausted, the men were affected with scurvy and other sickness, and two of them died, as did also the sledge-dogs. Dr. Kane, under these circumstances, resolved to quit the ship, and endeavour, partly in boats and partly in sledges, to reach the Danish settlements on the coast of Greenland, 1300 miles south from the position of the Advance. During the greater part of this journey their daily provision consisted of six ounces of bread-dust and a piece of frozen tallow the size of a walnut per man. Fortunately, after ten weeks travelling, and when almost in a state of starvation, they killed a seal. At the end of eighty-four days they reached the Danish settlements of Upernavik, where they were kindly received and hospitably treated. Only one man was lost on this terrible journey, and he by an accident. Meantime, nothing having been heard of Dr. Kane and his party, the government of the United States fitted out a relief-expedition, consisting of a small screw-steamer and a clipper-bark, under the command of Lieutenant Hartstene, of the United States navy. This expedition sailed from New York on the 31st of May, 1855, and, having reached the Danish settlements, the missing party were found, and arrived at New York on Oct. 11, 1855. In May, 1856, the gold medal of the Royal Geographical Society was awarded to Dr. Kane, "for his distinguished services and important discoveries in the polar regions, and for his valuable memoir and charts."

In 1856 Dr. Kane published his 'Arctic Explorations: the Second Grinnell Expedition in Search of Sir John Franklin, in 1853-55,' Philadelphia, 2 vols. 8vo. In the autumn of the same year he paid a visit to England, and being in a state of failing health proceeded thence to the island of Cuba, in hope that he might derive benefit from the climate, but died at Havaña, February 16, 1857. His remains were conveyed to his native city of Philadelphia, and were interred there with unusual demonstrations of public respect and grief.

A badly written 'Biography of E. K. Kane,' by W. Elder, was published in 1858.

KANSAS, a Territory of the United States of North America, established by Act of Congress 1854, occupies the country lying along the river Kansas, north of the Indian Territory, and extending northward to the Nebraska River. It is bounded E. by the river Missouri, which divides it from the States of Iowa and Missouri; S. by the Indian Territory; W. by offsets of the Rocky Mountains; and N. by the Territory of Nebraska. The area is 114,798 square miles. The estimated population in 1856 was 36,000.

By far the larger part of the Territory consists of an unreclaimed wilderness, over which roam tribes of native Indians in search of game. The eastern and southern portions are broad open prairies, well watered and very fertile, but thinly timbered. The centre of the Territory forms a portion of the Great American Desert, which is said to be for the most part wholly irreclaimable, and to present scarcely an oasis. On the west are outlying members of the Rocky Mountains. The chief river of the Territory is the Kansas, the head streams of which rise near the eastern base of the Rocky Mountains, between the sources of the Arkansas and Nebraska. Its two principal branches, the Republican and Smoky Hill forks, run for a considerable portion of their course at a distance of 120 miles apart. Republican Fork issues from a rather large lake, in 39° 52′ N. lat., 103° 30′ W. long.; Smoky Hill Fork rises in the mountain region east of South Peak: their junction is near 39° N. lat., 96° 30′ W. long. The united stream is known as the Kansas: its general course is east-by-north to its confluence with the Missouri, in 39° N. lat., 94° 32′ W. long. It has a full body of water, is 340 yards wide at its mouth, and is said to be navigable for steam-boats for 150 miles, and for keel-boats, with its forks, for some hundred miles higher. Republican Fork, the larger of the two main branches of the Kansas, receives on its right side two considerable affluents, Solomon's Fork and the Grand Saline. Numerous smaller tributaries swell the main stream and its affluents. The chief of the secondary streams belonging to this Territory which fall into the Missouri are the Nemawhaw and the Independence. The Missouri itself forms the eastern boundary of Kansas, and affords an invaluable outlet for its products. The Nebraska River, on the northern side of the Territory, is a very wide but shallow river, with a rapid current and a bed full of shifting sand-banks: it is navigable by steam-boats for about 50 miles. The great emigrant and Frémont routes to Oregon, Utah, and California lie across the Territory of Kansas, and follow the line of one or other of these rivers.

As far as the country has yet been examined geologically, its southern and eastern parts appear to belong to the Lower Carboniferous system; the rocks consisting largely of mountain limestone and sandstone. In the south-eastern corner is perhaps some portion of the basin of Upper Carboniferous Rocks, or Coal-Bed of the Indian Territory. The western and northern parts of Kansas seem to consist chiefly of strata of the Cretaceous group, but we have no detailed account of the rocks. The country, with the exception of the central wastes, is considered to possess a fertile soil and a salubrious climate, while almost every part is well watered. The prairies are of the best kind, but are deficient in timber. The river bottoms have a rich alluvial soil. The few settlers who have established themselves within the Territory are said to report very highly of its capabilities, but as yet even the surface of the country is very little known. The only settlement beyond the recently-founded city of Worcester and a few scattered farm-houses, is the military station of Fort Leavenworth on the Missouri.

The vast tract known as Nebraska, including an area of upwards of 136,000 square miles, of which Kansas forms the southern part, was a portion of the country purchased by the United States from the French in 1803. It has been left till the last few years to the undisturbed occupation of the native Indians, but the constant stream of western migration, which caused the growth of one and another Territory and State on its eastern and southern borders, and still more perhaps the flood of emigration which poured across it to Utah and California, led to propositions which increased yearly in urgency for its organisation as a Territory. The first bill for the organisation of the Territory of Nebraska was introduced into Congress in 1845, but rejected. Subsequent measures met with a similar fate. But in the session of 1854 a bill was introduced for forming out of this extensive tract two Territories, Nebraska in the north, and Kansas in the south; and as the form of the bill re-opened the question of the admission into the Union of new slave states north of 36° 30′ N. lat., which the measure known as the Missouri Compromise was understood to have settled should not be done, it was made the occasion of a most earnest struggle between the supporters and opponents of slavery. Eventually the bill was passed, empowering the organisation of the Territories, but throwing open the occupation of the soil to all citizens of the United States, and to all who shall make the usual declaration of their desire to become citizens; and providing that the inhabitants of each Territory shall determine for themselves whether the institution of slavery shall exist among them. The consequence of this provision is said to have been that a considerable number of the more ardent slaveholders of the southern states at once prepared to remove with their property into Kansas with a view to obtain possession of it in the interest of the south, as well as to avail themselves of its rich agricultural and other resources. But the movement was immediately met by a counter-movement in the north. A corporation was at once organised, and received a charter, having for its primary object the colonisation of Kansas by free labour. The dispute between the two parties has not only led to much violence in Kansas, but has occasioned a severe struggle in Congress; but the matter seems not yet (March, 1858) to be terminated.

KANTURK, county of Cork, Ireland, a market- and post-town, and the seat of a Poor-Law Union, in the barony of Duhallow, is situated in 52° 11′ N. lat., 8° 52′ W. long., 126 miles S. W. from Dublin, at the confluence of the rivers Allua and Dallua, which after their junction flow into the Blackwater, 3 miles south of the town. The population of the town of Kanturk in 1851 was 3125, besides 3352 inmates of the workhouse. Kanturk Poor-Law Union, which is divided into 33 electoral districts, contains an area of 186,523 acres, and had in 1851 a population of 41,801.

The town of Kanturk is neatly built. The chief industrial products are beer, flour, and serge: wool-combing is carried on. Six yearly fairs are held. The Roman Catholic chapel, the bridewell, and the workhouse, which occupies a site of six acres, are the chief public structures. Near the town are the remains of Kanturk Castle, which was built by the Mac-Donough Mac-Carthy, prince of Duhallow, in the reign of Elizabeth. The building, which occupies the four sides of a quadrangle, 120 feet long by 80 feet wide, is four stories high: in each of the angles is a square embattled tower, five stories high. The estates of Kanturk were forfeited in the rebellion of 1641, and were conferred on Sir Philip Perceval, from whom they have descended to the earl of Egmont.

KARAMAN, a town in Asia Minor, which gives name to a pashalic, though the pasha resides at Koniyeh, is situated 65 miles S.E. from Koniyeh, in 33° 23′ N. lat., 37° 8′ E. long., and has about 2500 houses and 15,000 inhabitants. As each house is surrounded by a garden inclosed by a wall, the town appears very extensive for its population. Most of the houses are in a dilapidated condition. The bazaars are ill supplied. The Turkish castle consists of a square keep strengthened by several round and square towers, and surrounded at a little distance by an outer wall within which about a hundred small houses are built. In the wall are inserted stones with Arabic and Turkish inscriptions, which probably were taken from other buildings. Among several ruined mosques of Saracenic architecture is one of striking gracefulness, with an entrance of marble adorned with arabesques. The Armenians, who are pretty numerous, have a large and handsome church in Karaman. A little way north of Karaman is Kara-Dagh, an isolated tractytic mountain steep, rocky and barren, rising to the height of 8000 feet above the sea. To the south of it is the range of the Taurus. This town is supposed to have given name to the district of Asia Minor called Karamania, or Caramania, which is marked on some maps, but is wholly unknown to the Turks. Karaman was the seat of a flourishing petty sovereignty in the 14th and 15th centuries. It is identified with the ancient *Laranda*.

The name Karamania has been sometimes given also to the Persian province of Kerman. [Persia.]

KARIA, or **CARIA**, a division of Asia Minor, which comprised the south-western corner of that peninsula. It was bounded S. and W. by the Mediterranean Sea, N. by the valley of the Mæander, and E. by Phrygia and Lycia. Herodotus (i. 142) places Priene, which was north of the Mæander, in Caria, and it is most probable that Caria comprised the lower valley of that river; and that the Messogis range, now the Kastaneh-Dagh, which forms the watershed between the Mæander and the Caystrus, was its northern limit. The natural limit towards the east would be Mount Cadmus and its great southern offshoot, now the Bos-Dagh, which runs at a little distance from the right bank of the Calbis (Dolomon-Chai); but according to Strabo it seems that Caria comprised a large portion of the basin of the Calbis also, which lies east of this range, and extended to the western base at Mount Dædala and to the mouth of the river Glaucus, the towns of Dædala, Araxa, and Calynda being included in Caria.

With the exception of the valley of the Mæander (Mendereh), and a strip along the south coast, west of the Gulf of Glaucus (now Bay of Macri), the surface of Caria is extremely rugged and mountainous. From the mass of Mount Cadmus (now the Baba-Dagh) ranges run west and south, and cover with their ramifications the greater part of the surface. The Bos-Dagh, the southern range, runs parallel to the Calbis (Dolomon-Chai), and at a little distance from its west bank, attaining in its highest point an elevation of 8000 feet above the sea. Near 37° N. lat. it divides into two branches, one of which forming the high land, anciently called Lide, runs west and terminates in the peninsula of Halicarnassus, between the Ceramic and Iassic gulfs, now respectively the gulfs of Kos or Budrun, and Mandeliyeh. The Gulf of Iassus extended northward as far as the promontory of Poseideion, now Cape Monodendri. The other branch range has a south-west direction, and terminates in the lofty Mount Phœnix, and in the remarkable peninsula the Rhodian Chersonese, which stretches southward towards Rhodes and along the eastern side of the Gulf of Syme. The Cnidian Chersonese, which screens the Bay of Syme or Doris on the north, terminates westward in the Triopian promontory, now called Cape Krio. The Rhodian Chersonese terminates in two remarkable promontories — the Kynosema, now Cape Aloupo, opposite Rhodes, and the Paridion promontory, opposite the island of Syme. Between this Chersonese and the island of Syme lies the Gulf of Syme; and the part of the same inlet north of the island is called the Bay of Doris, which washes the Cnidian Chersonese on the south. On the north-western side of the Rhodian Chersonese, forming a subordinate part of the Gulf of Syme, were the bays of Thymnias, Schœnus, and Bubessius, or Bubassus. This last bay was the most north-eastern part or head of the gulf; it was named from a town of the same name; and near it, to the west, was the narrow isthmus which connected the Cnidian Chersonese to the mainland. The coast along these bays is bold, the limestone rocks rising perpendicularly in many places from the water, which is clear, deep, and abounding with sponges. The shores are remarkably well wooded. The Cnidian or Triopian Chersonese, which divides the Ceramic and Dorian gulfs, consists of two peninsular portions, the more western of which was formerly an island, and was connected by the Cnidians with the eastern portion by means of a causeway. [Cnidus.] Through the narrow isthmus which connects this Chersonese with the mainland, the Cnidians attempted to cut a canal in the time of Cyrus to protect their city and Chersonese from the Persians.

The high land called Lyde extends to the valley of the Mæander. Its northern slope is furrowed by several streams, the largest of which are the Mosynus (Kara-Su), the Harpasus

(Arpa-Su), and the Marsyas (Tshina-Su), which last rises in a region called Idrias by Herodotus (v. 118), and is skirted on its western side by the range of Latmus. Except the Calbis, which was also called Indus, no stream of importance flowed to the south coast. The Mæander, which carries off the drainage of the greater part of Caria, flows in a west-by-south course, and in ancient times entered the sea to the north of the peninsula of Miletus by the harbour of Latmus, which is now filled up by the deposits of the river.

On the south coast, east of the Rhodian Chersonese and the lofty Mount Phœnix, was a land-locked bay, at the head of which stood the town of Physcus. There was a road from Physcus to Ephesus. Farther east was another small Chersonese, which sheltered the Bay of Panormus on the west; and on the coast between this and the Bay of Glaucus or Macri, were the towns of Imbrus and Caunus, and the promontory of Artemisium. A few miles inland from the head of the Bay of Panormus and to the west of the Calbis is a large lake six or eight miles across, and with a number of small streams running into it; a channel twelve miles in length connects it with the sea. Fellowes says its waters are brackish. All the southern coast of Caria eastward from Mount Phœnix, and extending to the mountains inland belonged to the Rhodians, and was called Peræa. This district is very beautiful, and contains many fertile tracts. The irregular coast of Caria is most picturesque, indented by countless bays and inlets, whose shores, generally bold and well-wooded, are in parts diversified by extensive ancient ruins, and belted by numerous islands.

Though Caria is extremely mountainous it contains some extensive high plains, and there is a good deal of fertile land in the valleys of the Mæander and its feeders. The mountains are in most parts well clothed with timber; furs, oaks, and plane-trees being the prevailing species. The chief products are wheat, figs, olive-oil, fruits of all kinds, and wine. The vine is trained to go up the highest trees. The wine of Cnidus was celebrated in ancient times. The palm-tree and the orange grow luxuriantly. Cattle are fed on the mountain pastures, and sheep are numerous; the green slopes along the valley of the Marsyas are covered with flocks, the climate owing to difference of level varies greatly; in the lower grounds it is hot, while the high lands are cold, wintry, and snow-covered. At the source of the Mosynus the winter lingers to March or April. The limestone which everywhere abounds affords excellent material for building. Among other mineral products Fellowes mentions iron-stone of great purity as abundant between Stratoniceia and Mylasa, mica-schist, marble, &c. Warm springs abound, and there are gaseous flames.

The Carians maintained that they were an autocthonous people descended from Car, the brother of Lydus and Mysus. According to Cretan accounts they originally inhabited the Ægean islands, were subject to Minos, whose ships they manned, but they paid no tribute; and that driven from the islands by Ionians and Dorians, they came to the mainland where they displaced the Leleges and Pelasgi. Homer mentions the Carians with the Leleges, Caucones, and Pelasgi, among the auxiliaries of the Trojans; and they were probably all continental people and related to each other. The Caunii, whose town Caunus was on the south coast, spoke a language akin to that of the Carians. Thucydides says that the early inhabitants of the Ægean islands were Carians and Phœnicians, and that they were pirates. There seems little doubt from Thucydides (i. 8.) that the Carians with some other people occupied the island of Delos at some early period.

In Homer's time the Carians occupied Miletus, the banks of the Mæander, and the heights of Mycale to the north of the river. The Ionian emigration drove the Carians from Mycale near which Priene was built, from Myus, and from the city of Miletus. The Dorians dispossessed them of Halicarnassus, Cnidus, the Triopian Chersonese, and probably from the island of Kos. The south coast was probably seized by the Rhodians about the same time. Thus the principal parts of the sea coast were occupied by Greek colonies, but not all, for in the time of Xerxes the Carians furnished 70 ships to the Persian fleet, while the Dorian settlements supplied only 30 ships. North of the Mæander and in the neighbourhood of the Greek colonies there was probably some intermixture between the Carians and their neighbours; but they maintained their language, and in the interior the population was pure Carian. They lived in small towns or villages, and formed a federation with common religious rites to Zeus Chrysaoreus. The federation was called Chrysaoreum; its place of meeting for sacrifice and deliberation was the spot where the Macedonians after the time of Alexander founded Stratoniceia.

Caria was included in the kingdom of Crœsus, on whose defeat by Cyrus it came under the Persian dominion. In the Ionian revolt (B.C. 499-494) the Carians fought bravely side by side with the Greeks, but were at last compelled to submit. Under the protection of Persia, Caria was ruled by a dynasty of princes, whose capital was Halicarnassus. Artemisia, who accompanied Xerxes to the battle of Salamis with five ships, was one of these petty sovereigns. The Athenians afterwards made the inhabitants of the coast tributary, but the Carians of the interior maintained their independence. In the time of Alexander the Great there was a queen of Caria, named Ada. She surrendered to Alexander the strong town of Alinda, in consideration for which he restored her to the royal authority of which she had been deprived. Caria afterwards became successively subject to the Greek kings of Egypt and Syria. The Romans having defeated Antiochus (B.C. 190) shared Caria between Eumenes king of Persia and the Rhodians, but left certain towns free. About B.C. 129 Caria was added to the Roman province of Asia.

The Carians were a warlike race, not addicted to commerce like the Greeks; they hired themselves as mercenaries, and served under the kings of Egypt.

Among the towns of Caria were Cnidus and Halicarnassus, which were members of the Dorian hexapolis in Asia. *Halicarnassus*, now Boudroum, or Budrun, is particularly interesting as the birthplace of Herodotus and Dionysius the historians. It was founded by a colony from Trœzene in Argolis, was the largest and strongest city in all Caria, and became the seat of a Carian dynasty under the protection of Persia. One of its rulers, Artemisia, wife and sister of Mausolus, erected in his honour the celebrated sepulchral monument called the Mausoleum, of which there are still remains as well as of the ancient walls. Some interesting sculptures, supposed to have formed part of the decoration of the Mausoleum, are now in the British Museum. Halicarnassus continued to be a stronghold of Persia till the time of Alexander, who after a long siege burnt the city, but was unable to take the acropolis. Though afterwards rebuilt Halicarnassus never recovered from the blow.

Among the other towns were *Alabanda*, now supposed to be *Arab-Hissa*, on the Tshina, or Marsyas, where are remains of a theatre and other buildings; it was noted for its luxury: *Coscinia*, higher up the Marsyas, identified by Leake with the village of Tshina where Pococke found considerable remains: *Labranda*, to the south-west of Alabanda, famous for its Carian temple to Zeus Stratios, to which the Carians went in procession from Mylasa along the sacred road which connected the two places (the site of Labranda is unknown): *Iakli* which Fellowes erroneously takes for Labranda was Euromus, where are the remains of a beautiful Corinthian temple. *Mylasa*, in the interior and to the north-east of Halicarnassus, is now *Mellassa*, which is built chiefly from the ruins of the old town. There are still many beautiful remains of ancient architecture at Mellassa, which was visited by Fellowes. East by south from Mylasa was *Stratoniceia*, which was either founded or rebuilt on a spot called Idrias by a Macedonian colony after the time of Alexander. Stratoniceia is identified by Fellowes with Esky-Hirsa, which stands in a delightful country. There are remains of several temples, the marble walls of which are covered with inscriptions. The ruins of the ancient town extend far beyond the village of Esky-Hirsa.

Caunus, the chief town of the Caunii, was a place of considerable trade, on the south coast in the Rhodian Peræa. It was the birth-place of the painter Protogenes, and famous for its figs. It was for a long time subject to the Rhodians. In the massacre of the Romans in Asia in the time of Mithridates Eupator, the Caunii distinguished themselves by their ferocious cruelty to their victims. On a height above Caunus was the fortress *Imbrus*. Between Caunus and the Gulf of Glaucus was *Calynda*, which has not been identified, but is supposed to be in the basin of the Talaman, or Dolomon-Chai, the Calbis of Strabo and the Indus of Livy.

In the north-east of Caria, near the Phrygian frontier, was *Antiocheia* at the junction of the Mosynus with the Mæander; its remains, which are described by Hamilton and Fellowes, consist of the massive walls of the acropolis and an inner castle, some substructures of buildings, a stadium, and a small theatre. Southward from Antiocheia, on high ground to the east of the Mosynus, stood the city of *Aphrodisias*, now *Ghera*, where are remains of a beautiful Ionic temple of Aphrodite, from whom the town was named. There was a city *Plarasa*, probably not far from Aphrodisias. Fellowes ('Asia Minor') says that Ghera is the representative of the ancient *Caroura*, which was east of Mount Cadmus, near the confines of Caria, Lydia, and Phrygia. It was famous for its hot springs on the banks of the Mæander, by which its site has been identified. Hamilton ('Researches') conjectures that the town was named from its position on the boundary of Caria towards Phrygia (*Καρῶν οὖρος*.)

North of the Mæander were *Tripolis*, near the point where the river enters the plains (38° 1′ N. lat.), where are remains of the city walls, a theatre, and some other buildings: *Mastaura*, west of Tripolis and north-east of the modern Nazeli, and near the modern village of Mastaura, has some ancient ruins, most of which are overgrown with underwood, and a fine spring of cold water: *Tralles*, situated on a plateau of the Messogis above the modern Aïdin (a town of about 6000 houses); the plateau is covered with ruins, among which the Turks have quarried materials for the houses and walls of Aïdin; the most remarkable ruin is that of a palatial structure, which is probably not ancient: *Magnesia* farther west near the mouth of the Lethæus in the Mæander: and *Priene*, on a lofty rock near the modern town of Samsun, where many ancient walls remain, and a theatre cut out of the rocky hill. Several of these towns north of the Mæander are usually given to Lydia, to which in later times they seem to have belonged.

Along the west coast beyond Halicarnassus were *Myndus*, once the capital of Caria: *Caryanda*, a city which seems to have stood partly on an island and partly on the mainland, the two parts being united by a causeway (now a narrow sandy isthmus), alongside of which was the harbour which Leake takes to be that of Pasha-Limani: *Baraylia*, on the southern shore of the Iassic Gulf, between Myndus and Iasus, celebrated for its statue of Artemis Cindyas, upon which, though exposed to the open sky, neither rain nor snow (it was said) ever fell. *Iasus*, or *Jassus*, now *Askem*, *Asyn Kalesi*, on a small island at the head of the Iassic Gulf, was founded early by Argive colonists, but received additional settlers in the Ionian emigration under Neleus; it became a wealthy place owing to its fisheries; part of the city walls and a theatre cut out in the side of a rock still remain. *Branchidæ* was famous for its oracle and temple of Apollo Didymeus, of which there are still some remains; the temple was robbed and burnt by the Persians (B.C. 494), but it was afterwards rebuilt. A sacred way led from the sea to the temple bordered with monolithic statues seated on chairs, the feet close together and the hands on the knees—an imitation of the avenues of the temples of Egypt. (Leake, 'Asia Minor.') Branchidæ stood near a harbour, called Panormus, on the south of the Poseideion. *Miletus*, one of the most ancient and flourishing towns of Caria and famous for its woollen manufactures and for the numerous colonies founded by it on the Black Sea, was situated on high ground on the south bank of the Mæander and near its mouth. Its citizens were great traders and powerful by sea. They carried on long wars against the Lydian kings. It was subjected to the Persians by Cyrus the Great, and notwithstanding internal dissensions continued prosperous until the Ionian revolt, instigated by its tyrant Aristagoras; this event brought down upon it the vengeance of the Persians, who utterly destroyed it B.C. 494. It was rebuilt, and made a long resistance to the army of Alexander; but it never recovered its former importance, although it was a prosperous place under the Romans. Its site is marked by the modern village of *Pallattia*, where are seen the remains of an enormous theatre, an aqueduct, and a Christian church formed out of a Greek temple. South-east of Miletus, in the interior near the brackish lake of Baffi, which is probably part of the ancient Latmicus sinus, was *Heracleia* at the western foot of Mount Latmus, where some ruins mark the spot. Near it was shown the cave of Endymion. To the north end of this lake, near the Mæander, was *Myus;* and on the east side of Mount Latmus lay *Amyzon*, ruins of the citadel and walls of which remain.

(Pococke; Leake, *Asia Minor;* Sir C. Fellowes, *Asia Minor;* Hamilton, *Researches in Asia Minor; Dictionary of Greek and Roman Geography.*)

KARS, a town in Turkish Armenia, is situated in a high rugged plain, between 6000 and 7000 feet above the level of the sea, on the Arpa, a feeder of the Araxes, about 100 miles straight-line distance N.E. from Erzerum, N.W. from Bayazid, and S.E. from Batoum on the Black Sea, in 40° 27′ N. lat., 43° E. long., and has about 12,000 inhabitants. It is about 45 miles W.S.W. from the Russian town and fortress of Gumri, or Alexandropol. It stands in a rocky amphitheatre of black basaltic hills, and has a dark dismal look, from the total absence of trees, and from the circumstance that all the houses are built of black basalt. It contains about 300 houses, 20 mosques, and 4 baths. Part of the town is walled and has a citadel built by Amurath III.: but it is untenable against artillery, being commanded by heights within musket range on the opposite side of a deep narrow ravine traversed by the Arpa. The two portions of the town are united by two stone bridges thrown across the river which encircles the walled portion of the town on three sides. Kars was formerly a large town with from 6000 to 8000 houses, but a great part of the Turkish population abandoned it during the Russian occupation in 1828-9, and on the retreat of the Russian army all the Armenians emigrated to the neighbouring provinces of Russia; so that from Russian violence and the desertion of its inhabitants it fell into a state of ruin and decay.

Soon after the commencement of the late war between Turkey and Russia, General Guyon was sent to Kars at the end of 1853 as chief of the staff and president of the military council. He disciplined the Turkish army, and constructed defences. He was succeeded in 1854 by Lieutenant-Colonel Williams (now Major-General Sir William Williams) as her Majesty's Commissioner with the Turkish forces in the East. The defences were extended and improved, so that when the Russian General Mouravieff, who had invested Kars, attempted to take it by assault, Sept. 29, 1855, he was repulsed with great slaughter. The brave garrison, however, after being reduced to the extremity of starvation, were obliged to capitulate. General Mouravieff treated the garrison, soldiers and inhabitants, as well as officers, with great humanity and kindness. By the treaty of peace concluded at Paris in 1856, Kars was evacuated by the Russian army, and restored to Turkey.

The pashalic of Kars includes the most northern part of Turkey in Asia, extending from the Araxes and Suvanli-Dagh to the Choruk-su, the Black Sea and the Russian frontier. It is a rugged country of lofty mountains and high plains, drained by the Araxes, the Kur, and the Choruk-su.

KAWRIE PINE. [AGATHIS.]

KEITH, Banffshire, Scotland, a market-town in the parish of Keith, is situated in 55° 33′ N. lat., 2° 59′ W. long., on the banks of the small stream called the Isla, about 20 miles S.W. from Banff, 178 miles N. by E. from Edinburgh. The population of the town of Keith in 1851 was 2101.

The town comprises three distinct villages, called Old Keith, New Keith, and Fife Keith. Old Keith is a very ancient village, and at one time was a regality. It is now a mere hamlet. New Keith dates from the middle of last century. It consists of five principal streets, intersected by several smaller ones, with a square or market-place in the centre of the town. It contains the parish church, a courthouse, an Episcopal and a Roman Catholic chapel, besides chapels for congregations of the Free Church and United Presbyterian bodies. There are a library and a savings bank. A grain-market is held weekly; and several cattle-fairs are held annually, the most important of which is 'Summer-Eve Fair.' Fife Keith, a modern village, on the bank of the Isla, opposite Old Keith, with which it is connected by two bridges, consists of several well-built streets. Many of the inhabitants of Keith are employed in the manufacture of woollens, flax-dressing, weaving, bleaching, and the manufacture of tobacco.

KELLIADÆ, a family of minute *Mollusca* belonging to the Lamellibranchiate *Acephala*. Forbes and Hanley place this family between *Lucinidæ* and *Cycladidæ*. The British *Kelliadæ* embrace the genera *Montacuta*, *Turtonia*, *Kellia*, *Lepton*, and *Galeonura*. The genus *Kellia* has two British representatives, *K. suborbicularis* and *K. nitida*. They are small but elegant bivalves, living in the crevices of rocks, or on shells or sea-weeds, spinning a byssus, or lying free. There are about a dozen species known in different parts of the world. This genus, from which the family takes its name, was named after Mr. O'Kelly of Dublin.

KELLS. [MEATH.]

KEMBLE, CHARLES, was born on the 25th of November 1775, at Brecon (Brecknock) in South Wales. His father was Roger Kemble, an actor and theatrical manager. He was educated at the English Roman Catholic College at Douay, in the French department of Nord, whence he returned to England in 1792. He was placed, through the influence of his brother, J. P. Kemble, in the General Post-Office, London, but soon resigned his situation, and after a few trials in private theatres made his first appearance on the public stage at Sheffield, as Orlando in 'As You Like It.' He had engagements afterwards at Newcastle and other towns. On the 21st of April, 1794, he made his first appearance in London, as Malcolm, on the opening of the newly-built theatre of Drury Lane, John Kemble performing Macbeth, Mrs. Siddons Lady Macbeth, and Mr. Palmer Macduff. He continued for a considerable time to play secondary characters, but gradually improved in his art. On the 28th of November, 1796, he performed George Barnwell at Drury Lane, Mrs. Siddons taking the character of Millwood. In 1797 he was engaged at the Haymarket Theatre, where in 1800 he brought out his adaptation of Mercier's 'Deserteur,' under the title of 'The Point of Honour,' which was performed successfully, and became a stock-play. On the 2nd of July, 1806, he married Miss Marie Therese De Camp, of French parentage, but born at Vienna in 1774. Miss De Camp was engaged by her father as a danseuse at the Opera-House, London, at a very early age. Her father died when she was in her twelfth year; she was then patronised and instructed by some ladies, and had become, when Charles Kemble married her, a favourite actress in the walk of high comedy, and she so continued as Mrs. Charles Kemble till she left the stage in 1818. She died on the 3rd of September, 1838. In 1807 Mr. Charles Kemble brought out with success at Covent Garden 'The Wanderer, or the Rights of Hospitality,' which is an adaptation of Kotzebue's 'Eduard in Schottland;' and in 1808, at the Haymarket, with still greater success, the farce of 'Plot and Counterplot,' an adaptation of a French piece called 'Le Portrait de Michel Cervantes.' Three or four other dramatic pieces from the German and French, which he brought out afterwards, were less successful. Meantime he continued to improve in his profession, took a wide range, and in some of his characters was without a rival. Among his best characters may be mentioned Orlando, Falconbridge, Cassio, Leon, Benedick, Young Mirabel, Mercutio, Petruchio, Archer, Ranger, Charles Surface, and Friar Tuck. For several of these characters his handsome features, fine voice, and tall well-formed athletic person, peculiarly fitted him. He closed his career as an actor on the 10th of April 1840, shortly after having been appointed to the office of Examiner of Plays. He appeared in public occasionally afterwards as a reader of Shakspere. During some of his latter years he suffered the inconvenience of deafness. He was well acquainted with modern languages, and a tolerable classical scholar. He died on the 12th of November, 1854, aged seventy-nine years within a fortnight.

Mr. Charles Kemble left one son and two daughters. His son, John Mitchell Kemble, is noticed in a separate article. His eldest daughter, Frances Anne Kemble, known as Fanny Kemble, was married to Mr. Butler, of Philadelphia, but they separated. The other daughter, Adelaide Kemble, distinguished herself as an operatic singer. She became the wife of Mr. Sartoris, and then quitted the stage.

KEMBLE FAMILY. The Kemble family form probably the most extraordinary group of actors and actresses ever known. Macklin, when nearly 100 years of age, addressing John Philip Kemble, said, "Sir, I have known your family from generation to generation. I have seen you act, young man; and I have seen your father, sir; and I have seen your grandfather, sir. Sir, he was a great actor." Of the grandfather there appears to be no record but the testimony of Macklin. The father, Roger Kemble, was born on the 1st of March, 1721, in the city of Hereford. He was an actor, and the manager of a company that performed in the principal towns of Wales and the west of England. He married in 1753 Sarah Ward, born September 2nd, 1735, at Clonmel in Ireland. She also was an actress. They had twelve children, of whom Mrs. Siddons and John Kemble were the two eldest. [Siddons, Mrs. Sarah; Kemble, John Philip.] Charles Kemble was the 11th child and youngest son. Roger Kemble died in 1802, and Mrs. Sarah Kemble in 1806.

Stephen Kemble (George Stephen Kemble), the third of the children, was born on the 3rd of May 1758, at Kington, in Herefordshire. He was intended for the medical profession, and was placed with a surgeon at Coventry, but gave the preference to the stage. After a course of practice in the country he made his first appearance in London, at Covent Garden, on the 24th of September, 1783. In the same year he married Miss Satchell, a favourite actress. After acting for some time at Covent Garden he was engaged at the Haymarket. He became afterwards the manager of a company that performed at Edinburgh and Glasgow, and subsequently of another that acted at Newcastle, Durham, Sunderland, Lancaster, and Whitehaven. He was a good actor, but became so bulky in person as to be almost unfit for any character but Falstaff, which he performed frequently, both in London and the country. His last performance was in the character of Sir Christopher Curry, in the farce of 'Inkle and Yarico,' a few days after which he was attacked by inflammation of the bowels, and died on the 5th of June 1822, at the Grove, near Durham.

Frances Kemble, the fourth child of Roger Kemble, was born on the 28th of December 1759, in the city of Hereford. She also became an actress, and performed in London; but having become the wife of Mr. Francis Twiss, quitted the stage. She died in 1812, at Bath.

Elizabeth Kemble, the fifth child of Roger Kemble, was born on the 2nd of April 1761, at Warrington, in Lancashire. She was apprenticed to a mantua-maker, but left that occupation for the stage. After some practice in the country, she made her first appearance in London at Drury Lane Theatre, on the 22nd of February 1783, as Portia in 'The Merchant of Venice.' After repeating Portia she repaired to York, where she had previously accepted an engagement. In face, figure, and voice she bore a striking resemblance to Mrs. Siddons. On the 21st of June 1785 she was married to Charles Edward Whitlock, an actor and joint-manager of a theatrical company in the north of England, known as Austin and Whitlock's company, of which Mrs. Whitlock became the principal actress. The circuit of this company embraced Newcastle, Durham, Lancaster, and Whitehaven. Cooke and Munden were members of it before they appeared in London. In 1792 Mrs. Whitlock accompanied her husband to America, where she became almost as great a favourite as Mrs. Siddons was in England. She performed mostly at Philadelphia and Charleston, and frequently before General Washington. Having acquired an independence, Mr. and Mrs. Whitlock returned to England about 1807, and quitted the stage. Mr. Whitlock died about 1820. Mrs. Whitlock was much admired in society for the liveliness of her conversation. She died on the 27th of February 1836.

The other children of Roger Kemble died young, except a daughter, Anne, born in 1764, who was alive in 1834.

KEMBLE, JOHN MITCHELL, well known as one of the chief Anglo-Saxon scholars of his age, and also distinguished in historical literature generally, was the son of Charles Kemble, and was born in 1807. He was educated at Trinity College, Cambridge, where he took the degree of B.A. in 1830, and that of M.A. a year or two later. From the very first his studies were directed towards the Anglo-Saxon language and literature; and in 1833 he signalised his acquirements in this department by the publication of 'The Anglo-Saxon Poems of Boewulf, the Traveller's Song, and the battle of Finnesburgh, edited, together with a Glossary and an Historical Preface.' The work reached a second edition in 1837, when an additional volume, containing 'A Translation of the Anglo-Saxon Poem of Beowulf, with a Glossary and Notes,' was appended to the first. The more important of Kemble's subsequent works, were the 'Codex Diplomaticus Ævi Saxonici, operâ Johannis M. Kemble,' vol. i. 1839, vol. ii. 1840; 'The Anglo-Saxon Charters;' the 'Vercelli Codex: Poetry of the Codex Vercellensis, Anglo-Saxon and Latin, with an English translation,' published in 1843 as one of the works of the Ælfric Society; the 'Dialogue of Salomon and Saturnius, with an Historical Introduction and English Translation,' published in 1848 by the same Society; an edition of Twysden's 'Considerations upon the Government of England,' published in 1849 by the Camden Society; and lastly, 'The Saxons in England, a History of the English Commonwealth till the period of the Norman Conquest,' published in 2 vols. in 1849. This last work comprehends the main results of Mr. Kemble's Anglo-Saxon and historical studies. For a good many years Mr. Kemble was editor of the 'British and Foreign Quarterly Review,' a periodical of the highest class, which exercised considerable political and literary influence, but ceased to exist about the year 1845. He held the office of Examiner of Plays under the Lord Chamberlain, his acting assistant in this office being Mr. Donne. Mr. Kemble was a Fellow of various learned societies, including the Academies of Sciences of Berlin and Munich, and the Historical Societies of Stockholm and Copenhagen. He died March 26, 1857.

KENFIG, OR KENVIG. [Glamorganshire.]

KENMARE, county of Kerry, Ireland, a market and post-town, and the seat of a Poor-Law Union, is situated at the head of Kenmare Bay, on the north shore of the æstuary of the Roughty, in 51° 52′ N. lat., 9° 34′ W. long., 16 miles S. by W. from Killarney, 163 miles S.W. from Dublin. In 1851 the population was 1501. Kenmare Poor-Law Union contains 16 electoral divisions, with an area of 198,146 acres, and a population in 1851 of 21,282.

The town was a mere hamlet till the close of the 18th century; it now consists of one large street of neat well-built houses from which others diverge towards the Sound, a narrow part of the bay, which is spanned by the Lansdowne suspension-bridge. In the town are a Protestant church, a large Roman Catholic chapel, a news-room, market-house, petty-sessions house, a bridewell, and the workhouse, which affords accommodation for 540 inmates. A little below the town is a substantial pier; the depth of water at high-tide is 16 feet, and vessels of the largest size can come at all times within a mile of the pier. Coal, timber, iron, and slates are the chief imports: corn, salmon, and other fish, and copper-ore from the neighbouring mines, are the principal exports. The country on both sides of the bay for several miles belongs to the Marquis of Lansdowne.

KENNINGTON. [Surrey.]

KENSINGTON. [Middlesex.]

KEROLITE. [Mineralogy, *S.* 1.]

KEYNSHAM. [Somersetshire.]

KHIVA. [Kiva.]

KIDWELLY. [Caermarthenshire.]

KILBARCHAN. [Renfrewshire.]

KILBEGGAN. [Meath, West.]

KILMALLOCK. [Limerick.]

KILRUSH, county of Clare, Ireland, a sea-port town and the seat of a Poor-Law Union, is situated at the head of a small bay on the north shore of the æstuary of the Shannon, 26 miles S.W. from Ennis, 145 miles W.S.W. from Dublin, in 52° 38′ N. lat., 9° 29′ W. long. The population in 1851 was 4471, besides 4796 inmates of the workhouses. Kilrush Poor-Law Union contains 27 electoral divisions, with an area of 136,788 acres, and a population in 1851 of 51,247.

Kilrush Harbour is the first above the mouth of the Shannon, and the roadstead opposite it, sheltered by Scattery Island, is the first secure anchorage from westerly gales. The pier, which projects in the direction of Hog Island from the entrance of the creek, has been recently extended, and affords shelter and accommodation to sailing-craft and steamers. Kilrush is a market for the sale of the in-shore and deep-sea fisheries of the Milltown Malbay fishing district. Large quantities of fish are shipped to Limerick. A considerable trade is also carried on with Limerick in turf, cut in the extensive bog which extends northward from Kilrush to Dunbeg Bay. The town is much resorted to for the benefit of sea-bathing. It has a good weekly market on Saturday, and annual fairs on May 10th and October 12th. The town consists mainly of two wide streets running along two sides of a large square, the centre of which is occupied by a handsome market-house. There are a new church, a spacious Roman Catholic chapel, a custom-house, a bridewell, police barracks, fever hospital, workhouse, and several large corn-stores. The Methodists have a chapel, and there are several schools. Quarter and petty sessions are held in the town. The island of Scattery abounds in ancient ecclesiastical remains, among which is a round tower 120 feet high. The mansion and extensive demesne of C. M. Vandaleur, Esq., the proprietor of Kilrush, are close to the town. Steamers ply regularly between Kilrush and Limerick. Kilrush is one of the stations of the Royal Western Yacht Club.

KILSYTH. [Stirlingshire.]

KINETON, or KINGTON. [Warwickshire.]

KINGSCLERE, a village in Hampshire, remarkable for the exhibition of the Greensand Formation in the midst of the elevated chalk downs, on the line of an anticlinal axis passed east and west. The anticlinal axis passes through the middle of a valley (hence called a 'a valley of elevation') in which the greensand appears; and it might seem on a first view that the discontinuity of the chalk was simply owing to elevation and fracture, but by considering the areas and slopes of the strata, in plans and sections on a true scale, it will immediately appear that a considerable mass of chalk must have been removed by denudation. For the knowledge of this interesting 'valley of elevation' we are indebted to Dr. Buckland. ('Geol. Trans.,' 2nd series, vol. ii.) Sir Charles Lyell has contemplated it in connection with the more extensive denudation of the Weald of Kent and Sussex. (*Principles of Geology.*)

KINGSTON. [Canada, *S.* 2.]

KINGSTOWN, county of Dublin, Ireland, a sea-port town and the mail-packet station of the city of Dublin, is situated in the parish of Monkstown, barony of Rathdown, distant 6 miles E.S.E. by railway from Dublin. The population in 1851 was 10,453. This place was called Dunleary till September 3rd, 1821, when the name was changed to Kingstown to commemorate the embarkation of George IV. for England, which circumstance is recorded on a granite obelisk near the wharf. Although an ancient place, it was a mere fishing village and collier haven till the new harbour-works were commenced in 1817. Since then the town has been greatly extended, so that Kingstown may now be said to include not only Dunleary, but also Monkstown, Bullock, and Dalkey. The harbour is formed by two piers inclosing an area of 250 acres, with a depth of from 15 to 27 feet, and approaching each other within a distance of 760 feet. The eastern pier, on the extremity of which there is a bright revolving light, is 3500 feet long; the western is 4950 feet long; and along both piers there are quays 40 feet wide, which are protected from the sea by parapets 9 feet high. The harbour has not proved so useful as was expected, owing to the anchorage being very much exposed. The number of vessels that entered Kingstown harbour in 1851 was 2126, of the aggregate burden of 257,367 tons, exclusive of men-of-war, cruisers, and mail packets; of this number 1117 were vessels trading to or from the port of Dublin. The city of Dublin royal mail steam-packets sail twice a day with the mail and government dispatches to Holyhead; there is besides daily communication by steamers with Cork, Liverpool, Holyhead, and Chester, and packets sail regularly to London and other important towns. The chief exports are cattle, corn, lead-ore, and granite; the imports consist chiefly of coal, iron, and timber. The beauty of the situation, the salubrity of the air, the picturesque country around the town, the arrival and departure of the steam-vessels, and the bustle connected with the shipping, have contributed to make Kingstown a place of great resort: it is also much frequented as a watering-place. The principal street is George's-street, extending above half a mile in length. There are numerous avenues, terraces, and parades, some of which are uniformly built, and present a handsome appearance. Besides the parish church, which is at Monkstown, there are a large and handsome Roman Catholic chapel, St. Mary's convent, a Free church, the Mariner's church, and places of worship for Presbyterians, Methodists and Quakers. The Kingstown terminus of the railway to Dublin, and the tunnel of the atmospheric railway to Dalkey, are in front of the harbour. There are a petty sessions court-house, police and coast-guard stations, a savings bank, lying-in hospital, dispensary, National and other schools, and commodious baths. The town is lighted with gas, and partially paved. The paving and lighting of the town is managed by a board of 18 commissioners. There are remains of old castles at Monkstown and Bullock, and of three in the village of Dalkey. Kingstown is the station of the Royal St. George's Yacht Club.

KINGTON. [Herefordshire.]

KINIC or QUINIC ACID. [Chemistry, *S.* 2.]

KIRBY, THE REV. WILLIAM, one of the most distinguished naturalists of his day, and celebrated for his knowledge of entomology. He was the grandson of John Kirby, a miller at Wickham Market, in Suffolk, and the author of the 'Suffolk Traveller,' which was published in 1785, and was a work of great repute in its day. Joshua Kirby, a brother of the father of the subject of our present notice, was the friend of Gainsborough the artist, and distinguished as an architectural draughtsman, and the author of a work on Perspective. William Kirby, his father, was a solicitor, and lived at Witnesham Hall, where the entomologist was born, on September 19th, 1759. His mother, whose name was Meadows, of a family of some consideration in the county of Suffolk, early gave him a taste for the study of natural history. A collection of shells, and the plants of the fields, were the first objects to which his attention was directed. His natural history studies were however interrupted by his being sent to the grammar school at Ipswich, where it appears he did not distinguish himself. From thence he was entered at Caius College, Cambridge. Here again he failed to distinguish himself, for Cambridge had at that time no honours for those whose tastes led them to cultivate the natural sciences. He took his degree of B.A. in 1781; and having entered upon holy orders, was appointed shortly after to the cure of Barham, in his native county. In 1784 he married Miss Ripley of Debenham. At this time he became acquainted with the Rev. Mr. Jones of Nayland, whose writings on controversial divinity were highly estimated. Mr. Kirby had however no taste for polemics, and although he never neglected the duties of his office for the pursuit of natural history, his taste for the latter became so decided, that he published very little on subjects directly connected with his profession as a clergyman.

Left to the natural bent of his genius, and surrounded with objects of natural history, his early love of plants was rekindled, and he cultivated a knowledge of the plants of his neighbourhood. An accident drew his attention to insects. "About half a century since," he says, in a letter to a friend in 1835, "observing accidentally one morning a very beautiful golden bug creeping on the sill of my window, I took it up to examine it, and finding that its wings were of a more yellow hue than was common to my observation of these insects before, I was anxious carefully to examine any other of its peculiarities, and finding that it had twenty-two beautiful clear black spots upon its back, my captured animal was imprisoned in a bottle of gin, for the purpose, as I supposed, of killing him. On the following morning, anxious to pursue my observation, I took it again from the gin and laid it on the window-sill to dry, thinking it dead, but the warmth of the sun very soon revived it; and hence commenced my farther pursuit of this branch of natural history." These facts were communicated to Dr. Gwyn of Ipswich, who was a good naturalist, and led him to recommend to his young friend the pursuit of entomology. So diligent was Kirby in the pursuit of his new science, that we find him warmly taking up the cause of natural history science, and becoming one of the first members of the Linnæan Society, founded by Sir James Edward Smith in 1788. In 1793 he contributed his first paper to the Linnæan Society. It was entitled 'A description of three new species of Hirudo,' and was published in the second volume of the 'Transactions.' His next paper, which was published in the third volume of the same 'Transactions,' was 'A History of three species of Cassida.' In the same volume is a 'Letter to Mr. Marsham, containing observations on the Insects that infested the Corn in the year 1795.' He became early alive to the importance of making the pursuit of entomology of practical value, and paid particular attention to those insects which attacked wheat and other plants of importance to man. The last paper was followed by others on the 'Tipula Tritica,' on 'Insects that prey upon Timber;' and in the fifth volume of the 'Linnæan Transactions' is a paper entitled 'Observations upon certain Fungi which are Parasites of the Wheat.' These and other papers indicate great accuracy of observation, and prepared him for a work of higher and more important scientific interest. The family of *Hymenoptera*, including the bees and wasps, had been but imperfectly studied in this country, and he devoted himself to the production of a separate and complete work on English Bees. This work was published at Ipswich, in two volumes, with plates, in 1802, and was entitled 'Monogrphia Apum Angliæ, or an attempt to divide into the natural genera and families such species of the Linnæan genus Apis as have been discovered in England, with descriptions and observations.' This work embraced also general remarks on the class *Hymenoptera*, and a table of the nomenclature of the external parts of these insects. The publication of this work at once gave him a high position amongst the naturalists of Europe, and brought him into correspondence with Fabricius, Latreille, and other naturalists on the continent of Europe, as well as all the more eminent naturalists of his own country. This work was followed up by several papers, containing important additions to the literature of entomology, but was perhaps surpassed in scientific interest by his discovery of the genus *Stylops*, which he indicated as the type of a new order of insects, to which he gave the name *Strepsiptera*. These insects were found parasitical during their larva state in the bodies of bees, and the novelty of their history and beautiful forms excited a lively interest in the entomological world.

But whilst these discoveries were going on, he was preparing for a work by which his name became more widely known and imperishably associated with the popular literature of his country. We allude to the 'Introduction to Entomology,' which he published conjointly with Mr. Spence. Mr. Kirby's acquaintance with the latter gentleman commenced in 1805, and resulted in Mr. Spence proposing in a letter dated November 23, 1808, that they should write in partnership a "popular Introduction to Entomology." This proposition was readily acceded to by Mr. Kirby, and in 1815 the first volume of this work appeared. It speedily went through three editions, and in 1817 the second volume was published. On account of the illness of Mr. Spence the third and fourth volumes did not appear till 1826. This work at once took a position amongst the classical productions of our language, and few scientific publications have been so extensivly read. Since the death of Mr. Kirby, Mr. Spence has published a seventh edition, to which is added an appendix giving an account of the origin and history of the work. It is written in the form of letters, and gives in a familiar style an account of the structure, habits, and forms of insects. It is a model of the manner in which works on natural history to be popular should be written, and is almost exhaustive of the subject of the habits, uses, injuries, and instincts of insects. Of the fifty-one letters of which this work consists, it appears that twenty were written by Mr. Kirby, nine by Mr. Spence, and twenty-two by the two authors conjointly.

In 1830 Mr. Kirby was applied to by the trustees appointed under the will of the late Earl of Bridgewater to write one of the works since so well known as the 'Bridgewater Treatises.' Although he was then in the seventieth year of his age, the production of such a work was so congenial to his tastes and the spirit in which he had conducted all his natural history researches, that he at once consented. The subject was the 'Habits and Instincts of Animals.' From his previous history it would appear that Mr. Kirby had not had such extensive opportunities of studying the other groups of animals so accurately as he had done insects. It is therefore, especially considering his age, not surprising to find that this work did not equal in merit his previous productions. It contains, however, a great number of interesting facts which he collected with great diligence, in reference to all departments of the animal kingdom, and the spirit in which it was written was eminently in accordance with the object of the founder of the treatises.

Mr. Kirby's other principal labours are as follows:—'A Description of several new species of Insects collected in New Holland by Robert Brown, Esq., F.R.S.' ('Linn. Trans.' xii.); 'An Account of the Animals seen by the late Northern Expedition whilst within the Arctic Circle,' 4to, London, 1821, being a supplement to the appendix of Captain Parry's 'Voyage for the Discovery of a North-West Passage.' The insects were described by Mr. Kirby. The insects in 'Fauna Boreali-Americana, or the Zoology of the Northern parts of British North America,' 4to, Norwich, 1837.

Although most exemplary in the performance of his clerical duties, Mr. Kirby was never promoted in the church of which he was so great an ornament. The only appointment he ever received in addition to the cure of Barham was that of chaplain to the district workhouse in 1794. In scientific circles his name was one of influence. He was chairman of the first meeting of the Zoological Club of the Linnæan Society, which was founded in 1827. This was one of the first offshoots of the Linnæan Society, and was followed by the establishment of the Entomological Society in 1833. Of this society Mr. Kirby was elected Honorary President, and he presented it before his death with his very valuable collection of insects. He was made a Fellow of the Royal Society in 1818, and of the Geological Society in 1807. He also received the honorary diplomas of many scientific societies on the continent and the United States of America. In 1847 a museum of Natural History was founded at Ipswich; he was present at the opening of this institution, and held the office of President till his death.

Mr. Kirby was twice married, his second wife being Miss Rodwell of Ipswich, to whom he was married in 1816. She died in 1844. He had no family by either wife, and died on the 4th of July, 1850, at the great age of ninety. His 'Life,' to which we are indebted for many of the above particulars, has been written by the Rev. John Freeman, M.A., and was published in 1852.

KIRKBY MOORSIDE. [Yorkshire.]

KIRKBY STEPHEN. [Westmoreland.]

KIRKWALL. [Orkney Islands.]

KIRRIEMUIR. [Forfarshire.]

KIRTON. [Lincolnshire.]

KIRWANITE. [Mineralogy, *S.* 1.]

KISCHENEFF, or **KICHENEV**, a town in European Russia, capital of the government of Bessarabia, is situated on the Byk, or Bouk, a feeder of the Dniester, 40 miles N.W. from Bender and Tiraspol, on the latter river, 70 miles E. from Jassy. It was a small place with narrow dirty streets darkened by the projecting roofs of the houses, and a population of about 4000 when it came into the possession of Russia in 1812. Since then the town has been enlarged so as to cover three adjacent hills, and it now contains 15 churches, a synagogue, a Greek theological seminary, a gymnasium, several schools, and a public library. In 1838 the population had reached 13,000. The town is adorned with handsome marble fountains, and has a fine public garden. The inhabitants, who consist of Russians, Cossaks, Poles, Jews, Germans, Armenians, Bulgarians, Greeks, and gipsies, carry on a considerable trade in corn, cattle, sheep, flax, hemp, tobacco, fruit, wine, &c. The principal industrial products are brandy, leather, soap, candles, some woollen stuffs, &c.

KITTA. [Corvidæ.]

KITT'S, ST. [Christopher's, St.]

KITTO, JOHN, was born at Plymouth, December 4, 1804. His father had been a respectable builder, but soon after his son's birth became much reduced in circumstances through the adoption of intemperate habits. At four years old John Kitto was transferred to the care of his maternal grandmother, by whom his intellect was called into activity by the relation of marvellous stories, and by leading him to notice and admire the natural objects around him in the fields and woods. He early learned to read, and read with avidity all the books he could procure. By the time he was twelve years old, his father had descended to the rank of a jobbing mason. He was unable to keep his son at school regularly, who, whenever he could be made available, was required to attend his father in his labours. On February 13, 1817, having ascended a ladder with a load of slates, he fell from a height of thirty-five feet. He was taken up senseless, conveyed home, and lay for a fortnight in a state of unconsciousness. He recovered, but was himself unaware at first that he was deaf. He wondered at the silence around him, and at length, asking for a book, was answered at first by signs, and next by writing on a slate. He inquired with astonishment, "Why do you not speak?" His attendants wrote again, "You are deaf." No efforts could restore his hearing. He still continued his reading, but in 1818 his grandmother was obliged to quit Plymouth, and he was left to the care of his father. For nearly a twelvemonth he lived with his parents in a state of great destitution. At length, on November 15, 1819, he was placed in the workhouse, where he was treated with much indulgence, and began to learn shoemaking. His deafness occasioned him to write often, and by constant practice he acquired great facility. In August 1820 he commenced a journal, which he continued till January 1822, and he was encouraged to write lectures which were read to the other boys. In 1821 his grandmother died, which event made a great and serious impression on his mind. In November 1821 he was apprenticed to a shoemaker; but his master was harsh, he was somewhat awkward, and still passionately devoted to reading. Finding himself uncomfortable, he wrote to some of his friends, and after pleading his cause in writing before the magistrates, he was taken back to the workhouse in May 1822. Early in 1823 he wrote some essays which were published in Nettleton's 'Plymouth Journal,' and he also wrote some imaginary correspondence. In April 1824, Mr. Grove, a dentist, who had known something of him in Plymouth, but who was then settled at Exeter, engaged him in order to teach him his art, and he accordingly removed to Exeter, where he succeeded in attaching Mr. Grove to him as a sincere friend. In 1825 he published his first work, a volume entitled 'Essays and Letters, by John Kitto.' It produced but little profit, but it contributed to make him known, and excited the interest of many of the inhabitants of Plymouth. By their efforts, greatly assisted by Mr. Grove, he was sent to the Missionary College at Islington, there to be taught printing, which it was thought might render him useful in some of the missionary establishments abroad. He entered that institution in July 1825, and was despatched to Malta as a printer in June 1827, but his health being unequal to his work, he returned to England in February 1829. In the following May he agreed to accompany Mr. Grove on an extensive tour to the East, during which he was to instruct Mr. Grove's children. In this journey he visited St. Petersburg, Astrachan, the Calmuck Tartars, the Caucasus, Armenia, Persia, and Baghdad. At this latter town he was detained during the plague. Mr. Grove there lost his wife, and Kitto thence returned to England in June 1833.

In July of that year, Mr. Woolcombe of Plymouth wrote a letter of introduction for him to Mr. Coates, the secretary of the Society for the Diffusion of Useful Knowledge, recommending him for employment on the 'Penny Magazine.' On the 18th he waited on Mr. Coates with a letter written by himself, in which he proposed a plan of writing his travels, either in the form of weekly numbers, "like the 'Penny Magazine,'" or as volumes of the 'Library of Entertaining Knowledge.' Mr. Coates referred him to Mr. Charles Knight, as editor of those works, telling him he thought the society could not undertake the travels in the 'Entertaining Knowledge.' On the 19th he wrote to Mr. Knight, stating his willingness to use his journal for separate papers in the 'Penny Magazine.' On the 20th he called on Mr. Knight: the conversation was carried on by Mr. Kitto speaking, which he did very imperfectly, and Mr. Knight writing. A few letters afterwards passed, specimen articles were sent and approved of, and on the 4th of August he accepted Mr. Knight's proposals for a general engagement at a salary, saying that "the terms offered would be sufficient not only for my present but my prospective wants." He continued for two years in various literary employments. In 1835 Mr. Knight formed the plan of publishing a Pictorial Bible with notes, and asked Mr. Kitto if he would like to furnish a few of them, illustrating particular passages from what he had observed in his travels. He not only eagerly embraced the proposal, but earnestly entreated to be allowed to undertake the responsibility of the entire work. A specimen was prepared, and eventually it was approved of: the whole was then entrusted to him. The 'Pictorial Bible' was finished in 1838. During its progress, for about two years and a half, Mr. Kitto received an annual payment of 250*l.*; but upon its completion he was presented with an additional sum, which seemed to him a little fortune. In 1838 he embodied a great portion of his experience in Persia in two small volumes, 'Uncle Oliver's Travels.' In 1839 and 1840 he was engaged in writing the 'Pictorial History of Palestine,' also for Mr. Knight. He was entitled to ask, and he received for these and subsequent works, payments according to the highest scale of literary remuneration. From 1841 to 1843 he found employment with Mr. Fisher in preparing the letter-press for the 'Gallery of Scripture Engravings,' in 3 vols. In 1843 he wrote a 'History of Palestine,' published by A. and C. Black of Edinburgh; and 'Thoughts among Flowers,' published by the Religious Tract Society. In 1844 the degree of D.D. was bestowed upon him by the University of Giesen in Prussia.

In 1845 he renewed his connection with Mr. Knight, and prepared 'The Pictorial Sunday Book,' and wrote 'The Lost Senses—Deafness and Blindness' for 'Knight's Weekly Volume.' In this year he commenced the 'Cyclopædia of Biblical Literature,' published by A. & C. Black. In 1847 he undertook for Mr. Knight a new edition of the 'Pictorial Bible,' of which he greatly improved the notes, and which was completed in four volumes in 1849. For this revised edition he received upwards of 600*l.* It is right to mention, that although Mr. Kitto in his latter years was uneasy in his circumstances, his difficulties were not caused by inadequate payments by his various publishers; nor did he sustain any loss whatever by any one of them, as is stated in his 'Biography.' In 1848 he had commenced on his own account the 'Journal of Sacred Literature,' which was continued periodically under his editorship till 1853, but he says himself that it never produced him any profit. He also engaged in various other works, among the most considerable of which were 'Daily Bible Illustrations,' two series, in seven volumes, of which the first series appeared in 1849-51, and the second in 1851-53. In February 1854 he was attacked by a paralytic stroke, from which he never completely recovered. In August he went to Ramsgate without experiencing much benefit. He had received a pension of 100*l.* a year in 1850 from her Majesty, and his friends having raised a subscription to a considerable amount to relieve him from embarrassments, he went to Germany, and settled at Cannstadt in Würtemberg. Here he died on November 25, 1854. He had married a lady in 1833, by whom he had a large family. She was a most effective assistant to him in his literary labours, and a sedulous promoter of his comforts. Since his death she has published a biography of her late husband, prepared by the Rev. J. E. Ryland, founded on materials left by himself either in the form of journals or of letters.

KLAGENFURT. [Clagenfurth.]

KNIGHTON. [Radnorshire.]

KNOT-GRASS. [Polygonum, *S.* 1.]

KOBELLITE. [Mineralogy, *S.* 1.]

KOLLAR, JAN, a poet and preacher, the originator of the idea of Panslavism, was born on the 29th of July 1793, according to Jungmann's 'History of Bohemian Literature,' at Moschowze, in the county of Trentschin in Hungary, being by birth a Slovak, or one of the Slavonic race of northern Hungary, who speak a language akin to that of their neighbours the Bohemians. After studying at Presburg and Jena, he became in 1819 pastor of a Slovakian evangelical congregation at Pesth. In 1823 and 1827 he issued in two volumes, under the title of 'Narodnie Zpiewanky,' or 'National Songs,' an interesting collection of the popular poetry of the Slovaks, which reached a second edition, with additions, in 1834 and 1835. Unlike some other Slovakian authors however, he was far from exhibiting a narrow and exclusive attachment to his native dialect. Considering the Slovakian as too circumscribed in its range to be equal to the dignity of literary composition, he took for the language of his writings the Bohemian, though it was at the time rejected for German in Bohemia itself by several of the native authors. In 1821 he published at Prague a volume of Bohemian sonnets, under the title of 'Basne' ('Poems'); and in 1824 at Buda, a new edition, under the title of 'Slawy Dcera' ('The Daughter of Glory'). The copy of the second edition, in the British Museum, formerly belonged to Bowring, to whom it was presented by Safarik, and who has written in it, "This is a very remarkable book, and how its true and fiery spirit should have burst this Austrian censorship is altogether unintelligible to J. B." The leading idea of the poems is that of the common bond of union between all the Slavonic nations, and the work was in consequence not looked upon with favour by the Hungarians, who were anxious to see their Magyar language extended over the whole of Hungary, and observed with apprehension that the Slavonians to the north of the kingdom, and the Slavonians to the south, were beginning to become conscious of their relationship. Kollar proceeded more and more to develop his idea in his 'Slawa Bohynie' ('The Goddess Slava or Glory'), a collection of philological and mythological essays, and in a work in German, on the connection between the Slavonic races and dialects, 'Ueber die literärische Wechselseitigkeit zwischen den Stämmen und Mundarten der slawischen Nation' (Pesth, 1831). In this publication the wish for a general combination of the Slavonic races is more openly expressed than in any previous one. The same idea pervades the 'Cestopis' (Pesth, 1843), a record of a journey to Upper Italy, the Tyrol, and Bavaria, made by Kollar in 1841, chiefly for the purpose of discovering traces of Slavonic antiquity.

Among his other productions is a volume of sermons, 'Kazne' (Pesth, 1831), which were found so eloquent that they were translated into several languages. Kollar was obliged to leave Pesth by the revolution of 1848, and must in the same year have seen many of his hopes destroyed by the breaking up of the Slavonic Congress at Prague by the cannon of Windischgrätz. In the next year he was, probably by way of compensation, named professor of archæology at the University of Vienna. In 1851 he made a journey to Mecklenburg, to study the remains of the Obotrites, and on his return to Vienna was surprised by death on the 29th of January 1852, when he was preparing for the press a German work, 'Das slawische Altitalien,' intended to prove that the ancient inhabitants of Italy spoke a Slavonic language.

The work of Kollar which is chiefly admired by his admirers, is his 'Slawy Dcera,' which in its latest shape, as it appears in his 'Dila Básnická' ('Poetical Works') published at Buda in 1845, is called a 'lyrico-epic poem,' in five cantos, and extends to 622 sonnets, having little connection except the common idea of 'Panslavism' which pervades them. Whatever the merit of some of the earlier portions, there can be no doubt that some of the later additions are scarcely calculated to awaken respect for the writer; in particular some coarse attacks on Mr. Paget and Miss Pardoe, apparently dictated by a feeling of resentment at their having spoken well of the Hungarians. The prose works of Kollar contain some valuable information, which is however disfigured by an occasional outbreak of the same spirit of mere Slavonic nationality. Several of Kollar's sonnets are translated in Sir John Bowring's work on the Bohemian poets.

KOLLYRITE. [Mineralogy, *S.* 1.]

KÖLN, or CÖLN. [Cologne.]

KONIYEH (Konieh, Koniah), a city in Asia Minor, capital of the pashalic of Karaman, which includes the greater part of Phrygia and Pamphylia, is situated in a wide plain in 37° 54′ N. lat., 32° 40′ E. long., 305 miles E. by S. from Smyrna, and the same distance S.E. from Constantinople. Population, 30,000. The town is surrounded by walls built with well-cut blocks of stone, and strengthened by square towers, some of them richly ornamented with cornices, arabesques, lions'-heads, and Arabic inscriptions. The walls rise from the brink of a wide fosse, and are pierced by handsome gateways, some of which are constructed with fragments of ancient structures. Within, the city, when seen by Hamilton, presented little except ruin and decay; large spaces lay covered with heaps of dilapidated mosques and deserted houses. The modern town and the bazaars occupy the more eastern part of the site, where also is the konak, or palace of the pasha. The houses are low, and mostly built of sun-dried bricks and wood. The old castle, which stands in the centre of the town, is crumbling to pieces, its stone-facings having been removed to build the pasha's konak. Koniyeh contains many beautiful remains of Saracenic architecture, among which may be mentioned the mosque of Sultan Alettin on the castle hill, and the Injemi Minareh Djami (Mosque with the Minaret reaching to the Stars), which is exquisitely adorned with delicate tracery, fretwork, and mouldings. The minarets are chiefly of glazed tiles and bricks of various colours, red and blue prevailing. The old Turkish prison, which forms part of the western wall, is an interesting half-ruined structure, bearing some resemblance to a gothic castle with its ruined towers, battlements, and keep. The pasha's konak is a large straggling building approached by a raised causeway between extensive burial-grounds, part of the site being now used as a cemetery. The other objects of note in the town are its large bazaars, several medresseh, or colleges, several sepulchral chapels, a few Armenian churches, the public baths and khans, and the tomb of a Moslem saint venerated all over Turkey. The manufactures are confined to carpets and blue and yellow marocco leather. Cotton, wool, and skins are sent to Smyrna. The immediate neighbourhood of the town is belted by a small breadth of garden-ground, which is kept in a state of verdure by irrigation. The rest of the plain in summer is a dusty desert; in winter flooded and impassable. The city is supplied with fruit and vegetables chiefly from the Greek village of *Zillieh*, which is two hours' distant, and situated in a gorge among the trachytic hills westward of Koniyeh. This village is inhabited by about 5000 Greeks, descendants of the ancient inhabitants of Koniyeh, who were driven out and obliged to settle here by the Turks when they captured the city.

Koniyeh is the ancient *Iconium*, which Xénophon says ('Anab.,' i. 2) was in Phrygia; in later times it was considered the capital of Lycaonia. Under the Romans it seems to have risen in importance. Cicero spent ten days in Iconium on his way to Silicia ('Epist. ad Atticum,' v. 20). In the first age of Christianity it is described as a populous city inhabited by Greeks and Jews. St. Paul and St. Barnabas preached in the synagogue of Iconium. Under the Greek emperors the city continued to be the metropolis of Lycaonia; but it was wrested from them first by the Saracens, and afterwards by the Seljukian Turks about A.D. 1075, who made it the capital of their dominions. Under the Seljukian sultans, and during the period of the Crusades, Iconium acquired its greatest celebrity. The Seljukian dynasty and power terminated in 1294. After a period of anarchy the city was seized by Othman, the founder of the Ottoman empire in Asia, which had Brusa for its capital. From this time Koniyeh declined rapidly. Ibrahim Pasha, commander of the Egyptian army, completely defeated the Turks near Koniyeh, December 20, 1832.

A Christian synod held at Iconium about A.D. 230 pronounced against the validity of heretical baptism. Koniyeh is looked upon by the Moslems as a sacred city; many dervishes reside in it, and it is visited by many pilgrims.

(Hamilton, *Researches in Asia Minor; Dictionary of*

Greek and Roman Geography; London Geographical Journal, vols. viii. and x.; *Conversations-Lexicon; L'Art de Vérifier les Dates*.)

KOSTENDJE, or KUSTENDJI, a sea-port town or rather village of Turkey in Europe, is situated in the Dobrudscha at the eastern termination of the fortification called Trajan's Wall, 225 miles in a straight line nearly due north from Constantinople, and about 40 miles E. from Rassova. The town, which consists of about 500 houses, is built on the west shore of the Black Sea on a peninsular projection of limestone rock, which rises precipitously from the sea to the height of about 100 feet, and shelters the harbour on the northern side. The harbour is exposed, except on the north side, and ill adapted for large ships, having in places only 7 feet water. Kostendje occupies the site of an ancient town, *Constantiana*, which is said to have been founded and named from Constantine the Great. It retains in its ruined mole traces of Roman masonry. The town has some trade in corn. The project of opening a channel for the Danube across the Dobrudscha by the chain of lakes called the Kara-Su into the harbour of Kostendje has been often mooted. [DOBRUDSCHA, *S.* 2.]

KÖTHEN. [CŒTHEN.]

KOZLOFF. [EUPATORIA.]

KRAIN, or CARNIOLA, a crownland of the Austrian empire, is bounded N. by Carinthia, E. by Styria and Croatia, S. by Croatia and the Küstenland, and W. by Friuli and the circle of Görz. The area is 3838 square miles, and the population, according to the census of 1850-51, was 463,956.

The surface is extremely rugged and mountainous. The principal chain of the Carnic Alps penetrates into the north-west of the crownland, where it terminates in the mass of Mount Terglou, the highest point of which rises to 10,800 feet above the level of the sea. The northern boundary is formed by an offset or continuation of the Carnic Alps, which springs from the main chain near the village of Weissenfels in the north-western angle of the crownland, forming the watershed between the Drave and the Save, and running in a general south-east direction between Carinthia and Carniola, through Croatia and Slavonia, where it terminates in the valley of the Danube. This range, which is distinguished by different names, covers with its ramifications all that part of the crownland which lies north of the Save, its highest points being the Loibelberg (5477 feet), the Sattelberg farther east, and the Steiner Alps to the north of the village of Stein, which rise 10,000 feet above the level of the sea. These mountains are distinguished by their singular forms, and consist of steep, rugged, and for the most part naked masses of limestone, with but scanty vegetation and little timber. They are crossed by three roads, one from Villach to Laybach by the Wurzen Pass and the Upper Sauthal; a second from Klagenfurt to Laybach by the Leobel or Loibel Pass (4032 feet); and a third from Marburg and Cilli to Laybach by the Trojana Pass, which is also traversed by the Vienna-Trieste railway, now open as far as Laybach. In the angle between the main chain of the Carnic Alps and the chain that forms their continuation south-eastward, the Save has its rise in the glaciers that cover the northern flanks of Mount Terglou.

The central and southern parts of the crownland are covered by the Julian or Krainer Alps, and their ramifications. The Julian Alps run south-east from Mount Terglou between the Upper Save and the Isonzo to Mount Kleck in Croatia, reaching the height of 7458 feet above the sea in the Suisnik, or Schneeberg, close to the Croatian frontier. A branch runs southward from the main chain near Idria along the northern and eastern edge of the peninsula of Istria; and along the western side of this ridge to the south of the Wippach extends a stony wilderness called the Karst, which is a plateau of limestone rocks abounding with strange chasms and fissures and funnel-shaped cavities, infested by furious winds, and almost entirely destitute of vegetation. In all this region there is not a single tree; in a few sheltered spots a little corn is grown, and the vine is seen to creep along the crevices of the rocks. The Karst is connected by the Nanas Mountains (4000 feet) near Wippach with the main chain of the Julian Alps, here called Birnbaumerwald. From the Schneeberg a branch of the Julian Alps runs between the Kulpa and the Gurk, reaching in the summit of Jauernig an elevation of above 6000 feet, and stretching up to the Save in the most eastern part of the crownland. The Julian Alps consist of granulous limestone which is shattered into rugged fragments, rent by chasms, and full of grottoes, caverns, and underground passages, abounding with the most beautiful stalactites. The rain that falls and the snow that melts upon them, form streams, which for the most part flow in subterranean channels, and the want of moisture at the surface gives these mountains an aspect of the most repulsive barrenness. It is said that there are above 1000 grottoes and caverns in the Julian Alps, the most celebrated of which are those in the neighbourhood of ADELSBERG. [*S.* 1]. Innumerable rivulets disappear in the calcareous soil, and periodical fountains spring forth; even large streams plunge more than once into the chasms, which intersect the surface of the region, and pursue for a time an underground course. Nevertheless, some of the valleys present picturesque scenery, especially those of the Save and its feeders, and the Wippach. The principal roads that cross the Julian Alps in Carniola lead from Laybach to Idria, and from Laybach by the Adelsberg Pass (2159 feet) across the Karst to Trieste. This last is intersected by a road from Görz through St.-Veit, and Senosetsch to Fiume.

Except in the river-valleys which form a comparatively small portion of the surface, the soil is very unfruitful, naked mountains, rocky levels, marshes, or sandy flats, being the prevailing characters of the country. The climate on the mountains and uplands is sharp; the winters severe and long; snow disappears from the mountain tops only in the height of summer. The Bora, or north-east winds, at times sweep the Karst and the more exposed parts of the country with furious violence. In the glens and valleys the soil is better, in many parts fertile, the climate much milder, and the vine, the chestnut, and maize flourish. Rye, barley, oats, some wheat, potatoes, pulse, flax, hops, and fruit are grown. In some parts the mountain slopes are clothed with pine, oak, and beech forests, but they have been considerably thinned for the use of the smelting-furnaces. On the mountains many rare Alpine plants, medicinal herbs and roots are found. Horned cattle and horses are small; swine and poultry abound. Among the wild animals are deer, wild boars, the chamois goat, foxes, &c. Bears and wolves are rare. Birds of prey are numerous. Of game-fowl the principal kinds are pheasants, bustards, partridges, snipes, and water-fowl. Among the minerals the most important are iron, quicksilver, copper, lead, cinnabar, alum, coal, marble, gypsum, rock-crystal, &c. The great quicksilver mines of Idria in the west of the crownland, have been long famous; the entrance to them is in the middle of the town of Idria; they formerly yielded 16,000 cwts. yearly. The industrial products comprise chiefly bar-iron, iron and steel articles, such as scythes, sickles, nails, files, &c.; copper articles, woollen-cloth, leather, linen, lace, pottery, paper, straw-hats, canvass, horse-hair sieves, tiles, German tinder, &c. A good number of the population are employed in mining and metallurgy. There is a considerable trade in timber and firewood.

The principal rivers are the Save and the Isonzo. The *Save*, or *Sau*, rises on the northern flank of Mount Terglou, and runs first eastward along that mountain mass, and then southward for a short distance to its junction with the Savenitza; its course is then south-south-east to the neighbourhood of Laybach, in which the river Laybach joins it on its right bank. The river then runs eastward till it reaches the boundary, along which it runs in a south-east direction till it enters Croatia a few miles below its junction with the Gurk, which passes Neustädtl. The *Isonzo* (the ancient *Sontius*) rises on the southern slope of Mount Terglou, from which it runs southward through the western part of Carniola and the circle of Görtz in the Kustenland. At a short distance above Aquileia the Isonzo divides into two branches, the Isonzato and the Sdobbo, which inclose the isle of Morosina, and after their re-union enter the Gulf of Trieste. The principal feeders of the Isonzo are, on the right, the Torre, which drains a part of the province of Friuli, and on the left the Idria and the Wippach, both of which flow in a north-west direction, the former passing the town of Idria and entering the Isonzo above Canal, the latter falling into it between Görez and Gradisca. Both the Save and the Isonzo are subject to inundations on the melting of the snow in spring and after the autumnal rains. The Save is navigable in Carniola, and a river-port has been formed at Steinbruck, a station on the Vienna-Trieste railway to the south of Cilli. The Isonzo is navigable for small vessels for about 10 miles above its mouth. Both streams are available for floating timber down from the mountain forests. The Isonzo formed part of the eastern boundary of Italy under the French empire. The *Laybach*, above mentioned, rises near

Adelsberg under the name of *Polk;* this stream loses itself in the grotto of Adelsberg and reappears in the *Unz*, which again sinks below the surface, but reappears at the village of Ober-Laybach, where it becomes navigable for boats. The remarkable Lake of Czirknitz, or Zirknitz, is noticed in a separate article.

The crownland is divided into 10 circles. With the exception of Laybach and Idria the towns are small. *Laybach*, or *Laibach*, the capital of the crownland, is situated in 46° 1′ 48″ N. lat., 14° 30′ E. long., 258 miles S. by E. from Vienna by the Vienna-Trieste railway; in an extensive valley near the mouth of the navigable river Laybach, which divides the city into two parts, connected by five bridges; and has with its eight suburbs about 13,000 inhabitants. It is a bishop's see, and has a fine cathedral, twelve other churches, a lyceum, a gymnasium, and many other public institutions. The chief industrial products of Laybach are porcelain, linen, and refined sugar; there is an active transit-trade from the interior to Trieste, in which direction a railway is in course of construction. The citadel, situated on a commanding eminence, is now used as a prison. At a short distance to the north of the town there is a stone bridge of 11 arches, 540 paces in length, over the Save. Laybach is celebrated for the congress held there in 1821. The other towns are Stein, which gives its name to the Steiner Alps, from the summits of which, 10,274 feet above the level of the sea, there is a magnificent prospect over Carniola; Krainburg, with the castle of Kieselsteen; Neumarktl, famous for the manufacture of scythes, sickles, &c.: none of these towns have so many as 2000 inhabitants.

Neustädtl, the capital of a circle, is beautifully situated on the river Gurk, 38 miles E.S.E. from Laybach. It is a very pretty regularly-built town, with three churches, a gymnasium, a Franciscan convent, and about 2000 inhabitants.

The only other place of importance is *Idria*, a mining town, famous for its quicksilver mines, which were accidentally discovered by a peasant in the year 1497. It is situated partly at the bottom of a narrow valley, surrounded by high mountains, 22 miles W. from Laybach, on the banks of the little river Idria, and partly on several low hills, of which that called Mount Calvary is distinguished by its height and picturesque form. The town consists of between 400 and 500 houses, and has about 5000 inhabitants, who subsist partly by lace-making and straw-plaiting; but the greater part are employed in the mines and works. A large building called Schloss, in the middle of the town, contains the offices of the manager of the mines; close to it is the entrance to the mine by a large iron gate, which opens to a horizontal passage hewn in the solid rock, leading to a flight of 757 steps cut in the limestone rock, which are kept in perfect order and provided with a hand-rail. At the foot of this staircase there is a small aisle serving as a chapel where the miners perform their devotions before they proceed into the mine, and where a couple of tapers burning on the altar help to cheer the gloom that reigns in these subterranean caverns. The visitor proceeding from this chapel soon reaches various adits running in all directions, and would soon be bewildered in the labyrinth without a guide. This mine is one of the greatest curiosities in the Austrian empire, and unequalled for the order, beauty, and safety which are remarked in every part. The noxious exhalations of the quicksilver, which sensibly affect respiration, and the suffocating heat, soon make the visitor anxious to return to the light of day, to which he ascends by a perpendicular shaft in a kind of box or case, which lands him on the surface of the earth, at a great distance from the spot at which he entered. The greatest depth of the mine is 750 feet. About 150 tons of mercury are produced annually. The stamping-mills, washing-houses, furnaces, and roasting-houses for the refinement of the mercurial ore are at a short distance below the town. Besides the quicksilver-works there is a manufactory of cinnabar, which produces 1800 cwts. annually. In the vicinity there are marble, jasper, and freestone. All the establishments for smelting, refining, &c., are admirably arranged, and there are various benevolent institutions for the poor miners, whose health is most dreadfully impaired by the deleterious atmosphere in which they ply their sickly trade. These mines, the grottoes of Adelsberg, and the Lake of Czirknitz, are celebrated as 'the three sights of Carniola.'

Carniola was, until the political arrangement of the Austrian empire in 1849, divided into the three circles of Laybach, Neustädtl, and Adelsberg, which corresponded with the older divisions of Upper, Lower, and Inner Krain respectively, and formed the government of Laybach. Krain was early inhabited by a people of Slavonic stock, and formed in the 10th century an independent margraviate, which at a later period the dukes of Austria and Carinthia divided between them, and which was raised in the 12th century to a dukedom. The duchy on the death of the Earl of Tyrol in 1335 fell to the Earl of Görz, from whom it came, through failure of male issue, to the house of Austria in 1364. By the treaty of Vienna in 1809 Krain was ceded to France, and constituted part of the Illyrian provinces. In 1813 it again came into the possession of Austria, and formed part of the kingdom of Illyria. [ILLYRIA.]

KRASINSKI, COUNT VALERIAN, was a native of the ancient Polish province of White Russia, and was descended from a noble family. The branch to which he belonged embraced at an early period the Protestant faith, to which he adhered. He received a superior classical education, and while yet a young man was appointed chief of that department of the ministry of public instruction in the kingdom of Poland which was charged with the superintendence of the various classes of dissenters. He was zealous in his endeavours to promote instruction among them, and especially exerted himself in the establishment of a college at Warsaw for the education of Jewish rabbis. In order to lessen the expense of valuable works, especially those on scientific subjects, he was the first to introduce stereotype printing into Poland, and this was not accomplished without a considerable diminution of his own income. When the Polish revolutionists of 1830 had proclaimed the throne of Poland vacant, and organised a national government, with Prince Czartoryski as president, a diplomatic mission was sent to England, of which Count Valerian Krasinski was a member. When the Russian armies in 1831 had overpowered the revolutionary movement of his countrymen, he was still in England, where he then became, with many others of his countrymen, a penniless exile. After having instructed himself in the English language, he attached himself to literature as a means of support, and became the author of several valuable works. He resided in London during the first twenty years of his exile, and during the last five in Edinburgh, where he died December 22nd, 1855. He was a man of varied learning, and possessed extensive information, especially on all matters connected with the Slavonic races. His conversation was instructive and his manners elegant, and he was admitted to the best society.

His most important works are the following:—'The Rise, Progress, and Decline of the Reformation in Poland,' 2 vols. 8vo, 1839-40; 'Panslavism and Germanism,' 12mo, London, 1848; 'Lectures on the Religious History of the Slavonic Nations,' 8vo, London, 1849; 'Sketch of the Religious History of the Slavonian Nations,' 8vo, Edinb., 1851; 'Montenegro and the Slavonians in Turkey,' 8vo, Edinb. 1853; 'A Treatise on Relics, by J. Calvin, newly translated from the French Original, with an Introductory Dissertation on the Miraculous Images of the Roman Catholic and Russo-Greek Churches,' 8vo, 1854. He published also some smaller works and pamphlets on recent political subjects, especially on those connected with the restoration of Poland.

KROKYDOLITE. [MINERALOGY, *S.* 1.]

KUGLER, FRANZ THEODOR, Professor of the History of Art in the Royal Academy, Berlin, was born on the 19th of January 1808, at Stettin in Pomerania. On the completion of his collegiate studies Herr Kugler especially devoted his attention to the early history of painting and architecture, for which purpose he made a prolonged stay at Heidelberg, and subsequently visited Italy. Poetry and music also occupied much of his attention, and he in 1830 gave evidence of his attainments in these arts by the publication of his 'Sketch Book,' in which he included original compositions in poetry, music, and linear design; he also in 1833 published with Reinick an artists' song-book. But the more important as well as the most numerous of his writings about this time, were those on the history of art during the middle ages; though the arts of ancient Greece and Rome (and particularly the subject of polychromy, on which he published 'Ueber die Polychromie der Griechischen Architectur und Sculptur und ihre Grenzen,' 4to, Berlin, 1835) also engaged his pen. His great work the 'Handbuch der Geschichte der Malerei' (Handbook of the History of Painting from the Age of Constantine to the Present Time) appeared in 2 vols. in 1837. It was received with great approbation by his learned countrymen and by students of art generally, and was quickly translated into the leading languages of Europe. In

England the translation appeared in parts, the 'Schools of Painting in Italy, translated by a Lady [Lady Eastlake], with Notes by Sir Charles Eastlake,' in 1842; and subsequently, the 'German, Flemish, and Dutch Schools of Painting,' and the 'Spanish and French Schools of Painting,' under the editorship of Sir Edmund Head. A second edition of the 'Handbuch' was issued in 1850, in which, with the assistance of Dr J. Burckhardt, the work was to a great extent remodelled, and a large amount of new materials embodied; and from this revised work a new edition of Sir Charles Eastlake's version of the 'Italian Schools' was published in 2 vols. 8vo, with additional notes and upwards of a hundred outlines from the old masters, by Mr. G. Scharf, thus rendering the English translation of this portion of the work of even more value than the original. Of Dr. Kugler's other works, which are somewhat numerous, may be named his 'Geschichte Friedrichs des Grossen: gezeichnit von A. Menzel' (8vo, Leipz., 1840), translated into English by A. Moriarty, under the title of 'History of Frederic the Great' (Lond. 1844); 'Beschreibung der Kunst-Schätze von Berlin und Potsdam' (1840) ('Description of the Art-Treasures in Berlin and Potsdam'), a work of much more labour and research than its title would indicate; 'Karl Friedrich Schinkel: eine Charakteristik seiner Kunstlerischen Wirksamkeit' ('Schinkel: the Influence of his Theories of Art'), 1842; 'Handbuch der Kunstgeschichte' (Stuttg. 1842), a distinct work from the 'Handbuch der Geschichte der Malerei.' Both these works appeared at Stuttgart in 1848, where also was published (1845-53) a folio atlas of plates to illustrate his histories of art. For more than twenty years Dr. Kugler lectured in the University of Frederick William, as well as in the Royal Academy of Berlin; and also filled for some years an important position in the Ministry of Public Instruction. He died March 18, 1858.

KUPFERINDIG. [MINERALOGY, *S.* 1.]

KUPFERSCHAUM. [MINERALOGY, *S.* 1.]

L

LABUAN, an island in the Malay Archipelago, and the seat of a British colonial government, is situated near the north-west coast of the island of Borneo, and 30 miles N. from the town of Borneo, in 5° 22′ N. lat., 115° 10′ E. long. The island is about 10 miles in length, 5 miles in breadth, and 25 miles in circumference. The population in 1855 was 1696. The island is well supplied with good water, and contains coal. It was ceded to the British in 1846, and the colonial government was established on it at the beginning of October 1848.

The locality on which the government establishment was formed consists of a narrow and slightly raised ridge on the sea-shore, forming the outer edge of a low flat, called the Plain, which is in many parts below the level of the sea, and was converted into a marsh during the rains. The area of the Plain probably does not exceed 100 acres. It is bounded on the inland side by swampy tracts of jungle. The harbour is tolerably good. The unhealthiness of the marshy ground in the Plain has been considerably abated in consequence of the construction of a canal, by which the water is carried off.

The coal is wrought on the north-east point of the island. The mines have been taken by the Eastern Archipelago Company, who in 1851 exported 5032 tons of coal, of which 938 tons were supplied to vessels belonging to the British navy. During 1852 there entered inwards 1198 ships and prahus, of an aggregate burden of 6223 tons; and there cleared outwards 27, of an aggregate burden of 5052 tons. The imports in 1852 were valued at 30,970*l.*; the exports at 16,564*l.* The principal exports were:—Coal, 5448*l.*; sago, 2879*l.*; birds'-nests, 1937*l.*; pearls, 1680*l.*; and camphor, 1559*l.* The principal item of revenue is the royalty on coal. Farm licences are increasing in value, improved rentals being obtained at each succeeding sale.

LACHMANN, KARL, professor in the University of Berlin, and member of the Academy of Sciences, occupied a high rank among the critics and philologists of Germany. He was born at Brunswick on the 4th of March 1793. In that town he received his early education, and under his teacher, Konrad Heusinger, was first awakened his love for literature. For one session, in 1809, he attended the lectures of Hermann in the University of Leipzig, and next pursued his studies in that of Göttingen, where, in conjunction with Dissen, Schulze, and Bunsen, he founded a philological society in 1811. While at Göttingen, Benecke lectured upon the old German literature, which probably directed Lachmann's attention more particularly towards it, and at a later period led to much valuable criticism upon and editions of many of the early German writers. During the short war occasioned by Bonaparte's return from Elba to France in 1815, Lachmann served as a volunteer in the Prussian service, in which he continued till the end of that year. In 1816 his edition of Propertius, which he had prepared at Göttingen, was published at Leipzig; and at Easter of that year he read his probational essay before the University of Berlin, 'Ueber die ursprüngliche Gestalt des Gedichts von der Niebelungen Noth' ('On the Original Form of the Poem on the Niebelungen Calamities'). After this he was appointed, in rapid succession, teacher at the Gymnasium and professor at the University of Königsberg, and professor of the University of Berlin, the last promotion being attained in 1827. Highly esteemed as an academic teacher, and sedulous in the discharge of his duties, he nevertheless actively continued his literary labours. Many of these were critical or philosophical essays contributed to periodical works. Of his distinct works, the more important have been his essays on the Niebelungen Lied and on Homer ('Betrachtungen über die Ilias'), which are both masterly specimens of criticism. His last was the substance of two lectures delivered before the Berlin Academy in 1838 and 1841. In 1834 and in 1842 he published two editions of the New Testament, the last with the Vulgate translation, in which he endeavoured to restore the text to that of the 3rd and 4th centuries. In the classical department he published: 'De Choricis Systematis Tragicorum Græci,' Berlin, 1819; and 'De Mensura Tragædiorum,' Berlin, 1822; with carefully-prepared editions of Catullus, Tibullus, Terence, Babrius, and Avianus, at intervals from 1829 to 1845; one of Gaius, so important to the students of the Roman jurisprudence, in 1841; and essays upon Dositheus and Ulpian in the ninth volume of Savigny's 'Zeitschrift.' Most of these works have gone through more than one edition. His attention however was never diverted from the early literature of the north of Europe. In 1816 he translated the first volume of P. E. Müller's 'Sagabibliothek;' in 1820 a selection from the High-German poets of the 13th century; in 1826 an edition of the 'Niebelungen Lied;' in 1827 an edition of the poems of Walther der Vogelweide; in the same year, in conjunction with Benecke, an edition of Hartmann's 'Iwein;' in 1833, an edition of the poems of Wolfram von Eschenbach; in 1838, Hartmann's 'Gregor,' and the poems of Ulrich von Lichtenstein in 1841. These were all prepared with great care, and accompanied with valuable remarks. He also contributed numerous papers to the 'Rheinischen Museum,' and read others before the Berlin Academy. The most noticeable are 'Ueber althochdeutsche Betonung und Verskunst' ('On the early High German Accentuation and Versification'), 'Ueber Singen und Sagen,' and 'Ueber das Hildebrandslied.' He also published an excellent critical edition of Lessing's collected works, in 13 vols., Berlin, 1838-40; and an edition of Klenze's 'Philological Essays.' Lachmann is likewise the author of a translation of Shakspere's sonnets, published in 1820; and of 'Macbeth,' published in 1839. He died in March 1851.

LACTAMIDE. [CHEMISTRY, *S.* 2.]

LACTUCINE. [CHEMISTRY, *S.* 2.]

LADING, BILL OF. By the statute 18 & 19 Vict. c. 111, the endorsement of bills of lading, which previously passed only the property in the goods, now transfers all the rights of suit and all the liabilities of the original contractors.

(Blackstone's 'Commentaries,' Mr. Kerr's edition, vol. ii. p. 452.)

LADY-BIRD. [Trimera.]

LADY-FERN. [Aspidium, *S.* 1.]

LADY'S SLIPPER. [Cypripedium, *S.* 1.]

LADY'S SMOCK. [Cardamine, *S.* 1.]

LAMBOURN. [Berkshire.]

LAMENNAIS, FELICITE-ROBERT, ABBÉ DE, the son of a ship-owner of Saint-Malo, was born at that port, on the 6th of June, 1782. Prevented by the turbulence of the times from being sent to school at the usual age, he received from his elder brother his first lessons in Latin, and then finished alone his stinted education. For all that, he was able to read Livy and Plutarch when he was only twelve years old. In 1794, having been sent to live with an uncle, this relation not knowing what to do with a wilful boy, used to shut him up for whole days in a library, consisting of two compartments, one of which, called "Hell," contained a large number of prohibited books, which little Robert was enjoined not to read. But the lad already cared for none but books of reflection, and finding some of these on the prohibited shelves, that division became his favourite. Long hours were thus spent in reading the ardent pages of Rousseau, the thoughtful volumes of Mallebranche, and other writers of sentiment and philosophy. Such a course of reading, far from producing its usual effects of precocious vain-glory and unbelief on so young a mind, served rather to ripen his judgment, and to develop that religious fervour which was a part of his nature. Thus left to himself for many years, he declined his father's repeated offers to settle him in some mercantile office, and in 1807 found means to enter the college of Saint-Malo, as teacher of mathematics.

He produced in 1808 his first work, 'Réflexions sur l'État de l'Église en France, pendant le 18 Siècle, et sur sa Situation actuelle.' In this book he denounces the materialism propagated by the philosophers of the 18th century, and bitterly deplores the apathy thence induced to religion. His vocation being the Church, he took the tonsure, of his own accord, in 1811; and in 1812, in concert with his brother, published his 'Tradition de l'Église sur l'Institution des Evêques.' As the power of Napoleon I. was dissolving, and the time seemed propitious for the diffusion of unfettered thoughts, he went to Paris in 1814, his first production being a violent pamphlet against the fallen emperor. This untimely philippic drove him from France during the Hundred Days; he sought refuge in England, spent several months as usher at a school kept by the Abbé Caron, near London; and then returning home in 1816, was at length ordained priest.

The following year was signalised by the appearance of his 'Essai sur l'Indifférence en matière de Religion;' a book which produced an impression so sudden and so deep, that in a single day, said his disciple Lacordaire, he rose like a new Bossuet above the horizon. But in this, as in all his former works, the Abbé Lamennais still adhered to the orthodox standard of Catholicism, no other theological writer going beyond him in upholding the clerical authority in preference to private judgment. In 1824 he visited Rome, met with the most flattering reception from Pope Leo XII., but declined the offer of the Cardinal's hat, made to him by that pontiff. His next work, 'La Religion considérée dans ses Rapports avec l'Ordre Civil et Politique,' began to exhibit that freedom of thought, reaching to the last boundary of revolution (but which, however, independent of church interests, abandons nothing in spiritual faith), for which he subsequently became so widely known. For this book he was summoned to appear before the Cour Correctionnelle, and condemned to a fine.

The general agitation and the ferment in the public mind, which preceded the fall of Charles X., had gradually produced a modification in the opinions of this enthusiast, whose faith was too sincere to be stagnant: the revolution of July induced him to adopt the principle of the people's supremacy. Still he continued the same full believer, and earnest worshipper in the Christian doctrine, as it is understood in the Roman Catholic Church. In attaching himself with equal warmth to the democratic principles, he pointed his objections at the temporal abuses of the Church; whilst his reverence for her spiritual authority remained unaltered. In September 1830, he brought out a journal called 'L'Avenir,' in which several young men who had adopted his opinions, assisted him with their contributions. Among these were the Abbé Gerbet, the eloquent preacher Lacordaire, and M. de Montalembert. The object of this journal was to spread the system of the Abbé Lamennais, and to explain that it combined the advocacy of the interests of the Roman Catholic Church, and the defence of liberal opinions in connection with it; and to maintain that religion, so long neglected, and suffered to decline by the upper classes, ought to be, and might be regenerated by the common people. He likewise demanded, in this paper, the complete separation of the spiritual from the temporal power, insisting that political influence ought to be transferred to the multitude by means of universal suffrage. These bold opinions, expressed in a style of eloquence, somewhat biblical in form, and of remarkable power, produced upon an excitable people an effect so manifest as to provoke the censure of Rome, in the form of an encyclical letter, of the 18th of September 1832. Having submitted to this rebuke by suppressing his journal, the abbé received a gracious letter of congratulation from the pontiff on the 28th of December.

But in May 1834, the new champion of independence in church matters produced his most admired book, the 'Paroles d'un Croyant,' a pathetic lamentation, addressed alike to the suffering classes, and to the great and powerful; a work which sundered for ever the bond that united Lamennais to the see of Rome. Irritated by this new provocation, Gregory XVI., in a second letter, dated July 7, 1834, condemned the book in very severe terms; whilst the revolutionary party applauded their advocate for his independent spirit and original powers of mind. Thus stigmatised by the Church, prosecuted by government, and by the people hailed as an apostle, the Abbé Lamennais set no bounds to his course. He now produced in rapid succession: 'Les Affaires de Rome,' in 1836; 'Le Livre du Peuple,' in 1837; Le Pays et le Gouvernement,' in 1840 (for which he was sentenced to a year's imprisonment); 'De la Religion,' in 1841; 'Le Guide du Premier Age,' in 1844; 'Une Voix de Prison,' in 1846; and 'Les Conseils de l'Abbé Lamennais au Peuple,' in 1849. His most elaborate work, 'Esquisse d'une Philosophie,' was published in 4 vols, 1840-46. He died February 27, 1854, unreconciled to the Church, though during his last illness the most strenuous efforts were made to induce him to retract his heterodox opinions. By his express desire he was interred without any religious ceremony. It was one of his last and most earnest injunctions that certain papers, which contained his latest sentiments, should be published without alteration or suppression; but the religious advisers of his niece (who was also his housekeeper) so far wrought on her susceptibility as to cause her to refuse to give up the papers to the persons whom Lamennais had authorised to superintend their publication. The matter was in consequence brought before the proper legal tribunal, when the judges directed (August 1856) that the papers should be handed over for publication in their integrity.

LAMPETER, Cardiganshire, a market-town, municipal and parliamentary borough, and the seat of a Poor-Law Union, in the parish of Lampeter-Port-Stephen, is situated in 52° 7′ N. lat., 4° 3′ W. long., distant 29 miles E. by N. from Cardigan, and 209 miles W. by N. from London. The population of the borough of Lampeter in 1851 was 907. The living is a vicarage in the archdeaconry of Cardigan and diocese of St. David's. The borough is a contributary to the Cardigan district of boroughs in returning one member to the Imperial Parliament. Lampeter Poor-Law Union contains 14 parishes and townships, with an area of 74,200 acres, and a population in 1851 of 9883.

The town is pleasantly situated on the left bank of the river Teify at the foot of the Tregaron Downs. Besides the parish church, which was rebuilt in 1836, there are places of worship for Wesleyan and Calvinistic Methodists and Independents; a National school, and a Free Grammar school. An agricultural society has been established here. A county court is held. The market is on Saturday; and there are 11 fairs in the course of the year. St. David's College, Lampeter, founded in 1822 by Bishop Burgess, was incorporated in 1828, and received by a supplementary charter in August 1852, authority to grant the degree of Bachelor in Divinity. The course of instruction is adapted especially for Welsh students, but others are admitted. The college grants at the end of the term a certificate to students who have satisfactorily completed their theological course; which is accepted by most of the bishops as a qualification to become candidates for orders. About 30 scholarships and exhibitions are attached to the college, and it possesses a library of 30,000 volumes. The college buildings, erected in 1827 from a design by C. R. Cockerell, R.A., stand on an elevated site near the town, and form a quadrangle of a picturesque appearance: they accommodate about 70 students: the number of students in 1851 was 50. The annual income of the college is about 3000*l*.

LAMPRIS, a genus of Fishes belonging to the family *Scomberidæ*. It has an oval body greatly compressed; small scales; a single elevated and elongated dorsal fin; sides of the tail carinated; teeth wanting; branchiostegous rays 7.

L. guttatus, the Opah, or King-Fish, has been taken on the British coasts. It is a very rare fish, and as beautiful as rare. The upper part of the back and sides are of a rich green, reflecting both purple and gold in different lights, passing into yellowish-green below; above and beneath the lateral line are various round yellowish white spots, from which the fish received the name of Luna. The irides are scarlet; all the fins bright vermilion. It has been remarked, on account of these showy colours, that the Opah looks like one of Neptune's lords dressed for a court-day.

This fish was formerly referred to the genus *Zeus*, and called *Z. Luna* and *Z. imperialis*.

LANARK. [LANARKSHIRE.]

LANARKITE. [MINERALOGY, *S.* 1.]

LAND-CRAB. [GECARCINUS.]

LANDSEER, JOHN, Associate Engraver of the Royal Academy, was born at Lincoln in 1769. He learnt engraving under Byrne, a landscape-engraver of much ability; as early as 1793 he acquired some celebrity by engraving some vignettes, after Loutherbourg, for Maclise's Bible; and increased his reputation by engravings executed for Bowyer's 'History of England' and Moore's 'Views in Scotland.' Mr. Landseer also published an excellent series of engravings of animals from the works of Rubens, Snyders, Gilpin, and other eminent artists. In 1806 Mr. Landseer delivered a course of lectures on engraving at the Royal Institution, which were published in the following year, and excited some discussion in the profession on account of some peculiar views promulgated in them. In the same year he was elected an Associate Engraver in the Royal Academy. The subordinate position assigned to engravers in the Academy—they not being admitted under any circumstances into full membership—was the source of considerable ill-feeling among engravers, and the post of associate engraver had been refused by several eminent engravers when Mr. Landseer accepted it. He announced however that he had only done so in the hope of being able to labour at a greater advantage in striving to remove the obnoxious restriction. Accordingly he memorialised the president and council on the subject, but after a year or two of correspondence and controversy the claim was rejected. Landseer's mortification is said to have been so great as to have disgusted him in a great measure with his profession itself, but, whether this be so or not, he appears from this time to have engraved comparatively little. The literary tastes however which lecturing and controversy had aroused, he seems to have cultivated. Delighting in controversy, he started an art periodical, which soon died; and one he set on foot long after to counteract the mild influence of the 'Art Journal,' under the title of 'The Probe,' soon shared a like fate. He published likewise, at various times, several pamphlets and letters. In 1817 he communicated to the Society of Antiquaries a paper on 'Engraved Gems brought from Babylon,' which was printed in the 'Archæologia,' vol. xviii. Although possessing little of the requisite learning or mental training for the successful prosecution of such a subject, he continued to follow the game thus started; and after having delivered a course of lectures on 'Engraved Hieroglyphics' at the Royal Institution, he in 1823 published an elaborate volume entitled 'Sabæan Researches.' This was followed in 1834 by a gossipping volume called 'A Descriptive, Explanatory, and Critical Catalogue of the Earliest Pictures in the National Gallery,' which, though of no more value æsthetically than his previous works were archæologically, is yet in its discursiveness a somewhat amusing volume. But it is rather as the father of Edwin Landseer than on his own account that Mr. John Landseer will be remembered; and it is noteworthy that one of his best engravings, the 'Dogs of Mount St. Bernard,' is from one of Edwin Landseer's earliest pictures. Mr. Landseer died on the 29th of February 1852 in his eighty-third year, leaving three sons, all of whom have won an honourable and one a pre-eminent place in the history of English art.

LANESBOROUGH. [LONGFORD.]

LANGHOLM. [DUMFRIESSHIRE.]

LANGPORT. [SOMERSETSHIRE.]

LANTERN-FLY. [FULGORA, *S.* 1.]

LANTHANIUM. [CHEMISTRY, *S.* 1.]

LARCENY. Petty larcenies may now be tried and summarily determined, with the consent of the accused person, by magistrates in petty sessions, the punishment in such cases being limited to six months' imprisonment (10 & 11 Vict. c. 82; 13 & 14 Vict. c. 37; 18 & 19 Vict. c. 126.) Persons confessing such offences may under the last named statute be similarly punished by the same tribunal. (Blackstone's 'Commentaries,' Mr. Kerr's edition, vol. iv. p. 333.)

LARDIZABALACEÆ, *Lardizabalads*, a small natural order of Plants, containing 7 genera and 15 species. The species are twining smooth shrubs with alternate compound leaves, without stipules. Racemes solitary or clustered; flowers coloured white, lilac, purple, or deep yellow, sometimes fragrant. The sepals of the male plant are 3 or 6 in 2 rows, deciduous; petals 6 in 2 rows, opposite the sepals, the inner ones smaller, or gland-like, or absent. Stamens 6, opposite the petals; filaments united into a tube, or even distinct; anthers turned outwards, rarely inwards, 2-celled, opening by a longitudinal slit. The female flowers as before, but larger, with 6 very imperfect stamens. Carpels distinct, 3, rarely 6 or 9, 1-celled, with a short style and a single stigma. Two of the genera inhabit the cooler parts of South America, the remainder are from the temperate parts of China. *Burasaia* is the only tropical form. These plants appear to be harmless. Some of them are eaten by the natives of Japan and India.

LARKSPUR. [DELPHINIUM.]

LARNE, county of Antrim, Ireland, a sea-port town and the seat of a Poor-Law Union, is situated in a sheltered bay near the mouth and on the north shore of Lough Larne, 18 miles N.N.E. from Belfast, in 54° 50′ N. lat., 5° 50′ W. long. The population in 1851 was 2728, besides 346 in public institutions. The town is governed by nine commissioners. Larne Poor-Law Union comprises 13 electoral divisions, with an area of 117,763 acres, and a population in 1851 of 34,710. The town originally sprung up under the protection of Olderfleet Castle, which was erected in the reign of Henry III. upon a little headland close to the town, where its ruins are still seen. In the older parts of the town the streets are narrow and ill-paved, and the houses very inferior; the modern part consists chiefly of one long wide street of well-built houses. The places of worship are the parish church, three Presbyterian meeting-houses, a Roman Catholic chapel, and a Methodist chapel. Cotton-cloth, sail-cloth, ropes, and leather are manufactured; and there are several bleach-mills and flour-mills. The bay forms a good natural harbour for small vessels. Lime is exported in large quantities from the extensive works of Magheramorne adjoining the town. The other exports consist chiefly of provisions. Larne is now a mere out-port of Belfast. Fairs are held on July 31st and December 1st. The town has a dispensary and a petty sessions court.

LATROBITE. [MINERALOGY, *S.* 1.]

LAUDER, Berwickshire, Scotland, a royal and parliamentary burgh in the parish of Lauder, is situated in 55° 42′ N. lat., 2° 45′ W. long., 25½ miles S.E. from Edinburgh. The population of the burgh in 1851 was 1105. The town is governed by a chief magistrate and 17 councillors; and unites with North Berwick, Dunbar, Haddington, and Jedburgh in returning one member to the Imperial Parliament.

There is only one street in the town. The parish church, the town-house and lock-up house, the Free church, and the United Presbyterian church are the public buildings. The burgh possesses an extensive common, which is exclusively used by a small body of privileged burgesses. Close by the town is the residence of the Earl of Lauderdale, Thirlestane Castle, which stands in a spacious park.

LAUDER, SIR THOMAS DICK, Baronet, was born in 1784. He was the seventh baronet, and was the only son of Sir Andrew Lauder, the sixth baronet. He succeeded his father in the baronetcy in 1830. He became a contributor to 'Blackwood's Magazine' at its commencement, and furnished numerous articles to that periodical and others. His first contribution to Blackwood, 'Simon Roy, Gardener at Dumphail,' attracted considerable attention, and was by some ascribed to the author of 'Waverley.' He also published in early life two novels, 'Lochandhu,' and 'The Wolfe of Badenoch.' His paper on 'The Parallel Roads of Glenroy,' which was read before the Royal Society of Edinburgh, and published in vol. ix. of their 'Transactions,' consists of a description of the geological strata of that district of the Highlands of Scotland. In 1830 Sir T. D. Lauder published an interesting 'Account of the Great Floods of August 1829 in the Province of Moray and the adjoining Districts,' 8vo, Edinburgh. In 1837 he published 'Highland Rambles, with Long Tales to shorten the Way,' 2 vols. 8vo, Edinburgh, and in 1841 'Legendary Tales of the Highlands,' 3 vols. 12mo. He also published a 'Tour round the Coasts of Scotland,' and a 'Memorial of the Royal Progress in Scotland' in 1842, 4to, Edinb., 1843. For the 'Edinburgh Tales,' conducted by Mrs. Johnstone, 3 vols. Edinb., 1845-46, he wrote the story of 'Farquharson of Inverey,' and 'Donald Lamont, the Braemar Drover.' Sir Thomas Dick Lauder married in 1808, and had issue two sons and seven daughters. He died May 29, 1848, at his residence, the Grange, near Edinburgh, and was succeeded by his son, Sir John Dick Lauder, who was born in 1813, and married in 1845. Sir T. D. Lauder was deputy lieutenant of the counties of Haddington and Elgin, and a Fellow of the Royal Society.

LAUREL. [Laurus.]

LAURIC or LAUROSTEARIC ACID. [Chemistry, *S.* 2.]

LAVENDULAN. [Mineralogy, *S.* 1.]

LAVENHAM. [Suffolk.]

LAW, CRIMINAL. Upwards of 65,000*l.* has been spent on various commissions, which have been issued during the last thirty years for the consolidation or codification of the criminal law; but that object has not yet been attained, nor have any really practical measures been adopted for such an annual revision of our statutes as would in a few years naturally produce their consolidation, if not a codification of the law itself. It is thought however that the well-grounded impatience of the House of Commons will before long compel the passing of general acts consolidating and so far codifying the criminal law; on this ground it is desirable to abstain from any attempt to enumerate those alterations in details which have been made therein. One or two points only need be referred to. The summary jurisdiction recently conferred on magistrates in petty sessions is noticed under Larceny, *S.* 2; the liability of trustees to prosecution for breach of duty, under the head Trustees, *S.* 2. Great improvements were effected in the procedure of the courts which take cognizance of crimes by the statute 14 & 15 Vict. c. 100, which abolished all technical objections for misnomers or nondescriptions, and invested the judges with ample powers of amendment. Finally, transportation as a punishment to be ordered by the court has been abolished by the statute 20 & 21 Vict. c. 3. *Penal Servitude*, as it is termed, created by statute 16 & 17 Vict. c. 99, has been substituted; but criminals sentenced to long terms of penal servitude continue to be transported as before.

LAW, EDWARD. [Ellenborough, Lord, *S.* 2.]

LAYBACH. [Krain, *S.* 2.]

LEASE. The lease for a year [Lease and Release, 'Penny Cyclopædia,' vol. xiii., p. 378] is no longer used in conveyancing, a statutory recital in the release coming in place of it. (4 & 5 Vict. c. 21.)

LEATHERHEAD. [Surrey.]

LECANORIC ACID. [Chemistry, *S.* 2.]

LECHLADE. [Gloucestershire.]

LEE, REV. SAMUEL, D.D., was born May 14, 1783, at Longnor, a village in Shropshire, about eighteen miles from Shrewsbury. He received the rudiments of education at a charity-school in that village, where at the age of twelve years he was apprenticed to a carpenter and joiner. At the age of seventeen he formed a determination to learn the Latin language, and though he had at first only six shillings a week, and afterwards seven, to subsist on, he contrived to buy rudimentary books and then classical writers, and by the end of his apprenticeship had accomplished his purpose. He then determined to learn the Greek, and this he also accomplished. The Hebrew, Chaldaic, and Syriac languages were next mastered. When in his twenty-fifth year he removed into Worcestershire to superintend on the part of his employer the repairing of a large house, in which however a fire broke out, when he lost all his tools, and was reduced to extreme poverty. In the meantime the Rev. Archdeacon Corbett had heard of his studious habits, saw him at Longnor, lent him books, and assisted him in pronunciation. In the course of a few months he acquired the Arabic and Persian languages, and afterwards a tolerable knowledge of French, German, and Italian. For two or three years previously to 1813 Mr. Lee held the mastership of Bowdler's foundation school in Shrewsbury. In 1813 he left Shrewsbury, and obtained an engagement with the Church Missionary Society. In the same year he entered himself of Queen's College, Cambridge, and in 1817 took his degree of B.A. Having received ordination, he preached in the following year at Shrewsbury a sermon in aid of the funds of the Shropshire Auxiliary Bible Society.

On the 11th of March 1819 Mr. Lee was elected Arabic Professor of the University of Cambridge, but not having been at College the time requisite for taking his degree of M.A. (which was necessary before he took the chair), a grace passed the senate to request the Prince-Regent to grant a mandamus, which was obtained accordingly. In 1822 the University of Halle conferred on him, without solicitation, the degree of D.D. In 1823 he was appointed chaplain to the jail at Cambridge, and in 1825 was presented to the rectory of Bilton with Harrowgate. He took the degree of B.D. in 1827, and in 1831 was elected Regius Professor of Hebrew to the University of Cambridge, and with it obtained the accompanying canonry in the cathedral of Bristol. The degree of D.D. was conferred upon him by the University of Cambridge in 1833. He was afterwards presented to the rectory of Barley in Hertfordshire. He died on the 16th of December, 1852, at Barley rectory. He was twice married.

Among the more important of Dr. Lee's works are the following:—'Hebrew Grammar,' 1830; 'Travels of Ibn Batuta, translated from the Arabic,' 1833; 'The Book of Job, translated from the original Hebrew,' 1837; 'Hebrew, Chaldaic, and English Lexicon,' 1840; 'An Inquiry into the Nature, Progress, and End of Prophecy,' 8vo, Cambridge, 1849; 'The Events and Times of the Visions of Daniel and St. John, investigated, identified, and determined,' 8vo, London, 1851. Besides these works, Dr. Lee published several pamphlets on subjects of religious controversy, sermons, and contributions to periodical literature.

LEE, SOPHIA and HARRIET, were the daughters of John Lee, a performer at Covent Garden Theatre in the last century. Harriet was born in 1756; Sophia was a few years her senior. Soon after their father's death they opened a school at Bath. In this undertaking they acquired a moderate competence, upon which they retired to Clifton, where both died, Sophia on March 13, 1824, and Harriet on August 1, 1851, aged ninety-five. Sophia first appeared in 1780 as author of a comedy, 'The Chapter of Accidents,' which was performed at the Haymarket with considerable success. Her next work was 'The Recess,' which appeared in 1785 in three volumes, one of the first so-called historical novels, a somewhat lachrymose tale of the adventures and calamities of a supposed daughter of Mary of Scotland, by a marriage with the Earl of Leicester, which contains as little of history either in the facts of the tale or in the depicting of the manners of the age, as in any resemblance to the characters of the personages introduced, but which obtained a considerable share of popularity from the attempts at pathos and sentiment with which it is full. In 1787 she published 'The Hermit's Tale,' a poem; in 1796 'Almeyda, Queen of Granada,' a tragedy, which was successfully performed, Mrs. Siddons sustaining the principal character. In 1804 was published in six volumes, a novel entitled 'The Life of a Lover,' which is said to have been her earliest production, the effort of her girlish years, and is certainly one of the weakest of her writings. Her last work was a comedy, performed at Drury Lane Theatre in 1804, called 'Assignation,' which was condemned on the first night, and was never published. Her chief claim to notice, like that of her sister, rests on the 'Canterbury Tales,' of which she furnished two, 'The Young Lady's Tale,' and 'The Clergyman's Tale,' which occupy a volume and a half of the five volumes to which the series extended; and she wrote the introduction to the whole. These tales are certainly superior to her novels, but they are not equal on the whole to those of her sister.

Harriet's first appearance as an author was in 1786, when 'The Errors of Innocence,' a novel in five volumes, was published; this was followed in 1787 by a comedy, 'The New Peerage; or, Our Eyes may deceive us,' 'Clara Lennox,' a novel in two volumes, in 1797, and 'The Mysterious Marriage, or the Heirship of Rosalva,' a play, in 1798: all have been forgotten. The 'Canterbury Tales' were published in successive volumes, the first in 1797, the fifth and last in 1805; they were so immediately popular that second editions of the first two volumes were published in 1799. They consist of twelve tales, of which one, 'The German's Tale—Kruitzner,' furnished Lord Byron with the idea and some of the materials for his tragedy of 'Werner,' and he says of the tale that he had formed a "high estimate of the singular power of mind and conception which it developes." It is undoubtedly the most powerfully interesting of the whole, contains the most definitely drawn characters, and a well-developed plot. Several of the other tales however show a considerable knowledge of the human mind, are unexceptionably moral, generally pleasing, and are narrated in a simple and unaffected style.

LEERSIA, a genus of Grasses belonging to the tribe *Oryzeæ*. It has 2 paleæ compressed, keeled, and awnless, the lower one much broader; stigmas protruding from the side of the florets; nut inclosed in the paleæ.

L. oryzoides has a patent panicle with wavy branches, spikelets triandrous, half oval, ciliated on the back. It is a creeping plant with a stem one to two feet high, never procumbent, and rooting at the joints. The leaves are broad and rough-edged, the uppermost horizontal at the flowering season; panicle rarely, if ever, protruded in this country, mostly inclosed in the sheath of the uppermost leaf. It is found in marsh ditches in Sussex and Hampshire.

LEEWARD ISLANDS. The British Leeward Islands, in the West Indies, form a distinct government, which includes the islands of Antigua, St. Christopher's, Anguilla, Montserrat, the Virgin Islands, Nevis, and Dominica.

LEIGH. [LANCASHIRE.]

LEIOCOME. [CHEMISTRY, *S.* 2.]

LEIXLIP, county of Kildare, Ireland, a small town finely situated at the junction of the Rye with the Liffey, 11 miles W. from Dublin, by road and railway from Dublin to Galway: population, 832. It consists of a single street. The parish church is in the pointed gothic style. The Roman Catholics have a chapel. The Liffey is here crossed by a bridge. Above the town is Leixlip castle, built by Adam de Hereford, one of Strongbow's followers. A little way beyond the castle, the Liffey forms a fine cascade, called the Salmon Leap. The town is a place of resort on account of the beautiful scenery near it. Fairs are held in May, July, and October.

LE KEUX, JOHN, architectural engraver, was born in 1784, in Sun-street, Bishopsgate, London, where his father was a manufacturer of pewter; and to him the youth was in the first instance apprenticed, but disliking the business, he was at the age of seventeen transferred as a pupil to Mr. James Basire, an eminent architectural engraver, and remained with him four years. Le Keux formed for himself, however, a true and bolder style than that of his master, and eventually in the engraving of gothic architecture attained an excellence equalled by few in the profession. Indeed, it would not be too much to say that gothic architecture was for the first time thoroughly well engraved in this country by him; and that his engravings did much to render the study of gothic architecture popular. He possessed a very considerable acquaintance with both the general principles and the details of gothic architecture, and consequently his engravings displayed, not only minute correctness, but that 'feeling,' as artists term it, which is always an evidence that the work is executed as a matter of enjoyment, and not merely as a task. Le Keux was in fact an artist and not a mechanic, and even the admirable architectural drawings of Mackenzie lost nothing in fidelity, and sometimes, perhaps, gained a little in spirit, under the rendering of Le Keux's burin. The first important work we believe on which Le Keux was engaged was 'Britton's Architectural Antiquities of England,' and he also engraved much of 'Britton's Cathedral Antiquities,' and other of Mr. Britton's works; the elder Pugin's 'Architectural Antiquities of Normandy,' 'Gothic Examples,' and 'Gothic Specimens;' Neale's 'Westminster Abbey,' and 'Churches' (vol. i.); 'The Oxford Almanacs;' and lately the 'Memorials of Oxford,' and 'Memorials of Cambridge,' both of which were projected by himself and executed with much elegance, though of course from their smaller size with somewhat less freedom than his larger works. Mr. Le Keux died April 2, 1846. His eldest son, J. H. Le Keux, has a high reputation as an architectural engraver.

LENTIL. [VICIEÆ.]

LENZINITE [MINERALOGY, *S.* 1.]

LEO. [LION.]

LEONHARDITE. [MINERALOGY, *S.* 1.]

LEPIDOGASTER, a genus of fishes belonging to the Subbrachial *Malacopterygii*, and to the family *Cyclopteridæ*, or *Discoboli*. [DISCOBOLI, *S.* 1.] The genus *Lepidogaster* is distinguished by its smooth body without scales; dorsal and anal fins opposite and near the tail; pectoral fins large, descending to the inferior surface of the body, and by an extension of the membrane surrounding an oval disc; ventral fins united by a membrane which extends circularly under the belly, forming a second concave disc.

L. Cornubiensis, the Cornish Sucker, Jura Sucker, and Ocellated Sucker, *Cyclopterus Lepidogaster* of Pennant and *L. biciliatus* of Risso, is occasionally seen on the Cornish coasts, and has been taken on the coasts of Antrim and Clare in Ireland. This fish is small, a specimen described by Mr. Couch not being more than two inches and a half in length. It adheres with its sucker to almost any substance presented to it, and even to the human hand. The general tint of this fish is a pale flesh-colour, with spots and patches of carmine about the upper and under surface of the jaws, around the eyes, on the top of the head, sides of the body, and abdomen.

L. bimaculatus, the Bimaculated Sucker, is a second British species. This fish is rarer than the last. It has been taken on the southern coasts of Great Britain. It seldom exceeds three-quarters of an inch to an inch in length. Its general colour is a carmine red; pale flesh-colour underneath, with a light-coloured patch between the eyes, and otherwise liable to some variation in the markings; the two spots on the sides not always very obvious. It lives in deeper water than the last species.

LEPIDOLEPRUS, a genus of Fishes belonging to the family *Gadidæ*. It is closely related to the genus *Morrhua*, to which the Common Cod belongs. The suborbitals are united with the nasal bone, and form a depressed muzzle, advancing before the mouth, which however retains its mobility. The head and body have hard spinous scales; the ventrals are a little on the throat; the pectoral of mean size; the first dorsal high; the second dorsal, anal, and caudal united; the jaws short; the teeth fine and short. The species inhabit deep water, and utter a grumbling noise when taken out of the water. Two species are known. They inhabit the Mediterranean and Atlantic.

LEPIDOLITE. [MICA, *S.* 2.]

LEPIDOMELANE. [MICA, *S.* 2.]

LEPIDOSTROBI. Detached petrified cones which are scattered through the various strata of the Coal Formation have been thus named. They are obviously organs of fructification, and have therefore belonged to some of the arborescent plants whose remains they accompany. Such of them as are preserved in the nodules of iron-stone, or are otherwise mineralised without pressure, alone offer the means of ascertaining to what existing families of plants they are most nearly allied; for in those that are crushed flat in the shales the internal structure is wholly destroyed. Many of the better-preserved specimens have been sliced, polished, and examined with the greatest care; but this expensive operation has hitherto thrown little light upon the true nature of the objects investigated. This is owing to the fact that the three conditions necessary for their complete illustration have never been displayed by one specimen, but the most important point, the nature of the organs of fructification, has hitherto wholly escaped observation in all. Every one being an aggregation of organs of some kind, it becomes necessary to ascertain, not only the arrangement of these organs, but the nature of the tissues composing them, and their contents, before satisfactory conclusions can be drawn as to their relationship to any of the vegetable remains they accompany, or to whatever existing order of plants they are allied. The three necessary conditions are these:—

1. The arrangement of the individual organs of fructification, of which the cone is an aggregation, and the nature of the scales supporting them. These are characters sometimes displayed on the fracture of the specimen by ordinary means, though rarely, from the parts appearing to have suffered partial decay previous to or during petrifaction. The imbricating apices of the scales, which lie over one another like those of a pine cone, are generally removed with the matrix wherein the fossil is embedded.

2. The tissues, or anatomical structure of the various organs composing the cone: namely, of the central axis, which is a continuation of the stem of the plant; of the scales, which being inserted into the axis support the individual male or female organs; and of the latter themselves. These tissues can only be displayed by slicing fossils in the very best state of preservation, and in such as are changed into a more or less transparent mineral. Specimens of this description are exceedingly rare.

3. The two preceding considerations are secondary to the remaining one—the nature of the contents of the cones. There may be stamens or male organs—ovaria or female ones—or, lastly, capsules containing reproductive spores (which are peculiar to plants having no sexual system); for these three kinds of organs all occur arranged in the form of cones, undistinguishable from one another by any external marks. Up to the present time no carboniferous fossil cone has ever been known to supply this great desideratum, without which we can arrive at no exact conclusion as to whether these curious objects are clusters of flowers or fruits, or are the spore-bearing organs of flowerless vegetables, as mentioned above.

Specimens of *Lepidostrobi* are mostly found in seams or nodules of clay iron-stone, and are very highly mineralised, sometimes containing crystals of iron, and the cavities in their substance being filled with white carbonate of lime and magnesia. Those which are most complete always form the nuclei to nodules of clay iron-stone; others again, including all in which the spores are preserved, have occurred as broken frustules within stems of *Lepidodendron elegans* and other species of that genus. Usually the fragments of *Lepidostrobi* are not more than half an inch long, and very frequently are mere discs; so that though there is often the appearance of one several inches long, and traversing the whole length of the fragment of *Lepidodendron*, it will generally be found that this is owing to two being placed each at an extremity of the truncheon, and opposite to one another. [See Figure, COAL PLANTS.] That all were exceedingly brittle cannot be doubted, for no modern cone of any natural order could be broken up into the shallow discs which many of these fossils present. It is difficult to account for the presence of these fragments of *Lepidostrobi* in the stems of *Lepidodendron;* we can but conjecture that the trunks of the latter were erect stumps, whose interior was hollowed out by decay—that these stumps were covered with water in which were fragments of *Lepidostrobi* and other vegetable matter, which were thus washed into the stumps. This supposition is founded on the following considerations:—

1. The stumps of *Lepidodendron* appear to have been rooted and erect, and to have received the cone fragments into their cavity as fern fronds find their way into the axis of *Sigillariæ.* Were the stumps mere prostrate portions of stems it is evident that cones would have lain horizontally in them, and that no washing or drifting could have induced the fragments of these cones to lie with their axes parallel to them, or could have introduced so many into one trunk; and the latter would certainly have been materially compressed had they received on one side the pressure of the superincumbent shales.

2. The stumps must have been submerged, and the fragments quietly deposited from the water. Had the cones falleo from an overhanging forest they would have alighted in all manner of irregular positions, and in some cases overlain one another, which is never the case.

3. The deposit appears to have been effected by the gradual subsidence of the water, and not by a sudden rush or current. This again is proved by the non-interference of the cones, and their uniformly vertical position with respect to the *Lepidodendron.*

It is hard to account for the accession of so large a volume of water as would submerge these stumps and deposit these fragments, and yet exhibit no signs of drifting in its course. The sudden fall of a tropical torrent of rain on a *Lepidodendron* forest, in which were hollow stumps of these trees, must at once suggest itself. This would both carry down the *Lepidostrobi* from the trees and float up the fragments on the ground, depositing them together in the stumps. Another effect of such a fall would be to break down some of the older trees whose decaying stumps would be prepared to inclose other *Lepidostrobi* on the precipitation of the next similar torrent.

The extreme fragility of the *Lepidostrobi* displayed by these specimens is very satisfactory, as the Lepidodendrons, of which they are the fruit, no doubt partook of this character, which is eminently favourable to a rapid decomposition and intimate union with the silt or mud which is the basis of the clay-ironstone in the one case, and the formation of a homogeneous bed of vegetable matter, such as the coal presents, in another. The extraordinary abundance of the fragments too suggests a most vigorous vegetation, for they must indeed have been profusely scattered to be deposited in such numbers within narrow cylinders into which no current appears to have been directed.

It is worthy of remark that no fern-leaves are contained in any of these *Lepidodendron* stems; and their absence is the more singular from their being commonly deposited along with branches of *Calamites*, &c., in the erect stumps of *Sigillaria* resting on the coal-shales. This is no doubt connected with the well-known fact of the *Sigillaria* stumps being filled with sandstone, or the same materials as those composing the stratum above the shales they root into; whilst the fossil *Lepidodendron* of the clay-iron-stone seams is of the same mineral as that wherein it is embedded. Were the fragments of *Lepidostrobi* washed into their inclosing stumps by any current, that agent would in all probability have transported the remains of other plants to the same spot. The perfect preservation in which these fragments occur must be attributed to the protection afforded them by the surrounding *Lepidodendron* bark. That the circumference of the latter has been subjected to pressure may be inferred from the flattening of the prominences to which the leaves were attached. This pressure was moreover very considerable, as may be proved by comparing the evenness of their surface with that of a piece of *Lepidodendron* bark fossilised without pressure, and imbedded within the stem along with the *Lepidostrobi.*

If these cones be examined with reference to the known contemporaneous fossils which accompany them, it will appear impossible to deny their having the reproductive organs of *Lepidodendron*, not only from their association with the fragments of that genus, because the arrangement of the tissue in the axis of the cone entirely accords with that of the stem of *Lepidodendron.* Just as we find in modern cones of *Lycopodiaceæ* and *Coniferæ* that the axis is a continuation of the branch, which bears leaves modified into organs adapted to support and protect the parts of fructification. The most positive evidence that can be adduced of *Lepidostrobi* belonging to a genus allied to *Lycopodium* is afforded by the spores, the presence of which not only removes them from *Cycadeæ*, *Coniferæ*, or any other order of flowering plants, but directly refers them to the family of *Lycopodiaceæ.* It is well known to botanists not only that cones are far from being peculiar to one natural order of plants, but that their extreme form is no indication either of their contents or of the affinities of the plants which produced them. Accordingly we find that Dr. Lindley, the first English observer who published any extended views on the affinities of these plants, suggests the probability of their being referrible either to *Coniferæ*, *Lycopodiaceæ*, or more probably still to *Cycadeæ.* Dr. Hooker, after describing the nature of spurious cones which have no relation to the reproductive organs of the plant, as in the common cone-bearing willow, the larch, &c., and those produced by the puncture of an insect, as in a genus inhabiting Tierra del Fuego, where a cone is formed by this means from a leaf, says:—"Some of the so-called *Lepidostrobi* may be of this nature: witness the *Lepidodendron oöcephalum*, of which it is impossible to say whether it be a *Lepidostrobus* or the apex of a branch crowded with short leaves. Were the Fuegian plant to occur in a fossil state the probability is, that its cones would be regarded as undoubted reproductive organs, and the plants themselves be referred to *Coniferæ.*"

(Hooker, *On the Structure and Affinities of Lepidostrobi*, in *Transactions of Geological Survey of Great Britain.*)

LEPTURUS, a genus of Grasses having solitary spikelets, imbedded alternately on opposite sides of the rachis of 1 flower and a superior rudiment. Glumes 1 or 2 opposite to the rachis, cartilaginous, covering the flower. Paleæ scarious. Stigmas feathery.

L. incurvatus has a cylindrical subulate spike; 2 glumes equalling or slightly longer than the flowers; stem from 2 to 6 inches long: spike long, curved when dry. In a variety of this species, *L. filiformis*, the spikes are much more slender, filiform, scarcely at all curved. It grows in sandy salt-marshes.

LERNÆA. [SUCTORIAL CRUSTACEANS.] The following is Dr. Baird's arrangement of the British species of the *Lernæadæ*, or Lernæans:—

Tribe I.—*Anchorastomacea.*

Females.—Attached to their prey by means of their foot-jaws, which are stout and armed with strong hooks. One pair of antennæ; generally very distinct. Thoracic feet nearly rudimentary, or represented by appendages of considerable size, but differing in form from ordinary feet.

Males.—Free and unattached; very small, and differing totally in appearance from the females.

Family *Chondracanthidæ*.

Organs representing thoracic feet, in form of considerable-sized, cartilaginous-looking, not articulated appendages; generally three pairs in number. Three pairs of foot-jaws.

Genus 1.—*Chondracanthus*.

Two pairs of foot-jaws prehensile, the third nearly rudimentary. Appendages of thorax representing the feet, in form of digitated, but not articulated, and not setiferous lobes or tubercles. Oviferous tubes very short, broad, and flattened.

C. Zei. Body short, and rather thick. Head rounded; antennæ short, and rather broad; neck narrow, short. Thorax carrying on the under surface two pairs of small appendages, each consisting of three divisions or fingers, and furnished laterally with three pairs of longer prolongations, of many divisions, the terminal one on each side larger than the others, and embracing the oviferous sacs; the upper part of the thorax is covered with short, conical, sharp-pointed spines. Abdomen rudimentary. Oviferous sacs flattened, containing many small ova.

It is found adhering to the gills of the *Zeus faber*.

Genus 2.—*Lernentoma*.

Foot-jaws and thoracic appendages as in *Chondracanthus*. Oviferous tubes long, either club-shaped and stout or slender and twisting.

1. *L. cornuta*. Female:—Head oval, rather elongated; antennæ flattened, of considerable size, and projecting. Thorax elongated, club-shaped; anterior portion narrow for about a third of its length, the other two-thirds much broader, and terminating posteriorly in two sharp lateral tubercles of moderate length, and a middle one representing the abdomen, which is nearly quite rudimentary. Two pairs only of thoracic appendages are visible, occurring at the upper portion of the narrow part, each divided into two digitations, and situated at a short distance from each other. The oviferous sacs are of considerable size, cylindrical, and about two-thirds the length of the body. Length nearly 3 lines.

Male:—Somewhat pyriform in shape. Head very large, swollen. Thorax conical, divided into five segments, and terminated by a rudimentary abdomen armed with two small hooks. Antennæ slender, setaceous, projecting from the anterior extremity of the head, and underneath them a pair of hook-shaped foot-jaws. Mouth situated far back, and provided with mandibles; and behind the mouth two other pairs of foot-jaws are visible. Following these we observe two pairs of setiferous tubercles representing the feet. Length, a quarter of a line.

It is found on the branchiæ of a sole.

2. *L. asellina*. Female:—Body somewhat square-shaped. Head small, and situated at the end of a long and slender neck; it is rounded at the anterior extremity, and a little below the antennæ exhibits on each side a round lobe or tubercle. The antennæ and foot-jaws are very small. The neck nearly equals in length the rest of the body. The thorax is broad, and of a somewhat quadrangular shape, with a deep indentation on each side about the middle of its length. On the upper half we see two pairs of prolongations or appendages, each divided into three digitations; and on the lower half there are three smaller appendages, but simple, not digitated. The posterior angles of the thorax are prolonged also into short horns or appendages, which are also simple. The abdomen is in form of a short tubercle, with a rounded blunt point. The oviferous sacs are of about the length of the whole animal, of considerable size, and cylindrical.

The male is similar, according to Milne-Edwards, to that of *Chondracanthus* (*Lernentoma*) *cornutus*.

It is found attached to the branchiæ of the *Triglæ*.

3. *L. Lophii*. Female:—Body rather elongate, and somewhat gibbous. Head small, having on each side a small horn-shaped appendage directed a little obliquely backwards. Antennæ small, conical, and slightly curved. Thorax divided into four portions by as many contractions. The first narrow like a neck, having on the upper portion a short spine, and on the under surface a pair of appendages or prolongations of two divisions or digitations; the second is somewhat quadrilateral, with on the middle line of the back two conical tubercles and on the sides two others, the upper pair the longer, and having on the under surface a pair of appendages of two digitations; the third part is larger than the preceding, and has the same tubercles and prolongations, and in addition a small spine on the superior portion, and in the mesial line of the under surface; the fourth portion is rather the largest, with two horns or tubercles on the upper surface, a third on the median line of the under surface, and on each side a long terminal prolongation, rather blunt. Abdomen in form of a short tubercle in the centre of the posterior part of the thorax. Oviferous tubes very long, slender, and twisted. Length, 6½ lines; breadth 2½ lines.

The male is very similar to that of the *Chondracanthus cornutus* already described.

It is found on the *Lophius piscatorius*, in the pouches.

Tribe II.—*Anchoracarpacea*.

Attached to their prey by means of two long appendages which arise from the thorax. They unite together either at the base or near the tip only, and terminate there in a rounded knob like a button, by means of which the animal maintains its hold of the part to which it has attached itself. No thoracic feet, or they are represented by these arm-shaped appendages.

Males in general differ very much in appearance from the females, being greatly smaller and unattached.

Family I.—*Lerneopodadæ*.

Arm-shaped appendages long, wide apart from each other at their base, and united only at the tip.

Genus *Lerneopoda*.

Female.—Body generally elongated, oval. Head short and thick. Two pairs of foot-jaws, well-developed, and placed near each other. External ovaries of moderate length and cylindrical.

Male.—Body divided into two nearly equal portions of an ovoid shape; one representing the head, the other the thorax. Much smaller than the female.

1. *L. elongata*. The head is very distinct, of a horny texture, ovate, depressed, broad at the base, and obtusely pointed in front, resembling very much the shape of the body of the common Spider-Crab. The second pair of foot-jaws is large and well developed, consisting of a large rounded oval basal joint, and a more slender curved hooked terminal one, with a pretty strong tooth on its inner edge. The head is united to the body by a short narrow neck; the thorax is long and narrow, of a somewhat club-shaped form, and gives origin to two long cylindrical arms, which considerably exceed the length of the body. At the posterior portion, which is somewhat truncate, we see two small lobes; and on each side of these spring the ovaries, which are about the length of the entire body, thick, straight, and cylindrical.

Length of the whole animal nearly 3 inches. Head, one line and three-quarters. Body, 7½ lines. Arms, one inch and one line. Ovaries, one inch and one line and a half.

A specimen of this arctic species was found attached to the eye of a shark caught on the English coast, and brought to London in the winter of 1848.

2. *L. galei*. Female:—The head is oval, depressed, and of a hard horny substance; the thorax is long, rather slender, and somewhat cylindrical, narrow where it is attached to the head, and broadest at its posterior extremity. The arms are slender, and nearly the length of the thorax. At the posterior extremity of the body are two small lobes, between which, on the middle line, is a small tubercle representing the abdomen. Ovarian tubes of moderate length, not quite equal to the length of the thorax.

Length of the whole body, including arms, about three-fourths of an inch.

Male:—Body divided into two portions, of an ovoid form, and nearly of equal size; the upper half represents the head, and carries a pair of antennæ, and two pairs of foot-jaws of considerable magnitude; the lower half, representing the thorax, has at its posterior extremity two sub-globular appendages a little longer than those in the female.

The female was found attached to the cavity posterior to the vent of the *Squalus galeus*.

3. *L. Salmonea*. Linnæus's description of this species, as

far as it goes, is very good :—"Body ovate ; thorax obcordate ; the two arms linear, approximated." The head is rather small, somewhat bulging out at the back part, broader there, and rather sharp-pointed at the anterior extremity. From the base of the head spring the two arms, which are rounded, and slightly shorter than the body. The thorax is pyriform and short, and at its lower extremity we see two minute eminences. The ovarian tubes are of considerable thickness, cylindrical, and about the same length as the whole animal.

The colour of the animal is white. Length about half an inch.

It is found in the gills of the Salmon, in the London markets.

Family II.—*Anchorelladæ*.

Arm-shaped appendages very short, and united to each other from the base, so as to resemble a single organ.

Genus *Anchorella*.

Female :—Body in general short, and somewhat swollen. Head small, and situated at the extremity of a long neck, which is generally curved backwards. Two pairs of foot-jaws well developed, and a third rudimentary. Antennæ rudimentary. Ovarian tubes of moderate length, and cylindrical.

The male differs in appearance very much from the female, and is very small.

1. *A. uncinata.* Female :—The body of the animal is thick, oblong, of a milk-white colour, smooth, and opaque. Head very small, situated at the extremity of a long slender neck, which has a wrinkled appearance, and is nearly the length of the thorax. The arms spring from the upper portion of the thorax, and are rather short, terminating in a rounded knob or button. At the posterior portion of the thorax there is on the middle line a small protuberance representing the abdomen. The ovarian tubes are cylindrical, straight, smooth, and about the length of the body. Length from 6 to 8 lines.

Male :—Body globular, terminated in front by a small conical eminence, at the extremity of which is the mouth, and having at its base one pair of rudimentary appendages, and a pair of rudimentary foot-jaws. On the middle of the body, on the inferior surface, there are two pairs of large hooked claw-like members. Length, one-fourth of a line.

The female fixes itself to the fins and gill-covers of the Cod and Haddock, and is most probably the most common species of our seas. (Johnston.)

2. *A. rugosa.* Body nearly of a square shape, a little emarginated on each side. Head small ; neck slender, and nearly cylindrical. A rounded tubercle on the middle line represents the abdomen. Ovaries rather larger than the thorax, nearly cylindrical, or slightly club-shaped. Length, about 3 lines.

Found in the mouth of the *Gadus callarius.*

Tribe III.—*Anchoracerace*a.

Females :—Attached to their prey by the anterior extremity of their body only, thrusting the entire head into the tissues of the animal to which they adhere, and being retained there by means of a kind of horns, which are various in form, and spring from the posterior part of the head. No antennæ. Only one pair of foot-jaws, which is simple and hooked. Feet either very small or often wanting altogether.

Males :—Very small. Body globular, and more imperfect than in the preceding tribes, having no distinct thorax, and no rudiments of feet behind the appendages which represent the foot-jaws.

Family I.—*Penelladæ*.

Several pairs of feet situated on the under surface of the body near the head, but very small and rudimentary.

Genus *Lernconema*.

Body long, slender, narrowed anteriorly in the form of a neck, which is terminated by a swollen head furnished with two or three simple curved horn-shaped appendages. Abdominal portion of the body of inconsiderable length, and simple. Oviferous tubes long and slender.

1. ***L. spratta***, the Eye-Sucker. Body slender, considerably larger at the posterior extremity. Head of tolerable size, rounded, and provided with two narrow rather hooked horns at its back part, directed backwards. The head is connected to the body by means of a long and very slender cylindrical neck, which is furnished with about a dozen constrictions, which make this part of the body appear as if it were beset with an equal number of rings or knobs.

A short distance beneath the head it is very narrow, gradually increasing in size as it joins the body. Abdominal portion small, blunt, and obliquely truncate. The ovarian tubes are very long and slender, about as long again as the whole body of the animal. Length of the body about an inch ; ovaries one inch and a half.

It is found attached to the eyes of Sprats.

2. *L. encrasicoli.* Body cylindrical, shorter than the preceding, and about the same size at both extremities. The neck is long and slender, quite smooth, and destitute of the constrictions which mark so decidedly the preceding species. The neck is white, and the body is of a brown horny colour.

The abdomen is like that of the preceding, and the ovarian tubes are long and slender, at least twice the length of the body. Turton describes the ovaries as "clear white." Perhaps they may be so in the living animal, but in the specimens preserved in spirits they are of exactly the same colour as the body. In one specimen however one of the tubes is broken, and the ova have escaped, and in this the tube is white. Length of the body about half an inch ; ovaries fully one inch.

It is found attached to the bodies of the *Clupea encrasicolus* and *C. sprattus.*

Family II.—*Lerneoceradæ*.

No vestiges of feet on under surface of body, nor any appendages representing them.

Genus 1.—*Lerneocera*.

Body long and slender ; head furnished with horn-shaped appendages, which are simple and symmetrical in form. Ovarian tubes straight, and of moderate length. Abdomen very small.

L. cyprinacea. Head furnished with four horn-shaped appendages, which are somewhat long and slender. The two outer or posterior are bifurcated ; the anterior simple.

The thorax is very slender anteriorly, forming a long neck, but becomes much broader posteriorly, and when it terminates in the small abdomen appears obliquely truncate. The oviferous tubes are cylindrical, and rather long. The length of the whole animal is about 8 lines.

It is found on the sides of the Carp, Bream, and Roach, in many of our ponds and rivers, in great abundance.

Genus 2.—*Lernea*.

Body more or less twisted, and outré in appearance. Head furnished with horn-shaped appendages, which are irregularly branched. Ovarian tubes twisted into round masses, and placed under the posterior portion of the body. Abdomen of considerable size.

The genus *Lernea* is now restricted within very small limits. Established by Linnæus upon the *L. branchialis*, it is at the present day confined to that species and one or two others.

L. branchialis. Head rounded, and furnished with three horn-shaped appendages, each of which is divided at the tip into three short branches.

The anterior portion of the thorax is long, cylindrical, and very slender, like a long narrow neck, while the body itself is very much swollen in the middle, and abruptly twisted upon itself in the form of the letter S.

The abdominal portion of the body is long, blunt at the extremity, and of considerable size. The ovarian tubes are slender and very much twisted.

The whole animal is about an inch and a half in length, and is of a very firm consistence, being hard and horny.

It is found on the gills of the Cod.

(Baird, *History of British Entomostraca ;* Milne-Edwards, *Histoire Naturelle des Crustacés.*)

LERWICK. [Shetland.]

LETTERKENNY, county of Donegal, Ireland, a market and post-town, and the seat of a Poor-Law Union, is situated on the side of a steep hill above the left bank of the Swilly, at about a mile above its entrance into Lough Swilly, in 54° 57′ N. lat., 7° 44′ W. long., 15 miles N.W. from Lifford, 140 miles N.N.W. from Dublin. In 1851 the population was 1947, besides 233 inmates of the workhouse. The Poor-Law Union contains 14 electoral divisions, with an area of

101,207 acres and a population of 20,665 in 1851. The town of Letterkenny consists principally of one long straggling street, which however contains some good retail shops. The chief buildings are the parish church, a Roman Catholic chapel, three chapels for Presbyterians, a court-house, fever-hospital, and the Union workhouse. There are also a dispensary, a bridewell, and a loan-fund. Quarter and petty sessions are held in the town, which is the head-quarters of the county police. The creek of Ballyraine, called the Port of Letterkenny, is a mile distant from the town, and admits vessels of 150 tons. The exports are chiefly corn, butter, eggs, and hides; the imports consist of colonial produce, manufactured goods, iron, coal, oak-bark, fish, &c. The scenery of Glen-Swilly above Letterkenny, and of Lough Swilly below, presents much picturesque beauty.

LEUCHTENBERGITE. [MINERALOGY, *S.* 1.]

LEUCIC ACID. [CHEMISTRY, *S.* 2.]

LEUCINE. [CHEMISTRY, *S.* 2.]

LEUCO'JUM, a genus of Plants belonging to the natural order *Amaryllidaceæ*. It has a 6-parted perianth, bell-shaped; the segments all equal, and thickened at their points; the stamens equal.

L. æstivum, the Summer Snow-Flake, has a many-flowered spathe; a style thickened upwards. The height is from 2 to 2½ feet. The flowers are white and drooping; the tips greenish. Leaves broadly linear, keeled; scape 2-edged; spathe usually as long as the flowers. It is found in wet meadows in Great Britain.

LEUCOLINE. [CHEMISTRY, *S.* 2.]

LEUCOPHANE. [MINERALOGY, *S.* 1.]

LEYBOURN, or LEYBURN. [YORKSHIRE.]

LIBERIA, Republic of, occupies a considerable extent of the West Coast of Africa. Liberia was originally confined to the tract of country lying west of the Grain Coast, of which the town of Monrovia on Cape Mesurado is the centre; but the republic, though its limits are not accurately defined, now, we believe, claims the entire coast (including the whole of the Grain Coast) from the Cavally River east of Cape Palmas, 4° 20′ N. lat., 7° 30′ W. long., to the Sherboro River, opposite Sherboro Island, 7° 23′ N. lat., 12° 31′ W. long., bordering on the colony of Sierra Leone: a length of about 450 miles, with a breadth at present ranging from 20 to 50 miles, but the settlers are gradually extending farther into the interior. The area may be about 17,000 square miles. We find some difficulty in stating the population. In a semi-official statement published in 1848 by the American Colonisation Society, in which the extent of the territory is made nearly as wide as that given above, the population is said to consist of 4200 colonists (including 700 in Maryland-in-Liberia) and "from 10,000 to 15,000 natives;" while in some popular works recently published in this country we find the colonists variously estimated at from 6000 to 10,000, and the natives at 250,000 to above 300,000. This no doubt is a great exaggeration; and we think the population, including the additions by immigration and extension of territory, cannot exceed 7000 colonists and 50,000 natives: perhaps the native tribes in the interior with whom the Liberians have entered into treaty may number 150,000 to 200,000, but they are not inhabitants of Liberia.

Liberia owes its origin to the efforts of the American Colonisation Society, founded in 1816, for the colonisation of the free coloured people of the United States. The first settlement was made on Sherboro Island, off the coast of West Africa, opposite the present western boundary of Liberia; but several of the settlers having died, and the others experienced much suffering, the settlement was abandoned, and the settlers removed to Sierra Leone. A second party was however sent out, who established themselves, early in 1822, on the site of the present town of Monrovia, on Cape Mesurado, 6° 19′ N. lat., 10° 46′ W. long. At first the settlers encountered many difficulties, owing to the unfriendly disposition of the native tribes; but after a time, as they increased in numbers and were more abundantly provided with fire-arms and some pieces of artillery, they were able not only to keep the natives in check, but to act on the offensive, and to drive them into the interior, or subject them to their authority. In about a dozen years the colony had become sufficiently numerous and energetic to seek the privileges of self-government. In 1839 a constitution was framed and a governor appointed by the Colonisation Society to carry out its provisions. The new constitution appears to have worked very well in home matters, but difficulties occurred in enforcing the laws on foreign traders; and the English government, which had displayed the friendliest feeling and rendered important assistance to the infant community, announced that it could not recognise the right of the Liberian authorities—the colony being neither an independent state nor an acknowledged dependency of the United States—to impose duties on goods imported into the country by British subjects. The Liberian council forwarded a resolution to the Colonisation Society, importing that the existence of the colony was dependent on its possession of complete political jurisdiction: and the Society replied by a resolution admitting that the time had come for the "commonwealth of Liberia to take into their own hands the whole work of self-government, including the management of all their foreign relations." Accordingly, the question was put to the vote of the people whether the settlement should declare itself an independent state, and carried in the affirmative. A convention was then appointed to draw up a constitution, and on the 24th of August, 1847, the flag of the 'Independent Republic of Liberia' was hoisted with much ceremony. The chief events in the history of the settlement have been the numerous encounters with the natives, and since its independence the visits of the president to England and America with a view to the arranging of certain treaties. The republic was recognised by England as an independent state soon after its declaration of independence, and has since been recognised by France, Prussia, Brazil, and some other powers, but not by the United States.

The coast of Liberia has a general direction north-west and south-east, and is broken by several inlets and coves, of which those formed by Cape Mount, Cape Mesurado, and Bassa Cove are of much value as harbours. The greater part of the coast is low and sandy, or marshy; but about Cape Mesurado and Cape Mount (which is 1060 feet above the sea) the shore is considerably elevated. Between those points however there is a low continuous beach of light brown sand, backed by an unbroken tract of forest. Towards the south-eastern extremity the coast is in many parts bold and rocky, the cliffs in many places being from 40 to 60 feet above the sea, with large irregular blocks of granite on the beach, over which the sea breaks heavily, and many rocks lie a short distance off the shore; but between the higher parts everywhere occur long stretches of low sandy beach, in many places bordered by sand-banks: so that nearly all along the coast it is necessary for the mariner to keep a sharp look-out.

From the coast the land rises for the most part gradually towards the interior. About 20 or 30 miles from the shore is a succession of hills covered, like a large part of the lower country, with forests, rising farther inland into mountain ridges, and divided by wide and fertile valleys. The rivers are numerous, and some of them are good-sized streams; but all have their mouths obstructed, and some entirely closed, by sand-bars; and, owing to the prevalence of rapids, none appear to be navigable far inland. The chief river is the St. Paul, which falls into the sea by Cape Mesurado. The sand-banks at its mouth leave only a narrow channel for boats, with 7 feet of water in it at low-tide. It is half a mile wide 40 miles from its mouth, has a considerable body of water, flows through an extremely fertile valley, and has along its banks numerous native villages as well as settlements of the Liberians; but its course is greatly obstructed by rapids; boats of light draught can only ascend it for about 25 miles. The other most important streams are the St. John, which falls into the sea at Bassa Cove; the Junk, which lies between the St. Paul and St. John, and has a very narrow channel through the bar at its mouth; the Cape Mount River, which falls into the sea at Cape Mount, and has its entrance almost closed by a narrow spit of sand; the Grand Cestos, some distance eastward; and the Droo, still farther east, which has about 6 feet of water over its bar, deepening inside to 4 fathoms.

The climate is hot and oppressive. During the dry season, which lasts from May to November, the temperature averages 85°; but in the wet season it falls to 75° or 74°. The extreme heat is alleviated by gentle breezes, which blow daily from the sea. To whites, whether natives of Europe or America, the climate is very prejudicial; but the negro colonists, though the descendants of families long settled in America, experience no inconvenience from it after they have passed through the 'seasoning,' or 'acclimatising fever,' which visits all the newly-arrived alike, but is now comparatively seldom fatal in its attacks. Nothing like an epidemic has ever appeared in Liberia.

The following brief extract from an 'Address of the Citizens of Liberia to the Free Coloured People of the United States" 1847, may serve, with allowance for a little heightening in the colouring, to convey a tolerably clear idea of the character and capabilities of the country :—

"A more fertile soil, and a more productive country, so far as it is cultivated, there is not, we believe, on the face of the earth. Its hills and its plains are covered with a verdure which never fades; the productions of nature keep on in their growth through all seasons of the year. Even the natives of the country, almost without farming tools, without skill, and with very little labour, make more grain and vegetables than they can consume, and often more than they can sell. Cattle, swine, fowl, ducks, goats, and sheep thrive without feeding, requiring no care but to keep them from straying. Cotton, coffee, indigo, and the sugar-cane are all the spontaneous growth of our forests, and may be cultivated at pleasure, to any extent, by such as are disposed. The same may be said of rice, Indian corn, Guinea corn, millet, and too many species of fruit to enumerate. Add to all, we have no dreary winter here. . . . Nature is constantly renewing herself, and is also constantly pouring her treasures all the year round into the laps of the industrious."

It is thought that when labour becomes more abundant, sugar, cotton (which yields two crops in the year), coffee, and indigo will come to be staple products of Liberia. The coffee-tree has already been somewhat extensively planted; at one place there is a plantation of 30,000 trees. At present the chief articles of export, besides fruits, vegetables, and salted meats supplied to ships calling at the ports, are palm oil, which has become an article of great importance, dye-woods, ivory, and rice, with some gold, tortoise-shell, gums, hides, wax, ground-nuts, ginger, and pepper; a good proportion of which is brought by natives from the interior. The exports in the two years ending September, 1843, amounted to 25,767*l.*, the imports to 32,880*l.*: the exports are said now to average upwards of 100,000*l.* annually. The supply of dye-woods, especially cam-wood, appears to be inexhaustible. It is said that from about 30 miles east of Bassa Cove, there "extends a forest-region of unknown extent, where scarcely any tree is seen except cam-wood." Liberia has a considerable coasting-trade, carried on by schooners belonging to the country; and a large trade with the interior. For home consumption as well as export there is a great variety of timber-trees suitable for building purposes; good building-stone abounds; as do also shells for lime, and clay of excellent quality for bricks.

Liberia is divided into the counties of Mesurado, or Montserrado, Bassa, and Sinoe. The chief town is *Monrovia*, the capital, on Cape Mesurado, a busy sea-port town and the principal place of trade. It contains a court-house, a public library, two or three churches and schools; several stores, warehouses, and good wharfs; a fort and a lighthouse; and has about 1500 inhabitants. The other larger towns and settlements along the coast are Marshall at the mouth, and on the right bank of the Junk River; Edina and Grand Bassa at the mouth, but on the opposite banks of the St. John, in Bassa Cove; Bexley, and the new town of Cresson in the same neighbourhood; Greenville on the Sinoe; Trade Town, a populous place 4 miles W. from Young Cestos; and Cestos, or St. George's Point in Cestos Bay. The chief inland towns and settlements are Caldwell on the St. Paul; New Georgia; and Millsburg. Along the coast are several factories, chiefly for the trade in cam-wood, belonging to Liberians, and some to English and American merchants: and both along the coast and inland are numerous native towns and villages, some of them, as Grand Cestos and Great Neefoo, of considerable size.

On Cape Palmas, the south-eastern extremity of Liberia, is established the colony of *Maryland-in-Liberia*, consisting of free-coloured emigrants sent thither from the state of Maryland by the 'State Colonisation Society.' The colony was founded in 1834, and a considerable number of free-coloured persons have since been sent to it by the Society, which is assisted in its operations by an annual grant from the state legislature of 20,000 dollars. The colony, which is independent of Liberia, is governed by an agent, or governor, appointed by the Colonisation Society, and a council and other officers elected by the colonists; and appears to be in a tolerably flourishing condition. *Harper*, the chief town, contains about 700 inhabitants, and carries on a good deal of trade. The Palmas River is about a hundred yards wide towards its mouth, but several rocks lie in the channel; it has a depth of 3 feet over the bar at low water. The colonists have erected a lighthouse on Cape Palmas, which shows a fixed light 100 feet above the sea. There are two or three villages and smaller settlements.

The constitution, adopted at the declaration of the independence of Liberia, and said to have been drawn up by Professor Greenleaf, of Harvard College, Massachusetts, is founded on that of the United States, which it greatly resembles in its leading principles. It proclaims the equality of all men; establishes perfect religious freedom, and the liberty of the press; prohibits slavery; gives the right of every one to be tried by a jury of his peers, of bail, and of habeas corpus; makes nearly all offices elective, and gives the suffrage to every male citizen 21 years of age possessing real estate—citizenship belonging however exclusively to persons of colour; and of such, at present at least, only to the free coloured emigrants from the United States, who immediately on arriving are admitted to full citizenship, and receive a grant of five acres of land, with liberty to purchase more. The executive government is vested in a senate elected from the counties, and a house of representatives elected after the American system, according to a ratio of representative population; and a president who is elected for two years, is to exercise supreme executive power, is the commander-in-chief of the army and navy, and has a qualified veto on the acts of the legislature. The judicature consists of a supreme court, and districts courts: the judges are only removeable by the president on a vote of two-thirds of the houses of legislature. The annual revenue and expenditure average about 7000*l.* a year each. The republic appears to be making steady progress.

There were in 1847 in Liberia (without including the Maryland colony) 23 churches with 1474 communicants, of whom 469 were natives; there are now above 30 churches. Schools are provided for all the children of citizens. In 1847 there were 16 schools with 562 scholars, of whom 192 were the children of native Africans: in 1851 the scholars were said to exceed 2000. Three high-schools are in operation in Monrovia; and an Act has passed the legislature for the establishment of a college. The 'Liberia Herald,' a very respectably conducted newspaper, has now continued to be published for above 20 years: one or two others have been issued within the last few years.

(*Constitution and Declaration of Independence of the Independent Republic of Liberia; Publications of the American Colonisation Society; Parliamentary Papers on African Slavery; Africa Redeemed; Travels in Africa*, &c.)

LIBRARIES, PUBLIC. Up to a recent period one of the first things which struck a foreigner with pain when he took up his residence in London, or in any other of our great towns and cities, was the total absence of free libraries. In every large town on the continent there is a public library (often there are two, four, or six), to which every one is admitted at once, without introduction or guarantee. In the whole of the British Islands there was but *one* such institution—Chetham's Library, in Manchester; and even this was so ill-managed in other respects as to be of hardly any use to the inhabitants of the town in which it existed. In 1849 a committee of the House of Commons was appointed, of which Mr. Ewart was chairman, and its report contained a mass of startling facts, and a number of valuable suggestions. It was shown that our public libraries were not only difficult of access compared with foreign libraries—they were wretchedly few in number. One of the most striking things in this report is a map of Europe, shaded so as to exhibit the relative provision of books in libraries accessible to the general public in the various states on the continent, excepting Turkey. The small German states—Baden, Hanover, Dresden, and so on—and England are on the two extreme verges. The minor countries are, in this respect at least, white with the light of science and learning, while the British islands appear to be in utter darkness. The gradations run down the scale thus:—For every 100 of the population, there are in the minor states of Germany 450 books; in Denmark, 412; in Switzerland, 350; in Bavaria, 339; in Norway and Sweden, 309; in Prussia, 200; in the Austrian empire and the kingdom of Hungary, 167; in the states of Italy, 150; in France, 129; in Sardinia, 100; in Spain, 100; in Belgium, 100; in Portugal, 80; in Russia, 75; in Holland, 63 to 53; in Great Britain and Ireland, 63 to 53. Look at it how we will, such a table is calculated to put one to the blush; but still it should not have been sent forth by the reporters without some sort of explanation. Such a statement is very likely to mislead continental writers, not well acquainted with England, into a grievous mistake. It is only too true that the peasant of Devonshire has fewer books accessible to him in public collections than the peasant of Podolia or the Banat has—the citizen of London or Liverpool than the weaver of Catalonia and the vine-dresser of Catania. But it is not true that there are more books in Russia and Hungary, in Spain and Sicily, in proportion to the number of inhabitants, than in Holland and England. It is not even true that there are more books accessible to the working classes in any of the countries named than in England. There are coffee-houses in the bye streets of London which have better libraries than can be found in cities of from five to ten or fifteen thousand inhabitants in Germany or Denmark. There are divans in the Strand where more papers and reviews are taken in than in the Casino of Pesth. In fact, with the exception of the United States of North America, no nation in the world has so many books, so much literature, in proportion to the amount of the population, as England. In Spain, in Italy, and Germany, even in France, very few persons have private libraries in their own houses. In England a house is not considered furnished without a stock of books. Even the cottage of the peasant has its family Bible, and its copy of Shakspere or Milton, a thing having no parallel in some of the countries standing higher in the above list. It is a remark often made by foreigners, that in England there are no pictures. It is much the same with regard to books. But the fact is, both our art and our literature are gathered up in our homes; while in public collections we are lamentably deficient, but only in public collections.

This distribution of books, as of paintings, in small quantities, and in many houses, has its evils as well as its virtues. It induces a certain amount of reading in the classes to whom literature is chiefly a graceful recreation; but the education of the masses, and the higher culture of men of letters, suffers by it most deplorably. Within the recollection of men still living there was no library in London, accessible to the public, even moderately complete in the great departments of inquiry. Gibbon had to purchase all the books necessary for the composition of his great works. Fortunately for us he had the means. Roscoe was unable to obtain from any public library in Liverpool the ordinary Italian authors whom he had to consult on the subject of his two biographies. Still later than this, the historian of North America (Graham) found himself obliged to remove from London to Göttingen, in order to get access to a well-stored library, which was at the same time open to the public. Within a year or two of our own time, Robert Southey was obliged to collect at his own cost all the materials of his voluminous writings, as any other author would have to do again next year, if it were inconvenient for him to reside in London, and to attend at the British Museum in the heart of the day. How disastrously this scarcity of books, publicly accessible, operates upon the current literature of the time, men of letters are alone truly aware. How it operates to prevent the spread of sound and useful information among the masses, is evident to every one who has been in the habit of reading in the libraries of foreign countries. For example, let any one compare the reading rooms, day after day, of the British Museum and the National Library in Paris, he will at once perceive that two distinct classes of persons frequent these rooms. In London he will find only men of letters and artists, the teachers of the people. In Paris he will see that it is the people themselves who come to read. In the British Museum he sees only grave men and women dressed in the customary suits of solemn black, so well befitting the avocation of letters. In the National Library, he observes groups of students from the civil and military colleges, soldiers of the line in their blue-coats, officers, clerks, shopkeepers, porters, and generally speaking specimens of all classes of the population. A peep over the shoulders of the readers in the two rooms will reveal another difference between them. In London, you see the tables covered with old volumes, maps, and manuscripts—the literature of the past. In Paris, you notice that the readers are chiefly poring over the new books and new writers—Thiers, Lamartine, Louis Blanc—the living literature of their own age. In strict truth, the British Museum is only a library of reference; the Parisian institution is a library for reading.

There is nothing in the theory of the two institutions which ought to lead to this variety of result; but practically it is so; and the circumstances in which the rules are founded are sufficient to explain it. The National Library is open to the public—the British Museum is not. Whenever a man finds himself in the heart of Paris with an hour's leisure on his hands, he can at once repair to the Library. No one can do this in London unless he is previously provided with a free card. The Parisian who obtains an unexpected holiday can use the institutions of his country—not so the Londoner; for although it is not difficult to get a pass card to the British Museum, to get it is a work of time. It cannot be done in a day. This is the great advantage which the masses of Paris have over the same classes in London. To the man of letters, Paris offers still greater advantages—as, under proper regulations, he is there allowed to take home with him the books he is using for literary purposes. How far in the opinion of the Committee these provisions might be safely extended to the British Museum readers, will be considered by and bye.

It appears from the evidence tendered to the Committee, that,

In France there are	107	Public Libraries	open freely.
,, Belgium . .	14	,,	,,
,, the States of Prussia	44	,,	,,
,, Austria (with Venice and Lombardy)	48	,,	,,
,, Saxony . . .	6	,,	,,
,, Bavaria . . .	17	,,	,,
,, Denmark . .	5	,,	,,
,, Tuscany . .	9	,,	,,
,, Great Britain and Ireland .	1	,,	,,

All the great public libraries on the Continent are like the National Library in Paris; that is, they are open freely to all comers without distinction of person, rank, or country. This is as it should be everywhere; none should be sent back from the temple of knowledge who knock for admission. The following list gives the number of these public libraries in the chief capitals in Europe:—

In Paris there are	7	open	Public Libraries.
,, Brussels . .	2	,,	,,
,, Berlin . . .	2	,,	,,
,, Vienna . .	3	,,	,,
,, Milan . . .	2	,,	,,
,, Dresden . .	4	,,	,,
,, Munich . .	2	,,	,,
,, Copenhagen .	3	,,	,,
,, Florence . .	6	,,	,,
,, London .	none	,,	,,

Compared with the population of these cities thus provided—the whole of them little over-counting London alone—the facilities for mental culture afforded to our masses are not to be named. Indeed all the collections of books which can by any straining of the terms of their acts of foundation be considered as public libraries are wretchedly inadequate to meet the wants of a population pining for a higher class of reading. Besides the British Museum, there are in London—the library of Sion College, in London Wall, founded by Dr. White, in 1636, and now containing nearly 40,000 volumes; the library in Red Cross Street, founded by Dr. Williams in 1716, and now containing about 20,000 volumes; and Archbishop Tenison's library in Westminster, containing about 4000 volumes. This last is now degraded to the purposes of a club-room. These are all public; a card of admission is obtained in much the same way as at the British Museum. Of course there are many other libraries in London to which men of letters obtain access for the objects of their craft—such as the library of the East India House in Leadenhall Street; the libraries of the Inns of Courts; libraries connected with the various professional Colleges; the library of Lambeth Palace; and so on. But from none of these can the books be borrowed. None of them are open to the general public, or to the unknown student. The only decent library in London from which books may be taken home is a subscription library in St. James's Square—and that is necessarily very imperfect in all departments, and is moreover barricaded by a large entrance fee.

Out of London, the Bodleian at Oxford, and the University library at Cambridge, are the best in England. But these are both closed to the public; and not only so, but to the majority of the students themselves. It is the same in the University library in Glasgow. At Trinity College, Dublin, at the University library of Aberdeen, and at that of St. Andrews, there are restrictions which exclude the public. Chetham's library, in Manchester, containing about 20,000 volumes, has the reputation of being the only one in England open to the public after the manner of the Conti-next. In Dublin, there are four other decent libraries in addition of that of Trinity College—belonging respectively to the Royal Irish Academy, 10,000 volumes; to the Royal Dublin Society, 19,000 volumes; to the Queen's Inns, and Marsh's library, 18,000 volumes. The Advocates' library in Edinburgh is the chief public collection of books in the east of Scotland.

Besides these great collections, which are known but not easily accessible to the general public, there are a considerable number of small libraries, belonging to the public, scattered about the country, which at present are neither known nor accessible—but which may constitute the nuclei of a system of public libraries by and bye. These little-known collections are of two kinds—cathedral libraries and parochial libraries. Of the cathedral collections there are known 34 in England and 6 in Ireland. For the most part they are stocked with works on theology and divinity, but some of them have also works on literature and history—particularly ecclesiastical history. Many of these have incomes settled upon them by pious and munificent founders. In such as have, new books are added yearly; the number of volumes which they contain will average from 7000 to 10,000 in each. In some the books have had little care taken of them, and much loss has thereby accrued to the public. Generally speaking, these church libraries are the closest of corporations. Parochial libraries once prevailed to a considerable extent throughout England and Wales, and Scotland. The Committee have come upon the traces of no less than 163 such institutions in England and Wales, and 16 in Scotland. These parish libraries were founded in the first instance by private benevolence. Many of them owed their origin to the efforts of Dr. Bray and his friends, the founders of the Society for Promoting Christian Knowledge, at the beginning of the 18th century; but others had already been in existence some time, as we learn from the preamble to an Act of Parliament for their better preservation, passed in 1708. Many of these libraries, from sheer neglect, have fallen into a state of decay. It is stated in evidence that "the books lie exposed to chance, and liable to be torn by the children of the village;" as however they were originally formed chiefly with a view to their being useful to the poorer ranks of the clergy, at a time when standard works were dear, and few parsonages could boast of a well-stocked set of shelves, the works which they contain are by no means fit only for children. They are generally of a high class; but there are not very many of them unfortunately.

That the public required greater facilities for consulting better works than they possessed, was proved—first, by the more educated classes continually making our national poverty in this respect the subject of complaint in the press and in society; secondly, by the artisan classes constantly making efforts to create libraries of a better class for themselves. Our lyceums and mechanics' institutes are chiefly supported by the strong desire of the daily worker for a good book, a desire which has already acquired something of the power and regularity of a passion. Nor is it only in the place of education that the hard-working man desires to see himself within the reach of an intellectual companion. Wherever there is a real want, it will sooner or later be supplied. If the workman who has little leisure, and that little only such as may be snatched from brief intervals allowed for rest and refreshment, seriously wishes to devote a part of that leisure to reading, he will soon, as in the London cheap coffee-houses, find them placed about him by those who are anxious to court his custom. Of these coffee-houses there are 2000 in the metropolis, many of which have books as well as magazines and newspapers. Some of these have as many as 2000 volumes, and, what is equally significant, novels, or works belonging to a light class of literature, form only a moderate proportion. Histories, poetry, travels, political works, and so forth, books of solid thinking and high character also find their place. A cursory glance at these places, lyceums and coffee-houses, will show that the race of hard workers is also a race of hard thinkers. Such considerations as these convinced the Committee of Inquiry, that the establishment of public libraries, open and free to all comers, was a national want, expressed in the most practical and convincing manner.

The suggestions offered by the Committee were chiefly for the purpose of rendering the existing libraries more available to the general public, with occasional grants from government for the purpose of extending them. They were not adopted altogether, but the Report produced such a conviction of the necessity for doing something, that in 1850 an Act was passed (13 & 14 Vict., cap. 65) "for enabling town councils to establish public libraries and museums." There had been a previous Act in 1845 for enabling them to form museums in towns or boroughs where the population exceeded 10,000. The town councils were by the present Act empowered, with the consent of a majority of two-thirds of the persons legally entitled to vote in an assembly called for the special purpose, to levy a rate not exceeding a halfpenny in the pound on the annual value of the property assessed to the borough rate, and to hire or purchase land, erect buildings, furnish them fittingly, appoint and pay officers, &c.; the property in buildings, books, maps, specimens of art and science, whether purchased or acquired by donations, to be vested in the council in trust for the inhabitants of the borough and others resorting thereto; the admission to such libraries and museums to be at all times free of charge. This Act was extended to Scotland and Ireland by the 17 & 18 Vict., cap. 74. Numerous towns have availed themselves of the powers of this Act in England; among others, Birkenhead, Bolton, Cambridge, Hertford, Kidderminster, Liverpool, Manchester, Norwich, Oxford, Salford, Sheffield, Warrington, and Winchester. The general results are reported in every case to be satisfactory; in some highly so. At Salford, in the first year, out of 3000 consecutive issues of books, 1931 were works of fiction; in 1855, out of the same number, only 720 were works of fiction. At Oxford it is said 235,000 persons have visited the library in two years (visits, we presume, are meant, and not distinct persons); and, it is added, the public library "has proved of more real benefit, and rendered more solid advantages to the middle and working classes in this city than any other measure which has been adopted." In Liverpool, it is stated, "a marked improvement has been noticed in the habits and manners of the people who frequent the library." The return also mentions that in Birmingham, Cheltenham, Exeter, Islington, and the City of London, the proposal for establishing a public library has been rejected.

One of the suggestions of Mr. Ewart's Committee was that, wherever the public were admitted to libraries, gas should be provided, that the artisan might use them in the evening. In most of the libraries established under this Act the suggestion has been adopted. Another suggestion, that the library of the British Museum should be to a certain extent divided, one division containing those works best adapted for general reading, to which the public might be admitted in the evening, and the other, the great national collection of records, manuscripts, and books of reference, for literary men, has not been attempted. Such a division would certainly be a great benefit to both classes of book-users. The recently constructed large and elegant new reading-room of the British Museum, even under the restriction of obtaining pass-cards, has yet too many readers to be pleasant for a student. If also, as in Paris, books could be had for a limited time to be used at home by the writer who, in fact, makes these hoarded treasures profitable for the world at large, it would be an invaluable boon.

LICHENINE. [Chemistry, *S.* 2.]

LIGNITE. [Coal, *S.* 2.]

LIGURITE. [Mineralogy, *S.* 1.]

LILY. [Lilium, *S.* 1.]

LIME, OXALATE OF. [Mineralogy, *S.* 1.]

LIMISSO. [Cyprus.]

LIMONINE. [Chemistry, *S.* 2.]

LIMPET. [Cervicobranchiata.]

LINARITE. [Mineralogy, *S.* 1.]

LINDE, SAMUEL BOGUMIL, the great lexicographer of Poland, was of immediate Swedish descent. His father was a native of Dalecarlia, who was settled at Thorn in Poland when Linde was born in 1771. After receiving a good education in the schools of Thorn, he was sent, at the age of eighteen, to study in the university of Leipzig, where he attracted the favourable notice of Professor August Wilhelm Ernesti, the editor of Livy and Tacitus. "Ernesti," says Linde, in one of the prefaces to his great work, the Polish Dictionary, "struck out for me, without my knowledge, an opening to a career which he thought would be for my benefit. One day he told me, to my great surprise, that he had written some weeks before to Dresden, to recommend that a chair of the Polish language and literature should be entrusted to me at the university of Leipzig. I told him, with some consternation, that I was not well acquainted with Polish; that all I knew of it was what clung to my memory from the mere intercourse of daily life at Thorn, where I was much neglected; and that if I were made professor I should myself be obliged to begin to learn the language anew from the first rudiments." In the course of 1792, however, Linde received the appointment, and began to do as he had said. Among the books that he procured from Poland was the 'Powrot Posla' ('The Deputy's Return'), a satirical play, directed against the national failings of the Poles, which he found so excellent, that, though many passages were beyond his comprehension, he commenced a translation, with the intention of making use of the original as a book for study with his pupils. It was lying on his table when two Polish gentlemen called on him, whose attention was at once attracted by the book, and he asked them if they could inform him who was the author of that anonymous masterpiece. One of them, Julian Niemcewicz, replied, "I wrote it." "That moment," Linde afterwards said, was "the decisive moment of my life." Niemcewicz became his intimate friend, explained to him the passages that had perplexed him, and introduced him to the society of the other distinguished Poles then living at Leipzig, to which it appears the professor had hitherto had no access. Among them were the Counts Potocki, Kollotaj, and Thaddeus Kosciuszko, some of the most illustrious names of Poland. Linde, who now first heard his native idiom from the lips of gentlemen and scholars, became fired with enthusiasm for the Polish language, and resolved to devote himself to the production of a great Polish dictionary. He took this resolution at the age of twenty-two; he published the last volume of his great work twenty-one years after, having worked at it almost unremittingly during the interval. The Dictionary of the Polish Language, 'Slownik Jezyka Polskiego,' occupies six quarto volumes, of which the first was published at Warsaw in 1807, and the last in 1814. It fills about five thousand quarto pages in closely printed double columns; to every word is appended an explanation in Polish and German, a comparison with the forms which resemble it in the other Slavonic dialects, and a collection of passages from authors in which it occurs, to amass which Linde read through six or seven hundred of the principal works in Polish, of which he gives a list in the first volume. It was the first great dictionary of the Polish language; it has served as the basis for every subsequent one, and though of course susceptible of improvement and augmentations, it is not likely to be ever either superseded or surpassed. In the course of its preparation Linde soon resigned the professorship at Leipzig which had first given rise to it, passed some time at Warsaw, then became librarian to Count Ossolinski at Vienna, and had the congenial employment of travelling in Poland to collect Polish books, by which he enriched the library and his Dictionary together, and lastly established himself at Warsaw to superintend the printing, which was carried on in his own house by compositors and pressmen, some of whom had the privilege of immortalising themselves by affixing their own names at the end. These labours were carried on during a stormy period, but the house in which the Dictionary was printing was repeatedly spared by contending armies, and the author received support from the Prussian and the Austrian governments, and in particular from the Russian, as well as from numerous Polish magnates, one of whom, Count Zamoyski, when the works were on one occasion brought to a stand-still by an absolute want of pecuniary means, sold a favourite horse and sent the proceeds to the lexicographer. Linde held various appointments connected with the educational establishments of Poland, and was enabled to introduce extensive reforms. He continued to reside at Warsaw as rector of the Lyceum and principal librarian of the university, during the long period of comparative tranquillity which preceded the insurrection of 1830; and though he was elected to the revolutionary diet as member for Praga, was averse to that unfortunate movement, which he thought ill-timed and likely to issue in nothing but calamity. Fryxell the Swedish historian, who, in his travels in search of Swedish documents, was surprised to discover that the Polish lexicographer was the son of one of his own countrymen, found him depressed and melancholy in the year 1834. "It was instructive," says Fryxell, in the preface to his 'Handlingar rörande Scandinaviens Historia,' "to hear him trace the true reasons of Poland's fall first and foremost in the national character of the Poles themselves, instructive especially for a Swede, who belongs to a country which has the same powerful and wily neighbour that Poland had, and who hears the same misleading doctrines preached around him which ended in subjecting Poland to the Russian yoke." Linde had at that time been re-appointed by the Russian government to some of the educational posts he formerly held; but he resigned them in 1838, and appears to have lived in retirement till his death on the 8th of August 1847 at Warsaw. In addition to his Dictionary he was the author of a work in Polish on the statutes of Lithuania, and he translated from the Russian Grech's 'History of Russian Literature,' with an appendix of additions. His pen was frequently employed in rendering Polish works into German, the language with which to the last he seems to have been most familiar. The most important of these was his translation (Warsaw, 1822) of the Dissertation on Kadlubek, the old Polish historian, by his friend and patron Count Ossolinski, who it should be mentioned assisted materially in the composition of the Dictionary, and to whom in conjunction with Prince Czartoryski, also a munificent patron, that work is dedicated.

LING. [Lota, *S.* 2.]

LINGARD, REV. JOHN, D.D. and LL.D., was born February 5, 1771, in the city of Winchester. He belonged to a Roman Catholic family in humble circumstances, and studied at the Roman Catholic College at Douay, in France, whither he was sent by the Roman Catholic Bishop Talbot, and there he remained till the revolutionary troubles obliged the small community to seek shelter in England. After several intermediate removals the college settled at Crookhall, in the county of Durham, and subsequently at Ushaw, near the city of Durham. Mr. Lingard accompanied the college, and performed the duties of some of its offices. He revisited France for a short time during the dangerous period of the revolution, and on one occasion escaped with difficulty from being suspended 'à la lanterne.' In 1805 he wrote for the 'Newcastle Courant' a series of letters, which were collected and published under the title of 'Catholic Loyalty vindicated,' 12mo. He afterwards wrote several controversial pamphlets, which in 1813 were published in a volume having the title of 'Tracts on several Subjects connected with the Civil and Religious Principles of the Catholics;' and he was also the author of 'Catechetical Instructions on the Doctrines and Worship of the Catholic Church,' of which there have been several editions. In 1836 he published anonymously an English translation of the New Testament, which is said to be accurate and faithful in several passages where the Douay translation is faulty. In 1845 he published the 'History and Antiquities of the Anglo-Saxon Church,' 2 vols. 8vo.

Dr. Lingard's great work, the 'History of England from the First Invasion by the Romans to the Accession of William and Mary in 1688,' was first published in 6 vols. 4to, London, 1819-25; second edition in 14 vols. 8vo, 1823-31; fourth edition, in 13 vols. 12mo, 1837; fifth edition, 10 vols. 8vo, 1849-50; and sixth edition, 10 vols. 8vo, 1854-55. Dr. Lingard's 'History of England' is a work of great research, founded on ancient writers and original documents, displaying much erudition and acuteness, and opening fields of inquiry previously unexplored. The narrative is clear, the dates accurately given, and the authorities referred to distinctly. The style is perspicuous, terse, and unostentatious. The work perhaps exhibits too exclusively the great facts and circumstances, military, civil, and ecclesiastical, and enters less than might be desirable into the manners, customs, arts, and condition of the people. In all matters connected with the Church the work is, as might have been expected, coloured by the very decided religious opinions of the author; but these are not offensively set forth.

Dr. Lingard, after the completion of his 'History of England,' paid a visit to Rome, where Pope Leo XII. offered to make him a cardinal, but he refused the dignity. He spent the last forty years of his life at Hornby, near Lancaster, where he died July 13, 1851. He was buried in the cemetery of St. Cuthbert's College, at Ushaw, to which institution he bequeathed his library. His latter years were rendered comfortable by the profits of his 'History,' and a pension of 300*l.* a year from the Queen for his services to literature.

LINOSYRIS, a genus of Plants belonging to the natural order *Compositæ*. The heads are not radiant; florets all perfect and tubular; receptacle naked, pitted; the pits with elevated dentate margins in the British species; phyllus imbricated; pappus pilose; fruit compressed, silky, without a beak.

L. vulgaris is an herbaceous Plant, found in middle and southern Europe and Great Britain. It has linear glabrous leaves, corymbose heads, the involucre lax; the stem from 12 to 18 inches high, simple and leafy; leaves single ribbed, smooth or scabrous, very numerous, more or less dotted: flowers yellow. It grows on limestone cliffs. It is the *Chrysocoma Linosyris* of Smith.

LINSENERZ. [MINERALOGY, *S.* 1.]

LINTON. [CAMBRIDGESHIRE.]

LISTA Y ARAGON, ALBERTO, an eminent Spanish mathematician, poet, and critic, was born at Triana, a suburb of Seville, in 1775, on the 15th of October, the day which, as he delighted to remember, was also the birthday of his favourite poet Virgil. His parents were in humble circumstances, and engaged in silk-weaving, and in his early years Lista was himself obliged to work at the trade, but he soon displayed such talents for mathematics, that by the time he was thirteen he was already enabled to earn his own living by giving lessons to pupils. As he went about from one house to another for this purpose, he filled up the intervals by playing with the other boys in the streets. At fifteen he was made teacher of mathematics in the schools of the society of 'Amigos del Pais,' and at twenty nominated by the king to the same office in the nautical college of San Telmo at Seville. Before that time he had studied philosophy, theology, and canon law at the university, and he had also devoted himself to the priesthood. This however did not prevent him from engaging in private theatricals, and gaining applause in some of the principal characters in Lope and Calderon. At that period there were four young men in Seville enthusiastic in their devotion to literature and intimate personal friends, Arjona, Reynoso, Lista, and Don José Maria Blanco, afterwards so well known in England by the name of Blanco White.

In 1808, soon after Lista's appointment to the professorship of poetry and rhetoric at the University of Seville, the French invasion brought ruin to every literary circle in the peninsula. Lista at first joined with Blanco in continuing the 'Semanario Patriotico,' begun by Quintana, but his firmness appears afterwards to have failed him. When the French entered Seville he remained, and while improvising patriotic odes on the victory of Baylen, he allowed himself to earn the compliments of Soult by the skill with which, under compulsion, he turned the French proclamations into excellent Spanish. The consequence was that when the French armies were driven out of the country in 1813, Lista found himself obliged to keep them company, and spent some years in France as a teacher of Spanish, and also as a curate, occasionally venturing to preach in French, though he could never conquer the Spanish accent. In 1817 he was allowed to re-enter Spain, and after passing a few years in the provinces as a teacher of mathematics, was established in 1820 at Madrid as, in conjunction with Hermosilla and Miñano, editor of the magazine 'El Censor,' one of the best periodicals Spain has ever produced. In 1822 he published his poems, with a dedication to Blanco White, under the name of 'Albino.' They at once placed their author among the first poets of modern Spain. Not long after he established a sort of private college at Madrid, the reputation of which rose singularly high, and had the effect of exposing him to many annoyances on the part of the government. Among the pupils of Lista at different periods of his life are found the names of Duran, Esproncede, Ventura de la Vega, Roca de Togores, and many others of peninsular eminence. He became so dispirited by the obstacles thrown in his way by the authorities, that he finally left the country and established himself at Bayonne, where he published a 'Gaceta de Bayona' in Spanish, which supported him by its circulation in Spain till it was prohibited by the ministry. He then went to reside at Paris, and while there paid a visit of a fortnight to London, for the exclusive purpose of renewing his intercourse with his old friend White, then a minister of the Church of England, resident at Oxford. When the friends met their emotion was so great that both were for some time unable to speak. Soon after, in 1833, the writer whose 'Gaceta de Bayona' had been forbidden to enter Spain, was summoned home to edit the 'Gaceta de Madrid,' where his leading articles were so highly approved, that King Ferdinand offered him in recompense the bishopric of Astorga, which he declined in favour of his friend Torres Amat, the biographer of Catalan authors. From this time his life flowed through a series of honours. When in 1837 he resigned the editorship of the 'Gaceta,' he became professor of Mathematics at Madrid, and helped to establish the Athenæum, or university there. His health suffered by the climate of Madrid, and he removed to Cadiz, where he superintended the new college of St. Philip Neri. In 1840 he gave this up, and returned to his native Seville, on his road to which he was met at two leagues off by a procession of friends and admirers to escort him in. He again accepted in his old age the professorship of mathematics in the city where his early triumphs had been won, and there he died on the 5th of October 1848. The municipality of Seville decreed that one of the streets in which he had often played when a boy should bear henceforth the name of 'Calle de Don Alberto Lista.'

Lista was an author of very various merit, his 'Tratado de Matematicas puras y mixtas' is the standard book on mathematics in Spain, and his amorous and anacreontic poetry is considered little inferior to that of the admired Melendez. His philosophic poems in the style of Horace are peculiarly happy, and his sacred poems are superior to those of any of his contemporaries. As a literary critic his 'Lecciones de Literatura Dramatica Española' (Madrid, 1839), and his 'Ensayos Literarios y Criticos' (2 vols., Seville, 1844), are in high esteem, and contain a fund of valuable information for foreigners; and he has also displayed his intimate acquaintance with the literature of his country in an excellent collection of selected extracts, 'Trozos Escogidos de los mejores Hablistas Españoles en Prosa y Verso.' A translation of Ségur's French work on universal history, which he executed when in France, has a title to be mentioned from the numerous additions it contains, including, among others, a history of Spain to a late period. As a political writer he was distinguished by his advocacy of moderate and cautious reforms; and it should be mentioned that among his poems is one entitled 'The Triumph of Tolerance,' directed against the Inquisition.

LISSOMUS. [ELATERIDÆ.]

LISTERA, a genus of Plants belonging to the natural order *Orchidaceæ*. It has a ringent perianth; a deflexed 2-lobed lip; the stigma transverse; rostellum elongated, entire, acute, with a minute globose appendage at its somewhat reflexed apex; column very short.

L. ovata, Tway-Blade, is found in woods and pastures in Great Britain. It has 2 opposite ovate leaves, the lip bifid, the column with a crest which includes the anther; the stem a foot high; spike elongated, very lax; flowers small, and greenish; leaves large.

L. cordata has 2 opposite cordate leaves, 4-lobed lip, column without a crest. Height 3 to 5 inches. The stem is slender. Flowers very small, in a lax spike, and of a greenish colour; the lip with 2 basal and 2 terminal linear lobes. It is found on turfy mountainous moors in Great Britain.

LITHOMARGE. [MINERALOGY, *S.* 1.]

LITTORELLA, a genus of Plants belonging to the natural order *Plantaginaceæ*. It is monœcious; the male flowers stalked; sepals 4; tube of the corolla cylindrical; limb 4-parted; stamens hypogynous; filaments very long. The female flowers sessile; sepals 3; corolla oblong, narrowed at both ends; styles long; capsules 1-seeded.

L. lacustris, has white flowers; the fertile flowers sessile; stalks of the male flower one or two inches long; leaves all radical, linear, fleshy, somewhat channelled. It is found on the margin of lakes.

LLANFAIR. [MONTGOMERYSHIRE.]

LLANFYLLIN. [MONTGOMERYSHIRE.]

LLANIDLOES. [MONTGOMERYSHIRE.]

LOCH, JAMES, was the eldest son of George Loch, Esq., of Drylaw, near Edinburgh, by a sister of the late Right Honourable William Adam. He was born in 1780, and called to the Scottish Bar in 1801; he was subsequently admitted within the English Bar. He was for many years auditor to the late Earl of Carlisle, and to the trust estates of the late Earl of Dudley, Viscount Keith, and also to the extensive properties of Lord Francis Egerton (afterwards Earl of Ellesmere), and his brother the Duke of Sutherland, which he managed with great ability during the period when the tide of Highland emigration had set in at its strongest. The improvements which were made on the Duke of Sutherland's Highland property were the subject of much controversy; but Mr. Loch, in some able publications, demonstrated that the removal of wretched cottiers, without any means of cultivating the land, to make room for profitable industry, was real benevolence. He was also well known as the author of a 'Statistical and Historical Account of the

County of Sutherland,' and as a member of the council of the University of London. He represented in the Liberal interest the since disfranchised borough of St. German's, Cornwall, during the last unreformed parliament, after which he sat for the Wick district of Burghs from December 1832 to the dissolution in 1852, when he finally retired from parliament. He died in Albemarle-street, London, July 8th, 1855.

LOCHMABEN. [Dumfriesshire.]

LOCHWINNOCH. [Renfrewshire.]

LOCKER, EDWARD HAWKE, was the son of Admiral Locker, to whom Nelson, soon after the battle of the Nile, thus wrote: "You, my old friend, after twenty-seven years' acquaintance, know that nothing can alter my attachment and gratitude to you. I have been your scholar. It is you who taught me to board a French man-of-war by your conduct when in the Experiment. It is you who always said, 'Lay a Frenchman close and you will beat him;' and my only merit in my profession is being a good scholar." The son, Edward Hawke Locker, was born at East Malling, Kent, on the 9th of October 1777. He was educated at Eton, which he left in 1795, and received an appointment in the Navy Pay Office. He remained in government offices till 1800, when he went to India as private secretary to Lord Exmouth. From that time till the peace of 1814, he was associated with that distinguished commander in arduous and confidential duties, especially as secretary to the Mediterranean fleet; duties which he discharged with eminent ability. In his official capacity he visited Napoleon at Elba in May 1814; of which visit he published an interesting narrative after the death of the ex-emperor. In 1815 Mr. Locker married the daughter of an eminent antiquary and philologist, the Rev. Jonathan Boucher, the author of a 'Provincial Glossary,' the publication of which from the posthumous manuscript commenced in 1832, but which has not been continued beyond the letter B. Mr. Locker resided at Windsor from 1815 to 1819, when he was appointed secretary to Greenwich Hospital. During his residence at Windsor his attention was called to an article in 'The Windsor Express,' in which was pointed out the deplorable want of books adapted to the large class who had learnt to read under the new system of education in National and other schools. Mr. Locker sought the acquaintance of the writer of that article, Mr. Charles Knight, then the editor of the Windsor paper; and they together projected and jointly edited 'The Plain Englishman,' almost the first, if not the very first of any literary pretension, of those cheap and popular miscellanies which the growing ability of the great bulk of the people to read imperatively demanded, in the place of mischievous or childish tracts. Some very eminent friends of sound education, such as the present Archbishop of Canterbury, were among its contributors. Mr. Locker's own papers in the miscellany are excellent models of popular writing—plain, energetic, affectionate. His 'Lectures on the Bible and Liturgy,' which have been reprinted in a separate volume; 'Lectures delivered to the Crew of the Caledonia, Lord Exmouth's flagship,' are admirable examples of clear exposition and earnest exhortation. Mr. Locker, after filling for several years the important duties of secretary to Greenwich Hospital, became the Resident Civil Commissioner of that great institution. The improvements which he introduced into its management were results of his active and comprehensive mind. Of these improvements the Naval Schools are striking instances. Himself an accomplished draughtsman and an ardent lover of the arts, he founded the Naval Gallery at Greenwich by his judicious exertions. In 1844 Mr. Locker's health so failed that he gave up his valuable appointment and retired upon a small pension, his fine faculties overclouded beyond the hope of recovery. Mr. Locker was the intimate friend of many distinguished men amongst his contemporaries. To use Mr. Lockhart's expression, he was "an old and dear friend of Scott's." He died on the 15th of October 1849.

LOCKERBIE. [Dumfriesshire.]

LOCKHART, JOHN GIBSON, was born in 1794 at the manse of Cambusnethan, in Lanarkshire, Scotland; his father, who was of an old Lanarkshire family, being then minister of the parish of Cambusnethan, in connection with the Established, or Presbyterian, Church of Scotland. His mother was related to the celebrated family of the Erskines. When Lockhart was two years of age, his father removed from Cambusnethan to become one of the city clergymen of Glasgow; and here Lockhart was educated. His talents were shown during his course at the Glasgow University; at the end of which, while still only in his sixteenth year, he obtained, by the unanimous voice of the professors, the Snell exhibition to Balliol College, Oxford—a college at which, either on the same exhibition or otherwise, many eminent Scotchmen have been trained. In 1813 he took honours as a first-class man in classics; and in 1817 he graduated B. C. L. at the university—a degree exchanged for the higher one of D. C. L. in 1834. After residing some time in Germany, and acquiring the language and seeing much of the literary society there, he settled in Edinburgh as a member of the Scottish bar in 1816. He never had much practice as a lawyer however, but from the first devoted himself to literature, as a member of the little band of young Scotch Tories, who, with Wilson as their chief, were then beginning to dispute the literary supremacy of the Scotch Whigs, as represented by Jeffrey and the 'Edinburgh Review.' When Blackwood started his magazine in 1817, Wilson and Lockhart were its chief supporters; and considerable portions of the famous 'Chaldee Manuscript' and of the earlier 'Noctes Ambrosianæ' papers were written by Lockhart, though Wilson afterwards made the magazine his own. It was in consequence of Lockhart's literary connection with 'Blackwood' and Scottish Toryism that he became acquainted with Scott, who looked with a kindly interest on the efforts of these young men of the same politics as himself. The first meeting of Scott and Lockhart took place in 1818, and from that time they were intimate friends. When Scott, from the pressure of other work, ceased to write the historical parts of the 'Edinburgh Annual Register,' he recommended Lockhart to the Ballantynes as his substitute. In 1819 Lockhart published anonymously his 'Peter's Letters to his Kinsfolk,' which gives such graphic accounts of Scottish men and manners at that time. In 1820 he married Scott's eldest daughter Sophia, and took up his abode at the cottage of Chiefswood, close to Abbotsford. Here perhaps he spent his happiest days; and few passages in Scott's 'Life' are pleasanter than those describing his walking over early in the morning to breakfast with the young couple at Chiefswood, or helping their servants on a summer afternoon, when they had a modest dinner-party, by drawing up the wine from the well into which it had been lowered to cool. This was also a prolific period in Lockhart's literary career. He wrote his translations of 'Spanish Ballads' for 'Blackwood,' afterwards published collectively; in 1821 he published anonymously his 'Valerius, a Roman Story,' in 3 vols.; this was followed in 1822 by 'Adam Blair, a Story of Scottish Life,' in 1 vol.; by 'Reginald Dalton, a Story of English University Life,' in 3 vols., 1823; and 'Matthew Wald,' in 1 vol., 1824, each showing great power in a peculiar vein; and in 1825 he wrote his 'Life of Burns,' and also a less-remembered 'Life of Napoleon,' for 'Constable's Miscellany.'

In 1826 Lockhart removed to London to succeed Gifford in the editorship of the 'Quarterly Review.' He continued to edit the 'Review' till 1853—with what success all the world knows. In his hands the 'Review' maintained and increased its reputation; and not a few of the most powerful articles that appeared in it during the seven-and-twenty years of his editorship, came from his own pen. He was particularly happy in biographical sketches, combined with criticism. One paper of this kind—that on 'Theodore Hook'—has been reprinted by itself.

On Scott's death in 1832, the task of writing his biography naturally devolved on his son-in-law Lockhart. The task was accomplished in 1837-39, when the voluminous 'Life of Scott' was given complete to the world. Those portions of the work which related to the fall of Scott's pecuniary fortunes, provoked some controversy at the time; but the work as a whole has now taken its place as one of the most interesting and admirable biographies in the language. It has been said by those who knew Lockhart, that such was his practical sagacity that, had his illustrious father-in-law had the benefit of his actual assistance in the management of his affairs, the catastrophe which ruined Scott towards the close of his life could certainly never have happened.

In 1843 Lockhart was appointed by Sir Robert Peel to the office of auditor of the Duchy of Cornwall, with a salary of 600*l.* a year; and as in addition to this and his large literary income he had inherited some family property, he was in very easy circumstances. His last years however were embittered by a series of bereavements. His eldest son, the 'Hugh Littlejohn' of the 'Tales of a Grandfather,' had died in early life; his wife died in 1837; his second and only surviving son died at a later period; and there remained only one daughter. This lady, who was also (by the death of Mrs. Lockhart's eldest brother childless in India, that of the younger brother unmarried, and that of her sister) the sole remaining descendant of Sir Walter Scott, married in 1847 James Robert Hope, Esq., barrister-at-law, and is now proprietress of Abbotsford. Along with her husband she embraced the Roman Catholic faith. She usually lives at Abbotsford, and has one child, a daughter, born in 1852. Lockhart, broken in health and spirit, lived to see his own pedigree and that of Scott centred in this child—his grand-daughter and Scott's great-grand-daughter. Gradually becoming more shattered, he resigned the editorship of the 'Review,' and went to Rome in 1853; but he returned in the spring of 1854, and retired to Scotland. He died at Abbotsford, November 25, 1854, in the sixty-first year of his age. To the last he retained something of the handsome aristocratic appearance and bearing which had distinguished him in earlier life. His manners, always reserved, had become chillingly so before his death; but those who knew him intimately, maintain that, beneath his morose and iron demeanour, his scornful smile, and his withering sarcasm, there lay a host of qualities which commanded the thorough respect and affection of those whom he did admit to his friendship, or who were related to him by blood or affinity.

LOGANIACEÆ, ***Loganiads***, a natural order of Exogenous Plants, consisting of shrubs, herbaceous plants, or trees. It is characterised by having opposite entire leaves, usually without stipules, which adhere to the leaf-stalks or are combined in the form of interpetiolary sheaths. The flowers are racemose, corymbose, or solitary; the calyx valvate or imbricated, inferior 4- or 5-parted; corolla regular or irregular, 4- 5- or 10-cleft, with valvate or convolute æstivation; stamens arising from the corolla, all placed upon the same line, and not always symmetrical with the divisions of the corolla, pollen with 3 bands; ovary superior, 2-celled; ovules absent or solitary; fruit either capsular, 2-celled, with placentæ finally becoming loose or drupaceous, with 1- or 2-seeded stones, or buried with the seeds immersed in pulp; seeds sometimes winged, usually peltate, albumen fleshy or cartilaginous; embryo small, with the radicle turned towards the hilum or parallel with it. All the species are either tropical or inhabit countries near the tropics, a few in America and Australia forming the only exceptions. It would be difficult to name a more poisonous order than this, of whose qualities the celebrated *Nux vomica* may be taken as the representative. Notwithstanding the active qualities of these formidable plants, some are used in medicine with great advantage. Several of the species of *Strychnos* are used in the East as remedies for various diseases, and the seeds of *Ignatia amara*, St. Ignatius' Beans, are employed in India for cholera. *Spigelia* yields also several species which are employed for useful purposes. The order consists of 22 genera and 162 species. It is related to *Apocynaceæ*, *Gentianaceæ*, *Cinchonaceæ*, and *Rhizophoraceæ*. The uses of the species will be found under their respective heads, SPIORLIA; STRYCHNOS; &c.

LONDON PRIDE. [SAXIFRAGA.]

LONDONDERRY, CHARLES WILLIAM VANE, THIRD MARQUIS OF, K.G., G.C.B., only son of Robert, first Marquis, by his second wife, Frances, daughter of Lord Chancellor Camden, and half-brother of Robert, second Marquis [*S.* 1], was born in Dublin, May 18, 1778. Charles William Stewart was in his fifteenth year when he received his first commission as ensign in a foot regiment, and embarked under the Earl of Moira (afterwards Marquis of Hastings), to relieve the Duke of York from the perilous position in which he found himself after the reduction of Ypres and the capture of Charleroy. Having held for a few months the post of assistant quartermaster-general to a division of the forces under General Doyle, he was attached in the following year to Colonel Crawfurd's mission to the court of Vienna; and while thus occupied he received a severe wound at the battle of Donauwerth. Returning home, he became aide-de-camp to his uncle, Earl Camden, during his Lord Lieutenancy in Ireland; having gained his majority in 1796, he was made in the following year lieutenant-colonel of the 5th Dragoon Guards, and while encamped on the Curragh of Kildare, succeeded in bringing into partial discipline and order "the worst of bad regiments," which he commanded through the trying period of the Rebellion of 1798. The regiment having been subsequently disbanded for insubordination, Charles Stewart was appointed to the command of the 18th Light Dragoons, which he accompanied to Egypt under Sir Ralph Abercrombie; and in this expedition he was again severely wounded. In 1803 he became full colonel, and aide-de-camp to his Majesty, and for a short time occupied the post of under secretary of state for the war department. This post he quitted in order to accept the command of a hussar brigade under Sir John Moore in Portugal, as brigadier-general, and he did good service by covering the march of Sir John Hope's division into Spain, and the retreat of Sir John Moore, during which he successfully repulsed an attack of the French Imperial Guard. On reaching Corunna he was labouring under severe ophthalmia, and Sir John Moore, who had the highest opinion of his abilities, sent him home to report progress. In a few months however he returned to the seat of war as adjutant-general under Sir Arthur Wellesley, which post he held until May 1813. During the pursuit of Marshal Sonlt's army across the Douro, and again at Talavera, he rendered important services, for which he received the thanks of the House of Commons. During all this time, since the meeting of the first parliament of the United Kingdom in 1801, he had represented the county of Londonderry, and continued to do so until 1814, when he was raised to the peerage as Lord Stewart, and sworn a member of the Privy Council. In the mean time he had risen to the rank of lieutenant-general, and had received the order of the Bath, besides Portuguese, Russian, and Prussian honours, in recognition of his services not only in the field, but also in the capacity of envoy extraordinary and minister plenipotentiary at the court of Berlin, where he acted as commissioner to the allied sovereigns, and was specially charged with the supervision of Bernadotte, the Swedish king, who had armed his troops with English supplies, but was thought to be wavering in his allegiance.

The secret history of the time shows what kind of remonstrances the British envoy found it necessary to employ at so critical a moment as that which immediately preceded the battle of Leipzig. In 1814 he was appointed ambassador to Austria, and in the following year was one of the plenipotentiaries at the Congress of Vienna, together with his brother, Lord Castlereagh, the Duke of Wellington, and Lords Cathcart and Clancarty. Having been left some years a widower, in 1819 Lord Stewart married the only daughter of Sir Harry Vane Tempest, Bart.; and assumed the name and arms of Vane; and having succeeded to the marquisate on the death of his brother in 1822, was soon afterwards created Earl Vane, with remainder to his sons by his second marriage. In right of his wife he became possessed of large estates in the county of Durham, and applied himself actively to the development of their mineral and commercial resources. With this view he constructed the harbour of Seaham, a vast undertaking for private enterprise, and one which will long be regarded as a wondrous achievement of engineering science.

After this time the marquis never accepted any public office or employment, with the exception of the embassy to Russia, which he undertook during Sir Robert Peel's brief tenure of office in 1834-35, but relinquished before proceeding to his destination. In 1837 he obtained the rank of general, and became colonel of the 2nd Life Guards in 1843. In 1852 the Earl of Derby bestowed on him the Garter vacated by the death of the Duke of Wellington. His lordship was the author of a 'History of the Peninsular War,' published in 4to, 1808-13, and he also edited the correspondence of his brother Robert, the second Marquis, which he published in 1850. During upwards of half a century Lord Londonderry advocated in the Upper and Lower House the strongest Tory principles, and not always in the way best calculated to disarm opposition. He died at Holdernesse House, London, March 1, 1854, from an attack of influenza, and was buried at Long Newton, near Wynyard Park, his princely seat in the county of Durham. He was succeeded in the marquisate and the Irish estates by his eldest son William Robert, who represented the county of Down for many years as Viscount Castlereagh; the earldom of Vane and his English property passed to the eldest son of his second marriage, George, Viscount Seaham, M.P. for the northern division of the county of Durham.

LONGNOR. [STAFFORDSHIRE.]

LONGTOWN. [CUMBERLAND.]

LOOSESTRIFE. [LYTHRUM, *S.* 1.]

LOPHINE. [CHEMISTRY, *S.* 2.]

LOTA, a genus of Subbrachial Malacopterygious Fishes belonging to the tribe *Gadidæ*. It is distinguished by having an elongated body, with dorsal fins and one anal fin, a chin with one or more barbules.

L. molva, the Ling, is a very valuable fish, scarcely less so than the Cod. Large quantities are taken among the Western Islands, the Orkneys, on the Yorkshire coast, and the Scilly Islands; and may be traced nearly all round the Irish coast. The fishing for them is by hand-lines and long-lines; and besides a portion that is consumed fresh, the fish are split from head to tail, cleaned, salted in brine, washed, and dried, but the demand generally falls short of the quantity cured, and the hardy fishermen are but poorly requited. The ports of Spain are the markets supplied; and so valuable an article of commerce was Ling considered formerly that an Act for regulating the price of Ling, Cod, &c., was passed as early as the reign of Edward III. The air-bladders, popularly called Sounds, are prepared separately, and with those of the Cod-Fish are sold pickled. The roes, which are of large size, are also used as food, or preserved in brine are sold to be used for attracting fish. The liver produces oil, which is used by the poor to supply the cottage lamp, also as a medicine. In Zetland the principal fishing for Ling is from May to August. On the Yorkshire coast the young are called Drizzles. In Cornwall they are caught in January and February, and their favourite haunts are about the margins of the rocky valleys of the ocean.

The Ling is exceedingly prolific, and has a most voracious appetite, feeding on young fish, not sparing anything that has life, and the prey is swallowed whole, so that no great art is required to catch it. It is tenacious of life, and survives great injury. Mr. Couch says he once saw a Ling that had swallowed the usual large hook, shaft foremost, of which the point had fixed in the stomach, and as the line drew it, it turned round, entered the opposite side of the stomach and fastened the organ together in complicated folds; yet having escaped by breaking the line, it survived to swallow another hook, and was taken several days after.

The most usual length of the Ling is from three to four feet; Pennant mentions having heard of one which measured seven feet; and Mr. Couch has known them weigh 70 lbs.

The body of the Ling is slender, more elongated than that of the Hake; roundish; head flat; gape large, lower jaw shorter than the upper, with a single barbule at its extremity; teeth in the upper jaw small, and very numerous, those in the lower jaw longer and larger, forming but a single row; lateral line straight, scales small, firmly adhering to the skin; two dorsal fins of equal height, the first short, commencing near the head, not pointed as in the Hake, but with most of the rays even; second long, immediately behind the first, reaching nearly to the caudal; the posterior portion the most elevated; vent in a line with the eighth or ninth ray of the second dorsal fin; the fin immediately behind it is long, resembling the second dorsal fin, and terminating on the same line with it; caudal rounded at the extremity. The back and sides are gray, inclining to olive; sometimes cinereous without the olivaceous tint; belly silvery; ventrals white; dorsal and anal edged with white; caudal marked near the end with a transverse black bar; the extreme tip white.

L. vulgaris, the Burbolt, or Eel-Pout, is the only British species of this numerous family of fishes that lives permanently in fresh water, and prefers in this country slow running rivers; but it is neither so generally known, nor so much esteemed and encouraged, as from the goodness of its flesh it deserves. It is said to be found in various parts of the north of Europe, Siberia, Asia, and India. In this country it is rather local. It occurs in the Cam, and in some of the rivers of Norfolk and Lincolnshire. The Trent produces it, and Nottingham market is occasionally supplied with samples for sale. The Burbolt is not unlike the eel in some of its habits, concealing itself under stones, waiting and watching for its prey, which consists of aquatic insects and young fishes, under arches and near eddies, into which such small and weak animals are likely to be brought by the current of the water. It feeds principally during the night, and like the eel, is most frequently caught by trimmers and night-lines. The Burbolt is sometimes called the Coney Fish, from its habit of lurking and hiding itself in holes like a rabbit. It spawns in February and March, is very tenacious of life, and is said to have lived a considerable time in a cold and damp situation, fed on small fishes and raw meat. In this country it has been known to attain the weight of 4½ lbs., but a common weight is about 2 lbs. The flesh is firm, white, and of good flavour, and is by some considered superior to that of the eel. As the Burbolt is extremely hardy, it might be increased in any quantity, while the value of the fish would amply repay the trouble and cost of the experiment. It would thrive well and multiply in large lakes. The length of the fish is from one to two feet; the head depressed, smooth; jaws equal; chin with one barbule; the gape large, with small teeth above and below; eyes of moderate size; gill-opening large; the length of the head as compared to that of the body as one to four; the form of the body cylindrical, compressed posteriorly; the first dorsal fin is small and rounded, the second elongated, reaching nearly to the tail; both dorsal fins nearly uniform in height; ventral fins placed very forward, narrow, and pointed; the pectoral fins large and rounded; the anal fin begins on a line behind the commencement of the second dorsal fin, but ends very nearly on the same plane; the tail oval and slightly pointed; the colour of the body yellowish-brown, clouded and spotted with darker brown, and covered with a mucous secretion; the under parts lighter; the lateral line indistinct and straight; scales small; the fins partaking of the colour of the part of the body from which they emanate, those of the lower surface being much the lightest.

(Yarrell, *British Fishes.*)

LOTUS, a genus of Plants belonging to the natural order *Leguminosæ*. It has a calyx with 5 nearly equal teeth; keel ascending with a narrowed point; the wings are connivent at their upper margin; longer filaments dilated upwards; style kneed at the base, filiform, subulate; pod linear; many-seeded, 2-valved, imperfectly divided by transverse partitions.

L. corniculatus, Common Bird's-Foot Trefoil, is found in pastures and on dry banks in Great Britain. The claw of the standard is obovate, transversely vaulted; calyx-teeth straight in the bud, subulate from a triangular base, the points of the two upper ones converging; heads 5-10-flowered. The plant is glabrous or slightly hairy; stem ascending; leaflets obovate; stipules ovate; angle between the two upper calyx-teeth rounded.

L. major has the claw of the standard linear; calyx-teeth spreading like a star in the bud, subulate from a triangular base, two upper ones diverging; heads 8-12-flowered; leaflets obovate; stipules roundish ovate.

L. angustissimus is found in the south of England, near the sea. It has the claw of the standard linear; calyx-teeth straight in the bud, subulate; pod linear eight times longer than the calyx; beak straight; head about 2-flowered.

L. hispidus is found near the sea in Devonshire and Cornwall. It has the claw of the standard subulate; calyx-teeth straight in the bud, subulate; pod rugose, terete, twice as long as the calyx; beak elongate, setaceous, bent downwards; heads few-flowered; leaflets obovate-lanceolate; stipules half cordate; stem procumbent. There are many other European species of this genus, none of which are of any importance.

LOUGHOR. [GLAMORGANSHIRE.]

LOUIS PHILIPPE, King of the French, Duc d'Orléans and Chartres, and Count de Neuilly, was the eldest son of Louis Philippe Joseph, Duc d'Orléans, the Philippe Egalité of the Convention [ORLEANS, HOUSE OF], and Louise Marie de Bourbon, daughter of the Duc de Penthièvre.

Louis Philippe himself was born at Paris, October 6th, 1773. His youth was marked by many acts of benevolence, and the judicious training of Madame de-Genlis was well calculated to draw out the good qualities of those who were brought up under her charge. In his infancy he bore the title of Duc de Valois and afterwards of Chartres. In 1791 the young Duc de Chartres, having been nominated to the colonelcy of the 14th regiment of dragoons, assumed the command of that corps. It is said that almost his first act of authority was the rescue from the fury of the mob of two priests, who had refused to take the oath at that time exacted by the government from all ecclesiastics. On this occasion he showed great tact and presence of mind, and he subsequently received the honour of a civic crown from the municipality of Vendôme for rescuing M. de Siret, an engineer of that place, from drowning. By these means he became popular among the French people. In August 1791 the young duke quitted Vendôme in command of his regiment for Valenciennes. Whilst he was stationed there, war was proclaimed against Austria, and in the April following he entered on his first campaign. He fought his first battle at Valmy on the 20th of September, and on the 6th of November was again engaged under Dumourier at Jenappes. At this period the Revolution was rapidly advancing to a crisis at Paris. A decree of banishment had been passed (October 1792) against the Bourbon race; and though his father, the Duc d'Orléans, had renounced his titles and had been enrolled as a citizen under the name of Philip Égalité, his son in vain attempted to dissuade him from returning to Paris, where, having been made the dupe of the revolutionary party, and having voted for the death of Louis XVI., he was dragged to the scaffold in his turn, January 21, 1793. For seven months after this date the young duke remained at his post with the army; but in the following October the Committee of Public Safety summoned before them both the Duc de Chartres, and his faithful friend Dumourier. Aware of the sanguinary character of the tribunal before which they would have to plead, they fled to the Belgian frontiers, and made their escape into the Netherlands, then in possession of Austria. The Austrian authorities gladly received the fugitives, and even offered to bestow on the duke a commission in their army; but he refused to take up arms against his country, and retired into private life. In April he set out disguised as an English traveller, on a tour through Germany, and journeyed through Liège, Aix-la-Chapelle, Cologne, and Coblenz, towards Switzerland. The resources at his command were small, and he was beset by dangers wherever he went. His sister Adelaide, known in history as Mademoiselle d'Orléans, at the same time fled the country together with Madame de Genlis, and met her brother at Zürich. The authorities of that canton, in fear of the French government, declining to harbour them, the exiles took up their abode in Zug; but being discovered, the duke placed his sister and Madame de Genlis in the convent of St. Claire, near Baumgarten, adopted the disguise of a traveller, and started on a fresh journey of danger and adventure.

His funds were nearly exhausted, when he received from M. de Montesquiou the offer of a post as professor in the college of Reichenau, close by the conflux of the Upper and the Lower Rhine. He at once offered himself for examination, and was accepted, under the assumed name of M. Chabaud, in October 1793. Here he remained eight months, during which he was engaged in lecturing on mathematics and geography. At this time he accepted the friendly offer of M. de Montesquiou of an asylum at Baumgarten, where he remained in concealment till the close of 1794. His retreat being again discovered, he next went to Hamburg, in the hope of being able to procure a passage to America; but being disappointed, he crossed over viâ Copenhagen to Norway, Sweden, and Finland, which he traversed almost entirely on foot, as far as the North Cape. Meantime the course of circumstances at Paris had changed, and the Directory became anxious to compromise matters with the Orléans family, by procuring their voluntary removal to America. For the sake of his two brothers, the Duc de Montpensier and the Comte de Beaujolais, who had been thrown into prison as dangerous subjects, and at the same time in order to procure the restoration of his mother's estates which had been confiscated, Louis Philippe (whom we shall henceforth term the Duc d'Orléans) accepted a passage to the United States, and having left the Elbe in September 1796, reached Philadelphia, where he was joined by his two brothers. The next year the three brothers spent in travelling through the western provinces of America. In the course of this excursion, the duke gained great repute for his medical skill, by lancing a vein in his arm in an attack of fever. He afterwards performed the same operation for an Indian chief; in reward for which he was allowed to pass the night upon the large rug at the feet of the wild sovereign and his relatives. Having made the acquaintance of Washington at Mount Vernon, they returned to Philadelphia, whence they proceeded to New Orleans, and thence to Havanna. Here the Spanish authorities declining to treat them with respect, or even with civility, they went on to the Bahamas, where the Duke of Kent was in command. His Royal Highness entertained them with true British cordiality, though he did not feel at liberty to grant them a passage to England in a man-of-war. Accordingly they took ship to New York, and crossing to England in a sailing packet, they landed at Falmouth in February 1800. The royal exiles were welcomed in London by the King, the Prince of Wales, Lord Grenville, the Marquis of Hastings, and the leaders of the politics and fashion of the day. An Orléans mania prevailed through London, and an invasion of France to effect the restoration of the Bourbons was even talked of. After a short time the brothers settled at Twickenham, in a house formerly occupied by General Pollock, and since known as Orléans Lodge.

The Duc de Montpensier, whose health had long been declining, died at Twickenham in May 1807, and was buried in Westminster Abbey. Soon afterwards the health of the Comte de Beaujolais failed also, and having gone to a warmer climate in obedience to the order of his physicians, accompanied by the duke his brother, he died at Malta in 1808. Being now rejoined by his sister, who for fifteen years had lived in retirement in Hungary, and by his mother, whom he met at Minorca, the Duc d'Orléans took up his residence at Palermo. It so happened that Ferdinand, king of Naples and Sicily, was dwelling in that city under the protection of the British Flag, while Murat occupied his throne in Italy. During his residence there, he gained the affections of the Princess Amelia, the second daughter of the king, to whom he was married November 25, 1809. For upwards of four years the Duc d'Orléans resided at Palermo without taking any part in the public affairs of Europe, if we except a visit which he paid to Spain in 1810, in the illusive idea that negociations commenced by the Spanish and English authorities might eventuate in an offer on their part to entrust to his hands the regency of that country.

In 1814 tidings reached Palermo of the downfall of the emperor Napoleon I., and of the intended restoration of the Bourbons. The duke returned to Paris without delay, and was re-instated in his honours and military rank. The return of Napoleon in the early part of the following year again disturbed the tenor of his life; and having sent away his family to England for safety, the duke took the command of the army in the north in obedience to the orders of Louis XVIII. Rather than endanger the peace of France by family feuds, he resigned his command in the following March, and retired to Twickenham, whence he returned to Paris after the Hundred Days, in obedience to a decree compelling the attendance of princes of the blood in the Chamber of Peers. He conciliated the popular esteem and respect by liquidating the debts of the Orléans estates, and by other politic measures. Louis Philippe, in his place in parliament, publicly protested against the extreme measures proposed by the government against those who had taken part in the revolution, and procured their rejection. Louis XVIII., who regarded him with especial jealousy, in disgust and revenge, forbade princes of the blood royal to appear in the Chamber of Peers. The Duc d'Orléans revenged himself upon the court by entering his son in one of the public colleges as a simple citizen of Paris. He returned to England, and continued to live in privacy at Twickenham during the remainder of that king's life and the first few years of the reign of Charles X. He did not return to France until 1827, when he took up his abode at the palace of Neuilly, where he continued to live in seclusion until the year 1830, when the revolution occurred which ended in his elevation to the throne as King of the French. Charles, whose weakness and duplicity were his ruin, was now in effect discrowned; and the cause of the elder branch of the Bourbons being pronounced hopeless, the struggle of the three days of July was followed by a provisional government, in which Lafitte, Lafayette, Thiers, and other politicians, took the lead. They naturally turned to the Duc d'Orléans, and in the name of the French people offered to him the crown. After a day's deliberation he accepted it, and came to Paris on the 31st of July; and, the preliminary forms having been passed through, on the 9th of August the crown was formally accepted by the Duc d'Orléans, who was proclaimed as Louis Philippe. For seventeen years he sat on his elective throne, and if an increase of the wealth and physical progress of a nation be a test, the results of his reign may be advantageously compared with those of the first empire. Peace was preserved abroad, order was maintained at home, and commerce increased steadily. His foreign policy was in like manner successful: his sons, the Duc de Némours and the Prince de Joinville, carried the French arms into Algeria; Abd-el-Kader was made a prisoner, and the Bey of Constantine forced to sue for peace, after a spirited resistance, and Algiers became a French military colony. Yet the king was not popular at home. He was hated alike by the Legitimist party, in whose eyes he was but a usurper, and by the revolutionists, who sighed for entire emancipation from kingly rule. Besides, there are deep and dark stains upon the reign of the 'Napoleon of Peace,' as Louis Philippe liked to be called. His reign was a period of corruption in high places, of jealousy and illiberal restriction towards his own subjects, of a fraudulent and heartless policy towards the allies of his country, whose goodwill he more especially forfeited by his over-reaching conduct in regard to the marriage of the Duc de Montpensier to a Spanish princess. And thus it came to pass that the heart of the nation became alienated from their king; and when a trifling disturbance in February 1848 was aggravated into a popular riot through the audacity of a few ultra-republicans, Louis Philippe felt that he stood alone and unsupported as a constitutional king, both at home and abroad, and that the soldiery were his only means of defence. He shrunk from employing their bayonets against his people: he fell in consequence, and his house fell with him. The king fled in disguise from Paris to the coast of Normandy, and taking ship again found a safe refuge on the shores of England, to which his family had already made their escape. He landed at Newhaven, March 3rd, 1848. The Queen of England—who, in 1843, had enjoyed the hospitality of Louis Philippe at the Château d'Eu, his royal residence near Dieppe, and who had entertained him in the following year at Windsor, and conferred on him the order of the Garter—immediately assigned Claremont, near Esher, as a residence for himself and his exiled family. From the time of his arrival in England, his health began visibly to decline, and he died on the 26th of August 1850, in the presence of Queen Amelie and his family, having dictated to them the conclusion of his memoirs, and having received the last rites and sacraments of the Church at the hands of his chaplain. He was buried on the following 2nd of September at the Roman Catholic chapel at Weybridge, Surrey, and an inscription was placed upon his coffin, stating that his ashes remain there, "donec Deo adjuvante in patriam avitos inter cineres transferantur."

LOVAGE. HALOSCIAS, *S.* 2.]

LOWESTOFFE, or LOWESTOFT. [SUFFOLK.]

LOXOCLASE, a Mineral belonging to the anhydrous silicates of Alumina. It has nearly the form of Felspar, but is distinguished by a cleavage parallel with the longer diagonal. It contains 8 per cent. of soda and 3 per cent. of potash. It is found at Hammond, in the state of New York, in company with Pyroxene, Graphite, and Calcspar.

LOYDIA, or LLOYDIA, a genus of Plants belonging to the natural order *Liliaceæ*. The perianth is persistent and patent; stamens inserted at the base of the perianth; anthers erect; style filiform; stigma trigonous; seeds angular above, flat beneath.

L. serotina is a native of Welsh mountains. It is a rare plant, but is found on Mount Snowdon. The root-leaves are semi-cylindrical; stem-leaves dilated below and sheathing; flowers mostly solitary, nectary a transverse plait. The height of the plant is 5 or 6 inches. Stem and leaves springing separately from the root; stem-leaves several, short; flowers white, with reddish lines internally.

LUCANIA, a province of ancient Italy, bounded N. by the Silarus, the Apennines, and the Bradanus, which separate it from Campania, Samnium, and Apulia respectively; E. by the Gulf of Tarentum, along which it extended to the mouth of the Crathis; S. by Brutium; and W. by the Tyrrhene Sea, between the mouths of the Laus and Silarus. The territory of Lucania is now comprised chiefly in the modern province of Basilicata; portions of it are included in Calabria and Principato Citra. Under these heads the physical geography of the country is given, and many particulars respecting its ancient towns. The rivers that fall into the Gulf of Tarentum between the Bradanus and the Crathis were—proceeding from the north, the Casuentus, the Acalandrus, the Aciris, the Siris, and the Sybaris. These rivers rise in the mountains that cover all the interior of the province, and run generally in the direction of east by south across a very fertile plain, which skirts the shore of the Tarentine Bay. Along this shore were several celebrated cities founded by early Greek colonies; Metapontum, between the mouths of the Bradanus and the Casuentus; Heracleia, near the mouth of the Aciris and on its right bank; a little higher up the right bank was Pandosia; Siris, near the mouth of the Siris and on its left bank; Sybaris, near the mouth of the Sybaris; and Thurii, a few miles higher up, in the plain between the Crathis and the Sybaris. On the coast of the Tyrrhene Sea were Paestum, a few miles south of the Silarus, and Elea, or Velia, further south, on the Bay of Elea, and a few miles north of the promontory of Palinurus.

Heracleia, founded about B.C. 432 by the inhabitants of Thurii and Siris, was the place of meeting of the Italian Greeks till its capture by Alexander, king of Epirus, who transferred the meetings to Thurii. The city early rose to prosperity, and was in close alliance with Tarentum against the Lucanians and Messapians. The first engagement between Pyrrhus and the Romans took place in the plain between Heracleia and Siris B.C. 280, and ended in the total defeat of the latter. Two years afterwards the Heracleiots entered into alliance with Rome, and it continued to be a flourishing city under Roman sway till the time of the empire. The date of its final extinction is unknown. Its site is marked by mounds of rubbish and the foundations of ancient buildings near the farm of Policoro, which is marked on some maps near the mouth and on the right bank of the Agri. Many coins, bronzes, and other antiquities have been found on the site, and at a short distance were discovered the two very interesting bronze tables called Tabulæ Heraclëenses, which contain a Latin inscription relating to the municipal regulations of the city. On the back is a long Greek inscription of earlier date and of much less interest. The coins of Heracleia are beautiful masterpieces of ancient art. Zeuxis the painter, it is said, was a native of Heracleia.

LUCAS, FREDERICK, was the second son of Samuel H. Lucas, Esq., of Croham, near Croydon, Surrey, a member of the Society of Friends. He was born in 1812, and was educated at the London University, where he gained early distinction as a debater. He was called to the bar in 1838, and in the following year became a member of the Roman Catholic Church. In his new position he took an active part in public matters, and became the founder of the 'Tablet' newspaper, which he conducted as editor for many years. He was also a frequent contributor to the 'Dublin Review.' In 1849 he transferred the 'Tablet' from London to Dublin, and in 1852 was elected M.P. for Meath, mainly through the influence of the Roman Catholic priesthood, whose cause, and that of the poorer classes of the land of his adoption, he warmly espoused. Believing that the Roman Catholic priesthood, under the existing circumstances of the country, were the natural friends and guides of the lower orders, he very warmly and zealously advocated their right to take part in political affairs. In this view he was not supported by the Roman Catholic episcopate in Ireland; and towards the close of 1854 he travelled to Rome, in order to appeal to the pope against the decision of that body. His health, which had long been failing from over exertion of his mental and physical energies, broke down while the matter was under deliberation at Rome, and Mr. Lucas returned to England and died before a formal decision was given. His death occurred on the 22nd of October, 1855. He was a powerful but declamatory writer and speaker; but he succeeded from the first in securing the respect and attention of the House of Commons, and his able and fearless advocacy of Tenant Right, and of the independence of the Roman Catholic Church in Ireland, made his loss much regretted by his party.

LUDGERSHALL. [WILTSHIRE.]

LUFFA, a genus of Plants belonging to the natural order *Cucurbitaceæ*. The male flowers are panicled and yellow; the tube of the calyx hemispherical, segments longer than the tube; petals distinct, dropping off by the base; stamens 5, distinct; anthers very wavy. The female flowers are solitary; the tube of the calyx oblong, clavate, segments shorter than the tube; stamens abortive; stigmas reniform; gourd ovate, 3-celled, fibrous, internally operculate.

L. amara is found in hedges and dry uncultivated places in the East Indies. It has several stems, slender, running to a great extent, but with few branches, pretty smooth, 5-sided; tendrils 3-cleft: leaves slightly 5-7-lobed, rough; stipules axillary, solitary, cordate, with glandular marks on one side. Male flowers pretty large, yellow, on long erect axillary racemes; the pedicels with a glandular bract near the base, and articulated a little above it. Female flowers rather larger, axillary, solitary, pedunculated; fruit oblong, 3 or 4 inches long, and 1 inch in diameter, tapering equally towards each end, 10-angled; when ripe dry, gray, and filled with dry fibres; the operculum deciduous; seeds blackish-gray, with elevated minute black dots; every part is extremely bitter. The fruit is violently cathartic and emetic; the juice of the roasted young fruit is applied to the temples to cure headache by the natives of India; the ripe seeds are used either in infusion or substance by them to vomit and purge.

L. Bindual is a native of Hindustan. It is a climbing diœcious plant; the leaves are toothed and 5-angled. Male flowers in racemes. Female flowers solitary; fruit round, echinate, with long, straight, ciliate bristles. It is considered in northern India a powerful drastic in cases of dropsy. The leaves of *L. acutangula* are a favourite potherb of the natives of India, and are esteemed very wholesome.

LUG-WORM. [Arenicola, *S.* 2.]

LUMINOSITY OF ORGANIC BEINGS. Organic bodies under certain circumstances become luminous, and upon the supposition that this appearance depends on the combustion of phosphorus at a low temperature, the phenomenon has been called phosphorescence. This luminosity is very constantly developed under the same circumstances in both animals and plants. It is observed both during the decomposition of the bodies of plants and animals as well as whilst they are still living. The oldest observations on this subject were made on the wood of trees whilst in a state of decay. This however takes place only under peculiar circumstances. It generally occurs when the wood of trees is buried in the earth whilst they are in a green state, and does not take place when wood is allowed to decompose in the usual way and in free contact with the air. It is also found that the phosphorescence does not take place when the wood is allowed to decompose in a damp place. Wood exhibiting this property will retain it for a long period when kept in a dry place. Albrecht observed luminosity in a tree during the night at a spot where one of its branches had been torn off. Decaying fungi have been often observed to emit this light. Travellers in tropical climates have observed that when plants containing a milky juice are wounded, the juice frequently becomes luminous, whilst it is descending the sides of the tree. The cause of this phenomenon in decaying plants is probably owing to a slow decomposition of the tissues attended with a union of oxygen gas, but what determines the development of light under these more than other circumstances is still unknown.

In living plants luminosity has been frequently observed. It is most constant amongst some forms of fungi, especially of the genus *Rhizomorphæ*. In the coal-mines in the vicinity of Dresden the species of *Rhizomorphæ* are so numerous as to "dazzle the eye by the brilliant light they afford." [Byssaceæ, *S.* 1.] The light from decaying wood, as also from the living *Rhizomorphæ*, continues although they are immersed in irrespirable gases, linseed oil, phosphoric acid gas, oxygen, &c. The phenomenon in both the living and the dead plants is probably due to the same cause.

Another class of plants in which light has been observed is the Mosses. Several species of the genus *Schistostega*, which grow in caverns and other damp places, have been observed to give out light. Mr. Babington and other botanists have observed it in this country in the *S. pennata;* whilst Funk, Brandenburg, Nees von Esenbeck, Hornschuche, Struve, Unger, Bridel-Briderei, and Agardh, have observed it on the continent of Europe. The two latter attributed this light to a small alga, which Bridel-Briderei called *Catoptridium smaragdinum*, and Agardh called *Protococcus smaragdinus*, which they supposed was parasitic on the moss. Unger however has examined the moss more accurately, and finds that at certain seasons the utricles of this moss assume a globular form, and being partly transparent, the light is refracted and reflected in such a way as to present a luminosity on the surface of the vesicles.

Another class of these phenomena is that which is exhibited by the flowers of some plants. The first observation on this subject was recorded by Linnæus, and made by his daughter Christina Linnè. She was walking in the garden one hot summer's evening, when she observed the flowers of *Tropæolum majus* to give forth a stream of light. This was attributed by many to an optical illusion, but the fact has since been repeatedly observed on this as well as other plants. We are not perhaps in a position to say this was not an optical illusion; but if it was, one would expect that it should be more constant. It has also been seen by several observers at the same time in different positions, and when one has seen it, the others have seen it also. A correspondent of the 'Gardeners' Chronicle,' October, 1843, says, "I have frequently observed the luminous appearance of garden plants, and have looked for it in each succeeding summer on the double marigold, and more especially on the *Papaver pilosum*, the hairy red poppy, in my garden in Worcestershire. In the evening after a hot dry day, the flashes of light have afforded much amusement to myself and others." It is to this phenomenon that Coleridge alludes in the following lines:—

"'Tis said on summer's evening hour
Flashes the golden-colour'd flower
A fair electric flame."

Decaying animal bodies frequently emit a luminous appearance, which has generally been attributed to the presence of phosphate of lime in their skeletons, which become decomposed and yield phosphorus when exposed to the action of organic compounds in a state of decomposition. It is to this cause that the luminosity of putrefying fish is attributed. But the emission of light is a very constant phenomenon of many of the invertebrate animals under peculiar circumstances. Thus during warm weather, when a vessel passes through the ocean, the waves frequently exhibit a diffused lustre with here and there streaks and stars of a brighter light. This occurs in our own climate, but the phosphorescence is much more brilliant in tropical seas. Pöppig, in his 'Reise in Chili, Peru, und auf dem Amazonstrome,' describes this phenomenon in an equatorial sea. "Whilst one side of the vessel is still illuminated by the last fading rays of the evening sun, and the opposite side darkened by the shade of the sails, the sea in this direction already becomes brilliant. One spot after another begins to be illuminated, indistinct stripes of light commence glimmering from greater depths, till at last, with the approach of night, a new creation seems to be called into existence. These illuminated beings move in various directions, sometimes appearing like sparks, sometimes like a radiating ball of fire, at others darting through the dark surface of the water like a rapid flash of lightning. A great number of these beings are undoubtedly true night-animals which conceal themselves during daylight in the dark depths of the ocean."

These lights in the sea are principally produced by various species of the family *Acalephæ*. [Acalephæ; Pulmograda.] The light emitted by these animals seems to be due to the secretions on the surface of their bodies, for when this secretion is removed it retains for some hours its luminous character, and will even impart it to milk or water. But this property is not confined to the *Acalephæ*. Many species of *Polypifera*, some of the *Echinodermata*, and the lower forms of *Mollusca* also exhibit this appearance. Some few of the *Crustacea* and even Fishes have been observed to possess the same property.

Amongst insects this phenomenon is not uncommon. Those which possess the greatest luminous power belong to the *Coleoptera*, the Beetle-Tribe, and of these the two families represented by the Fire-Fly—the *Elateridæ*, and the Glow-Worm—the *Lampyridæ*, are the most distinguished. [Elateridæ; Lampyridæ.] Some of the species of the tribes of *Myriapoda* and *Annelida* give out light occasionally, as the Centipede and the common Earth-Worm.

(Meyen, *Pflanzen-Physiologie*, band ii.; Carpenter, *Animal Physiology;* Lankester, in *Gardeners' Chronicle*, 1843.)

LUNACY. The statutes mentioned under this head [Lunacy, *S.* 1, p. 233] have been to some extent repealed, and their administrative provisions have been consolidated and amended by the Lunacy Regulation Act, 1853, 16 & 17 Vict. c. 70, by which the proceedings of the Court of Chancery in the care and custody of lunatics are now regulated. The Lords Justices of the Court of Appeal in Chancery have the same jurisdiction in matters of lunacy as the Lord Chancellor, and by them indeed are proceedings in such matters now usually disposed of.

LUNACY (SCOTLAND). The previous statutes regulating the care and treatment of lunatics in Scotland are repealed, and the whole law on this subject consolidated and amended by the statute 20 & 21 Vict. c. 71.

LUNGS. The development of the lungs has been recently investigated, and the following is Kölliker's summary of what is known:—

"In the *Mammalia* the lungs appear a little after the liver, in the form of two hollow protrusions of the anterior wall of the pharynx, which are in close apposition, and soon become furnished with a common peduncle—the rudiment of the larynx and trachea—and in the composition of which the epithelial tube and the fibrous membrane of the intestine take an equal share. In the further course of development there springs from the extremities of the original protrusions a continually-increasing number of arborescent processes, which differ entirely in what may be observed in most other glands. From their first formation they are always hollow, and in the sixth month the air-cells are developed from their invariably clavate dilated extremities. During this growth of the glandular elements the interior epithelium extends itself by spontaneous multiplication of its cylindrical cells (probably by division), whilst at the same time the fibrous layer surrounding them also grows, and finally constitutes the fibrous membrane of the bronchiæ and air-cells, together with the vessels and nerves. In the second month in the human embryo, the large pulmonary lobes are already formed; and besides them smaller divisions also, 0·16‴ in size, may be recognised, originating in the dilated extremities of the bronchiæ, which even at this time are considerably ramified. As development proceeds, and the ramifications of the bronchiæ are multiplied, these gland-granules, as they are termed, become more and more numerous, and ultimately, in the fifth month, are aggregated so as to form smaller lobules of 0·24‴—0·48‴ in size, each of which in all probability is produced from a single gland-granule, or bronchial termination, of the second month. Each of the gland-granules of these lobules, which correspond with the secondary lobules of the future lung, by continued budding, finally constitutes a primary lobule, which, with air-cells of 0·025‴—0·03‴ in size, first becomes distinctly visible in the sixth month, although up to the time of birth new alveoli are constantly superadded. In the new-born child the secondary lobules measure 2‴—3‴—4‴; the alveoli, before they are filled with air, 0·03‴, and after the first inspiration, 0·03‴—0·04‴—0·06‴; the latter at this time appear to exist in the same number as in the adult, the further increase of the lungs proceeding only from the expansion of all its parts.

"The investigation of the lungs," continue the translators of Kölliker, "presents no real difficulty, except in one point; that is, with respect to the relation of the pulmonary cells to the terminations of the bronchiæ; but here the difficulties are very considerable. In recent preparations it is obvious that the air-cells communicate in many ways, and in any case that they are not merely terminal on the extremities of the bronchiæ. If it be desired to investigate the whole subject, inflated and dried lungs (it is better in an inflated lung to tie off an end and dry it by itself), or corroded preparations, or lungs injected with uncoloured substances (wax and resin), are most suitable; and with such a definite result will be obtained, after a series of observations. Before the injection of the bronchiæ is proceeded with the air must be exhausted in the air-pump, for which purpose also, though less conveniently, a well-fitting syringe may be employed. The injection of the blood-vessels is readily effected, and the preparation should be kept wet; sometimes when injected with opaque material, sometimes following the processes of Schröder and Harting, with transparent substances (Prussian blue, &c.), dried preparations are to be preferred. The air-cells and bronchiæ, the larynx and trachea, are readily examined. The epithelium of the air-cells is obtained in large quantities in every section through the lung, as well as ciliated cells. If it be wished to study the alveoli, the air must previously be carefully removed. These are best displayed in man, in whom also all other parts, such as cartilage, elastic elements, muscles, and glands, are easily obtainable."

(Kölliker, *Manual of Human Histology*, translated for the Sydenham Society by Busk and Huxley.)

LUTEOLINE. [CHEMISTRY, *S.* 2.]

LYCIUM, a genus of Plants belonging to the natural order *Solanaceæ*. It has an urceolate calyx regularly 5-toothed, or irregularly 3-5-cleft; permanent corolla funnel-shaped or tubular; limb 5- or 10-cleft, or toothed, imbricate in æstivation, sometimes plicate; stamens 5, usually exserted; filaments banded and widened at the base; stigma peltately depressed, or capitate, bisulcate; berry roundish, 2-celled, propped by the permanent calyx; placentas adnate; seeds numerous, reniform. The species are trees or shrubs usually spinose. Corollas white, yellow, rose-coloured, purple, blue, or scarlet.

L. Europæum has erect loose branches; buds spinescent; leaves fascicled, obovate, lanceolate, obtuse, or spathulate, bent obliquely; flowers twin or solitary; corolla funnel-shaped; stamens exserted, but shorter than the limb. It is a native of the south of Europe and the north of Africa: in the Grecian islands common in hedges, but scarcely indigenous. The calyx is 5-cleft, ruptured at the side: the corollas pale violet, reticulated with red veins; tube greenish. Clusius says that the young shoots are eaten in Spain with oil and vinegar.

L. barbarum has dependent branches; buds spiny; leaves lanceolate, flat, glabrous, acute; flowers twin, extra-axillary, pedicellate; corolla funnel-shaped; stamens exserted, about equal in length to the limb. It is a native of the north of Asia, Africa, and south of Europe. There is a variety having pale corollas and yellowish red berries.

There are about 30 species of this genus described, many of which are to be found in our gardens. They are commonly known by the name of Box-Thorn.

LYCOPODIUM, a genus of Plants belonging to the natural order *Lycopodiaceæ*. It has 1-celled 2-valved capsules, containing powder, or 3-valved, containing 1 to 4 granules.

L. clavatum, Common Club-Moss, has scattered leaves, incurved, with a filamentous point; spikes stalked 2 or 3 together, cylindrical; scales ovate, triangular, membranous, finely incised, serrated. The stem is prostrate and long; branches short and ascending; spikes on long stalks, pale-yellow; scales on the stalks irregularly disposed in whorls. The powder contained in the spore-cases is highly inflammable: shaken out and collected it is employed under the name of Lycopode, or Vegetable Brimstone, on the Continent, in the manufacture of fire-works, and in pharmacy to roll up pills, which when coated may be put in water without being moistened. The plant has long been used as an emetic; a decoction of it is said to be serviceable in removing Plica Polonica.

L. annotinum has scattered lanceolate leaves; spikes sessile, solitary, terminal; scales roundish, with an alternated point, membranous, and jagged. The branches are rather long and erect, each year's growth is marked by a spot where the leaves are adpressed. The spikes are cylindrical, greenish-yellow, not persistent. It is found on stony mountains in Cumberland and Caernarvonshire, and is common in the Highlands of Scotland.

L. alpinum, Savin-Leaved Club-Moss, has leaves in four rows, imbricated, acute, keeled, entire; spikes sessile; solitary, terminal; scales ovate-lanceolate, flat; branches erect, clustered, forked, level-topped. The stem is prostrate and long. Fertile branches, usually twice dichotomous, each division ending in a short cylindrical yellowish-green spike, rather thicker than the branch. It is found on elevated mountains in Great Britain.

L. Selago, Fir Club-Moss, has leaves in eight rows, crowded, uniform, linear-lanceolate, acuminate; capsules not spiked, but in the axils of the common leaves; stem erect, forked, level-topped. The stem is short, erect, or slightly decumbent, densely leafy. Occasionally in sheltered positions the stem becomes elongated. In the Highlands of Scotland it is made into an irritating ointment, which is applied with advantage to the neighbourhood of the eyes as a counter irritant. Internally administered it acts as an emetic and cathartic. Linnæus says the Swedes find the decoction serviceable as a detergent lotion, and in destroying the vermin that infest cattle.

L. inundatum and *L. selaginoides* are the other British species, both found in boggy places. The most remarkable species is the *L. rubrum* of Chamisso, *Yatum condenado*, Great Devil. Sir William Hooker, who calls it *L. catharticum*, states that it acts most violently as a purgative, and has been administered successfully in Spanish America in cases of elephantiasis. According to Vastring, Club-Mosses are likely to become of importance in dyeing: he asserts that woollen cloths boiled with Lycopodiums, especially with *L. clavatum*, acquire the property of becoming blue when passed through a bath of Brazil-Wood. *L. phlegmaria* is reputed an aphrodisiac. *L. squamatum* is remarkable for its hygrometrical properties, rolling up into a ball when dry, and expanding when moisture is applied.

(Balfour, *Classbook of Botany; Babington, Manual of British Botany;* Lindley, *Vegetable Kingdom.*)

LYCOPSIS, a genus of Plants belonging to the natural order *Boraginaceæ* and the tribe *Anchuseæ*, which have their 4 nuts placed on a hypogynous disc, with an excavated space surmounted by a tumid ring at their base.

Lycopsis has the calyx in 5 deep segments; the tube of the corolla curved; the limb oblique. The species closely resemble those of *Anchusa*, except in the above characters.

L. arvensis, the Bugloss, has lanceolate erose-dentate very hispid leaves; the calyx of the fruit is bell-shaped, erect. The flowers are small and blue. The whole plant is very hispid, with strong hairs, each rising from a scaly tubercule. It is common in the fields and hedges of Great Britain and Europe.

LYCOPUS, a genus of Plants belonging to the natural order *Labiatæ*. It has a 4-fid corolla, scarcely longer than the equal 5-toothed calyx; stamens 2; anther-cells parallel or ultimately divergent; 2 upper stamens wanting, or rudimentary, or rarely perfect.

L. Europæus inhabits wet ditches and sides of ponds, and is known popularly under the name of Gipsey-Wort, because gipsies are said to stain their skins with its juice. It has stalked ovate-oblong leaves, glabrous or pubescent, opposite. Flowers small, in dense whorls. It is found on banks of streams and ditches in Great Britain.

LYDD. [Kent.]

M

MAAS, or MAES, NICOLAS, a celebrated Dutch painter, was born at Dort in 1632. He was a scholar of Rembrandt, whose manner he imitated with so much skill that it was thought difficult to distinguish the works of the pupil from those of the master. But a visit to Antwerp, where he diligently studied the productions of Rubens and Jordaens, led Maas to adopt a new and more independent style; and one in which, while retaining his former neatness and delicacy of touch, and breadth of chiaroscuro, there was more freedom of handling and variety of colour. His early celebrity was acquired by his genre pictures, chiefly domestic interiors, but he eventually devoted himself to portrait painting, especially after his removal to Amsterdam, where he settled in 1678; and where he rose into high reputation as a portrait painter, and acquired a considerable fortune by the practice of that lucrative branch of art. He died at Amsterdam in 1693. Bartsch mentions several plates etched by him. In the National Gallery there are three paintings by him—like most of his genre pictures, of small size, but elaborately finished—'The Cradle,' 'The Dutch Housewife,' and 'The Idle Servant.'

MACDIARMID, JOHN, was born about 1789 in Edinburgh, where he received his early education, partly at the common schools and partly at the university. He began his career as a clerk in a manufacturing establishment, whence he removed to the Commercial Bank, where for a few years he discharged highly responsible duties. While so engaged he ceased not to pay attention to his literary studies, was occasionally amanuensis to Professor Playfair, contributed poetry to the 'Scots Magazine,' and was an active member of a debating society called the 'Forum.' In January 1817 he became editor of the 'Dumfries Courier,' of which he afterwards became the proprietor. It was in this position that Mr. MacDiarmid chiefly distinguished himself. He raised the character of the provincial press by introducing originality and taste into the conduct of it, his newspaper becoming highly successful, and a model for others. Mr. MacDiarmid had a partiality for natural history, and he was accustomed to observe and record the abnormal specimens which occurred; but though a laugh was sometimes raised at his accounts of enormous gooseberries or marvellous turnips, it is not known that he ever wilfully exaggerated. In addition, he drew attention to the antiquities and natural beauties of Dumfriesshire, and the adjacent counties of Kircudbright and Wigton, not only in the newspaper, but by separate publications, 'The History of Dumfries,' the 'Guide to Moffat,' &c. His other works were—a 'Life of Cowper,' published in 1817; a 'Life of William Nicholson, the Galloway Poet;' 'Sketches of Nature,' 'The Scrap-Book,' &c. After conducting the paper with extraordinary vigour and fertility, he died on November 12, 1852.

MACGILLIVRAY, WILLIAM, a distinguished Scotch naturalist. He was born in the Isle of Harris, and early acquired a taste for natural history, and having gone to reside in Edinburgh, became the assistant of Professor Jameson in the Natural History and Geological Museum of the University. He was afterwards appointed to the position of Conservator of the Museum of the Royal College of Surgeons in Edinburgh. In these positions he had extensive opportunities of studying the specimens and preparations which were committed to his charge, and he seems to have neglected none of the rare opportunities which presented themselves for adding to his store of knowledge. He did not however confine himself to the museum, for he was in the strict sense of the word a lover of nature, and studied natural history extensively in the field. Nor did he confine himself to one department—minerals, plants, and animals, all laid claim to his attention, and he possessed a sufficient knowledge of each to make considerable contributions to the branches of science which contemplate their study. On account of his extensive knowledge of natural history the University of Aberdeen bestowed upon him the degree of LL.D., and subsequently he was appointed Professor of Civil and Natural History in Marischal College, Aberdeen. Here he cultivated natural history with great ardour, and wrote some of his most valuable works. He died at Aberdeen on the 5th of September, 1852.

Dr. Macgillivray published various papers on natural history subjects in the 'Memoirs of the Wernerian Society,' the 'Edinburgh New Philosophical Journal,' the 'Reports of the British Association,' and the 'Magazine of Zoology and Botany.' He was also the author of several substantive works of great value.

His labours in botany were not so extensive as in other departments of natural history; he nevertheless edited an edition of Withering's 'Arrangement of British Plants,' and published several lists of plants illustrative of the distribution of the British species.

His geological papers were numerous, and he published in 1839 'A Manual of Geology, with a Glossary and Index.'

Of his various works on zoology, his 'History of British Birds,' in three volumes, two of which were published after his death, is undoubtedly the most important. In this work he has displayed great power of observation, with a skill in the description of the habits of birds quite unrivalled. This work is illustrated with sketches drawn by the author, which display very considerable artistic skill. He is also the author of a 'History of British Quadrupeds,' in Jardine's 'Naturalist's Library.' In 1843 he published a 'History of the Molluscous Animals of the counties of Aberdeen, Kincardine, and Banff.' He also produced a 'Conchologist's Text-Book,' which has gone through a large number of editions.

At the time of his death he had prepared for the press a volume on the 'Natural History of Dee-Side,' which consisted of an account of a personal tour up the valley and among the mountains of Dee-Side. It also contained sketches of the geology, botany, and zoology of the district, with lists of the minerals, plants, and animals of Dee-Side. As this work could hardly be expected to meet with a remunerative sale the family declined to publish it, and the existence of the manuscript having been made known to the Queen of England she generously purchased it of the family, and the work has since been published by her Majesty's command. It forms a handsome octavo volume, illustrated with several woodcuts of the scenery of the district, and contains a carefully executed map of the district of the river Dee, in which the geology of the valley and mountains is laid down. This work was printed for private circulation, and was very liberally presented to the naturalists, natural history societies, and public libraries of Great Britain by His Royal Highness Prince Albert.

Dr. Macgillivray left behind him a large family. His eldest son, Mr. John Macgillivray, accompanied Captain Stanley in the voyage of the Rattlesnake, and published an account of the voyage on his return. He has also published several papers on various departments of natural history.

The following estimate of his character appeared in a notice of his 'British Birds' in the 'Athenæum' for 1852:—

"Dr. Macgillivray was a naturalist, and one of no mean order. Had he confined his attention to a few of the subjects of the vast field over which he laboured with unwearied industry through a long life, he would perhaps have attained a yet higher position as a man of science than that which he reached. Whilst in the fields, on the mountains, or by the sea-shore, he had an eye to every natural object that surrounded him, and the interest with which he regarded them is expressed in the numerous papers and works which he has written on botany, geology, and zoology. Though a list of Dr. Macgillivray's works would alone occupy a large space, yet he was not a man of the closet. Though one of the most diligent of compilers, he was a laborious original investigator. Whilst he lived by natural history as a profession, he pursued it as a science, and in return for the scanty means which it afforded towards the necessities of existence, he rendered a large amount of observation made with great labour and self-sacrifice. Although naturally an amiable man, he has frequently in his works—as is often the case with self-educated men of an ardent character—expressed himself strongly on the views of others, and in this way he made many enemies during his life. Now that the grave has closed over him, even those with whom he most differed will look back on his career only to admire."

MACHÆRIUM, a genus of Plants belonging to the natural order *Leguminosæ*. One species, *M. Schomburgkii*, produces the Itaka Wood of Guyana, remarkable for its brown and black streaks, on which account it is employed in cabinet-work.

MACHYNLLETH. [Montgomeryshire.]

MACLURA, a genus of Plants belonging to the natural order *Moraceæ*. The fruit of *M. aurantiaca*, the Osage Orange, is as large as the fist, orange-coloured, and filled with a yellow fœtid slime, with which the native tribes smear their faces when going to war. The wood of *M. tinctoria* is the dye-wood called Fustic; it contains Morine, a peculiar colouring substance; its fruit is pleasant; and used in North American medicine for the same purposes as the black mulberry in Europe. According to Martius, both the other species of the genus yield fustic in Brazil. (Lindley, *Vegetable Kingdom*.)

MACROCYSTIS, a genus of plants belonging to the natural order *Fucaceæ*, and the tribe *Laminaridæ*. The enormous fronds produced by *M. pyrifera* have been spoken of by many navigators. They appear to be from 500 to 1500 feet in length; the leaves are long and narrow, and at the base of each is a vesicle filled with air, without which it would be impossible for the plant to support its enormous length in the water, the stem not being thicker than the finger, and the upper branches as slender as common packthread. This plant was seen by Dr. Joseph Hooker in 61° S. lat., in large vegetating patches wherever the water was free of icebergs.

MACRODIPTERYX. [Night-Jars.]

MACROGLOSSA. [Cheiroptera.]

MACROOM, county of Cork, Ireland, a post and market-town, and the seat of a Poor-Law Union, is situated on the river Sullane, and on the road from Cork to Killarney, in 51° 55′ N. lat., 8° 55′ W. long., distant by road 24½ miles W. from Cork, and 182½ miles S.W. by S. from Dublin. The population in 1851 was 3727, besides 2124 in the workhouse. Macroom Poor-Law Union comprises 25 electoral divisions, with an area of 179,108 acres, and a population in 1851 of 37,394. The town consists principally of one street nearly a mile in length, occupied in great part by cabins and other mean dwellings. Near the centre are some good houses and shops. The parish church, the Roman Catholic chapel, the sessions-house and bridewell, and a market-house, the dispensary, and the Union workhouse are the public edifices. Petty-sessions are held monthly. Fairs are held on the 12th day of May, July, September, and November. There is a large weekly market. Macroom Castle is a fine old structure overhanging the river.

MACROPIPER, a genus of Plants belonging to the natural order *Piperaceæ*. *M. methysticum*, the Ava, is the most celebrated of the narcotic Pepper-Worts. It has cordate acuminate many-nerved leaves; solitary axillary spikes, very short, pedunculated, and spreading. The rhizoma is thick, woody, rugged, and aromatic. It is used in tincture against chronic rheumatism. Macerated in water it forms an intoxicating beverage, of which the Otahetians make use as a medicine; they make themselves drunk, after which very copious perspiration comes on: this lasts three days, at the end of which time the patient is cured.

MACRORHINUS. [Seals.]

MADATEUS. [Cheiroptera.]

MADELEY. [Shropshire.]

MADISON. [Indiana.]

MAES. [Maas, *S.* 2.]

MAGENDIE, FRANÇOIS, a distinguished French physician and physiologist. Although his father practised as a physician in Paris, he was born at Bordeaux on the 15th of October 1783. He was soon after brought to Paris, where he had the misfortune to lose his mother. His father took an active part in the revolutionary movements of the period, was mayor of the 10th arrondissement, a member of the Hospital Council, and of the Commune de Paris. He also married a second time, and the result was an almost entire neglect of his child, who is said not to have been able to read at the age of ten. He was however then sent to school, and at the age of fourteen had achieved such success that he was rewarded with a prize at the annual concours. Through his father he was introduced to the celebrated Boyer, and became his pupil, and afterwards his demonstrator of anatomy. At the age of twenty, after an examination by concours, he was appointed aide d'anatomie (prosector) in the Faculty of Medicine, and shortly afterwards a demonstrator. In this position he devoted himself enthusiastically to the study of surgery, but he was induced by Dupuytren to give up this branch of the medical art, and devote himself to the practice of medicine. He was subsequently appointed physician to the Hotel Dieu. In 1819 he was elected a member of the Academy of Sciences; he was also a member of the Academy of Medicine, and in 1831 he succeeded Professor Recamier, who had resigned on the accession of Louis Philippe to the throne of France, in the chair of anatomy in the College of France.

Professor Magendie was a laborious writer as well as one of the most illustrious physiological experimentalists and discoverers. His larger works are as follows:—1, 'Formulaire pour la Préparation et Emploi de plusieurs nouveaux Medicaments.' This work was published in 1821, and was speedily translated into all the languages of Europe. It contained an account of the action of those potent active principles found in plants, which had at that time been introduced into the practice of medicine, more particularly by the exertions of French chemists and physicians. It included such remedies as morphine, strychnine, prussic acid, and others, on the operation of which on the animal system Magendie had successfully experimented. 2, 'Précis Élémentaire de Physiologie.' This work was originally published in two volumes at Paris in 1816-17. It went through several editions, and was afterwards entitled, 'Elémens de Physiologie.' It was translated into German and English, and for many years it was one of the best manuals of physiology for the use of students. 3, 'Leçons sur les Phénomènes physiques de la Vie.' These were a series of lectures delivered at different times, and collected together by M. J. James, and published in 1836-42. These were also translated, though occupying four volumes, into German. 4, 'Leçons sur les Fonctions et les Maladies du Système nerveux.' These also were lectures delivered in the College of France, and were published in two volumes in 1839. 5, 'Leçons sur le Sang.' These lectures on the blood were also published in Paris in 1839. 6, 'Recherches philosophiques et cliniques sur le liquide cephalo-rachidien, ou cerebro-spinal,' Paris, 1842. In addition to these larger works, Magendie published a large number of papers, which will be found scattered through the 'Comptes Rendus,' and contained in the 'Journal de Physiologie experimentale,' a periodical which he started in 1821, and which he continued to edit for ten years. He was also a contributor to several of the Dictionnaires which appeared in France during the commencement of the present century. He wrote for the 'Dictionnaire de Médécine et de Chirurgie pratique,' the 'Encyclopædie des Gens du Monde,' and the 'Dictionnaire de Médécine usuelle.'

Although Magendie wanted the generalising power which would have placed him at the head of European physiology, he was most industrious in the performance, and ingenious in devising of physiological experiments. It was as an experimenter that he produced a lasting impression on the progress of physiology. In fact so numerous were his experiments at one time on living animals, that the authorities in France thought it necessary to interfere. Some of the results of his physiological enquiries are too important to be passed over in this notice:—

1. Magendie first successfully demonstrated what had been only suspected by previous physiologists, that the veins were organs of absorption. His experiments on this subject have been regarded by physiologists as setting this question at rest, and proving that the veins are the great agents in the absorption of liquids.

2. His numerous experiments on the absorption of poisons led to a more accurate apprehension of the nature of their action on the human system. He first demonstrated that

strychnia acts upon the spinal cord, and destroys by paralysis the nerves of respiration, thus inducing asphyxia.

3. He gave a more accurate account of the act of vomiting, and showed how little it depended on the action of the stomach itself.

4. He investigated with great care the action of hydrocyanic, or prussic acid on the human system, and drew attention to its value as a remedy in certain forms of cough arising from irritation in the lungs.

5. Long before the chemical nature of food was understood, Magendie pointed out that non-nitrogenous foods were innutritious. This conclusion was the result of a long series of experiments on the feeding of the lower animals.

6. He performed a series of experiments on the admission of air into the veins, and showed how likely this was to be a cause of death in operations about the throat.

7. Magendie must share with Sir Charles Bell the honour of having discovered the real functions of the spinal nerves. Walker had demonstrated the existence of two roots to the spinal nerves. Bell showed that the nerves performed two functions, that of sensation and volition, and that these were sometimes separate, but the final demonstration of the two roots of the spinal nerves being devoted to the two separate functions, seems to have been first clearly established by Magendie.

To these more important discoveries and investigations must be added a large number of experimental researches upon the functions of the brain, its parts and nerves. If these did not lead to immediate and decisive results, they have been important facts by means of which others have been since guided to more correct conclusions.

Magendie was made a Commander of the Legion of Honour, and few men gained more of the respect and confidence of the government in matters of public health, whilst amongst the medical profession he was held in the greatest respect on account of his great talent and original genius. He died on the 8th of October 1855.

MAGHERAFELT. [LONDONDERRY.]

MAGONIA, a genus of plants belonging to the natural order *Sapindaceæ*. The flowers are polygamous; the male flowers have a 5-parted unequal reflexed calyx; petals 5, linear, and unequal; disc unequal between the petals and stamens, on one side long and double, in the other short, simple, and rugose; stamens 8, diclinate. Hermaphrodite flowers as in the male, but stamens much smaller and not diclinate; ovary 3-celled, many-seeded; styles curved; stigma 3-lobed; capsule large, woody, 3-valved, loculicidal; seeds large, flattened, surrounded with a wing; hilum in the edge. The species are trees with a corky bark; leaves alternate, abruptly pinnate, without stipules; flowers panicled.

M. pubescens is a small tree common in the western deserts of the province of Minas Geraes in Brazil. It has downy branches; leaflets 8, ovate or oblong, sessile, deeply emarginated and downy; the flowers in a terminal sessile or stalked panicle from 9 to 16 inches long; calyx downy, yellowish-green; petals linear, obtuse above, in the middle smooth and dark purple, at the edges and point downy and green; fruit a large, woody, globose, 3-cornered, somewhat depressed capsule, with 3 valves, 3 cells, and many seeds. The ashes of this plant are extremely alkaline. The bark is used for subduing the swellings produced in the skin of horses by the stings of insects. The leaves of this species and *M. glabrata* are poisonous to fishes.

MAGPIE-MOTH. [ABRAXIS.]

MAI, ANGELO, CARDINAL, and Prefect of the Vatican Library, Rome, was born at Schilpario, a mountain village of the province of Bergamo, Italy, March 7, 1782. He received his early education in the village school, and his first master in the higher studies was the ex-Jesuit Father, Lewis Mozzi de' Caspitani. In 1799 Mozzi, struck by the taste and capacity for classical learning which Mai displayed, selected him, along with four other youths of the village, to enter the novitiate of the Jesuit society, which, although elsewhere suppressed, the Duke of Parma, with the sanction of Pius VI., was about to re-establish at Colorno, a small city of his duchy. In this community Mai resided till the provisional restoration of the society in Naples (1804), whither he was sent as Professor of Greek and Latin literature. About the end of 1805, he was transferred to Rome for the completion of his theological studies, and soon afterwards was removed to Orvieto, on the invitation of the bishop, Giambattista Lambruschini. He was here admitted to priest's orders; and to the opportunities which he thus enjoyed of intercourse with two learned Spanish fathers of the Society, Montero and Menchaca, he himself used to ascribe not only his familiarity with the Hebrew language, but what much more sensibly influenced his after-career, his accurate knowledge of palæography, and his skill in deciphering ancient manuscripts.

Mai returned to Rome in 1808, just about the time when the contest of Pius VII. with Napoleon was reaching the crisis; and an order issued by the viceroy, commanding all subjects of the kingdom of Italy to return to their respective provinces, compelled him to change his residence once again. Happily for the interests of literature he settled at Milan.

The Ambrosian Library of that city had long been known as rich in manuscripts of the highest interest—the remnant of the treasures of the old monastic libraries, especially those of Bobbio and Lucca, and of some of the suppressed Benedictine convents of the Protestant cantons of Switzerland. Many of its best treasures had been made public by Muratori, Mabillon, and the Benedictine editors; but there yet remained a department entirely unexplored, which Mai soon appropriated to himself, and which has since come to be regarded as exclusively his own—that of palimpsest or re-written manuscripts, in which the original writing has been effaced in order to make room for a later work written over it. Through the influence of Padre Mozzi and the recommendation of his friends, and especially of Count Mellerio of Milan, Mai was admitted an associate and eventually a doctor of this celebrated library; and, from the date of his arrival in Milan till his ultimate translation to the Vatican, he laboured in his novel editorial career with a zeal and success not unworthy of the traditional glories of his country. His first essay as an author was a Latin translation (with a commentary) of Isocrates 'De Permutatione' (1813), the original of which had been published by a Greek named Andrew Mustoxidi in the previous year; but this was only the prelude of his far more remarkable successes in the decipherment and publication of palimpsest manuscripts. Up to this period, with the exception of Kuster and Wetstein's readings of the Old and New Testament from the 'Codex Ephremi,' Knittel's portions of the Gothic Bible of Ulphilas, Peter Bruns's fragment of the ninety-first book of Livy, and Barrett's palimpsest of the Gospels, palimpsest literature was entirely untried. Within a few years Mai deciphered and published from palimpsest sources two volumes of inedited fragments of Cicero's 'Orations;' a volume of letters and other writings of Fronto, the preceptor of Marcus Aurelius; some fragments of the lost 'Vidularia' of Plautus; a lost work of Porphyrius, the Platonist; some portions of Dionysius of Halicarnassus; two works of Philo Judæus; eight orations of Lysimachus; an oration of Isæus; two books of the Sybilline Verses; and several other works of the same character.

During this time Mai, although a member of the Jesuit Society, had not taken the solemn vows of the order, which indeed was not formally restored by papal authority till 1814. It was then thought, both by his superiors and by the authorities at Rome, that he could render more effective services to literature and to religion by remaining attached to the Ambrosian Library. Accordingly, with the full approval of all the authorities, he withdrew from the Society, and remained, as a simple priest, at Milan till 1819, when he was called to Rome as chief keeper of the Vatican Library, canon of the Church of St. Peter's, and domestic prelate of the Pope Pius VII. Soon after his establishment in the Vatican, he completed what was wanting in those fragments of Fronto which he had already printed at Milan; having happily discovered in the Vatican the missing portion of the manuscript from which the Milanese fragments had been printed, and which had (as well as the Milanese manuscript) originally belonged to the library at Bobbio. In the following year he published the work by which he is best known out of Italy—a large and interesting portion of the long-lost 'De Republicâ' of Cicero, the fragments of which he arranged with consummate skill in their respective order, and interwove with all the known extracts of the work which had been preserved by ancient authors. The whole text he illustrated by a critical commentary of exceeding interest, which at once established his reputation as one of the first scholars of the age.

From these comparatively desultory labours he turned to a project not unworthy of the palmiest days of Italian editorship. Selecting from the vast and till then imperfectly explored manuscript treasures of the Vatican, he prepared his 'Scriptorum veterum Nova Collectio e Vaticanis Codicibus edita;'—a vast series of ten 4to volumes (Rome 1825, and following years), on the plan of the various *Anecdota*, published under different titles by Mabillon, Pez, Montfaucon, Muratori, and others. It is a work of immense labour and research, and of a most miscellaneous character—Greek and Latin, sacred and profane, theological, historical, patristical, and philosophical. One of the volumes, the second, is perhaps the most curious of the entire, containing considerable fragments, recovered from a very early palimpsest manuscript, of almost all the ancient Greek and Roman historians, Polybius, Diodorus Siculus, Dionysius of Halicarnassus, Dion Cassius, Appian, Dexippus, Eunapius, and others.

The 'Vaticana Collectio,' was quickly followed by a similar collection in ten volumes, 8vo, 'Classici Scriptores ex Codicibus Vaticanis editi,' completed in 1838; which included some of the editor's earlier publications (especially the 'De Republicâ'); although, with the exception of about two volumes, its contents are entirely new. While he was engaged in the publication of this series he held the laborious and responsible post of secretary of the Propaganda, to which he had been appointed in 1833; and it was observed with wonder that his extensive literary engagements never were suffered to interfere with the duties of the secretariate. His active and business-like habits, the promptness of his decisions, and the prudence and discretion of his whole administration, are still gratefully remembered by the members of the various missions under the surveillance of the Propaganda.

After five years of service in this laborious office, he was named (1838) cardinal, at the same time with his friend and successor in the Vatican Library, Mezzofanti; and soon afterwards was appointed to several important and confidential offices in the Roman court, chiefly of a literary character. He was named successively Prefect of the Congregation for the Supervision of the Oriental Press; Prefect of the Congregation of the Index; and Prefect of the Congregation of the Council of Trent. In 1853 he was appointed to the still more congenial post of Librarian of the Roman Church.

This elevation did not interrupt in the slightest degree the literary labours in which he had been engaged. Scarcely was the collection of 'Classici Auctores' completed when he commenced a similar one, also in ten volumes, 8vo, 'Spicilegium Romanum' (1839-44), equally interesting and various in its contents, and a fourth collection entitled, 'Nova Patrum Bibliotheca,' published in 1853 in six volumes 4to; thus completing a series unparalleled since the days of Muratori, and indeed far more extraordinary than the older collections, from the circumstance that it was compiled from the mere gleanings which had escaped the research of the earlier generations of editors and collectors. Several years before, he had undertaken to edit the well-known 'Codex Vaticanus' of the Old and New Testament with various readings and prolegomena. The text of this edition was printed many years before his death, but its publication was delayed in order that it might be accompanied by the intended prolegomena. He died however at Albano, September 8, 1854, in his seventy-third year, leaving this great work still unpublished; and it is much to be regretted that since his death no trace has been found among his papers of the long-expected dissertations which he had intended to prefix to the 'Codex Vaticanus.' It is conjectured either that, engrossed by his other manifold editorial occupations, he deferred year after year this anxious and difficult task, or that, dissatisfied with the execution, he in the end destroyed what he had prepared.

Cardinal Mai's abilities as an editor were of the very highest order. While his collections comprise an infinite variety of authors of every age, of every country, of every variety of style, and in every department of literature, in all he appears equally the master. Whether the subject be theology or history, or law, or languages, or general literature, his learning is never at fault, and his critical sagacity never fails. In the many delicate and difficult questions which so often arise;—in assigning an anonymous manuscript to its true author, in collecting fragments of the same work and dovetailing them together into intelligible order, in selecting from a heap of unknown materials all that is unpublished, and deciding upon the question of its genuineness or its intrinsic value; in a word, in all the thousand investigations which fall to the lot of a critical editor treading upon untried ground, he possessed a skill and acuteness which can hardly be described as other than instinctive, and which, taking into account the vast variety of subjects which engaged him, must be regarded as little short of marvellous.

The private character of Cardinal Mai has been well described as the very ideal of a Christian scholar. Earnestly devoted to the duties of his sacred calling, he yet loved literature for its own sake also, and he was ever foremost in every project for its advancement. He was a member of all the leading literary societies of Italy, and not unfrequently read papers in those of Rome and Milan. His charities were at all times liberal and indeed munificent; and at his death (reserving to the Vatican Library the right to purchase it at a moderate price) he bequeathed the proceeds of the sale of his noble library to be applied to the benefit of the poor of his native village of Schilpario. A monument has been erected to his memory in the church of St. Anastasia, from which he derived his title as cardinal.

MAIANTHEMUM, a genus of Plants belonging to the natural order *Asparagaceæ*. It has a 4-parted perianth; the segments horizontally patent or reflexed, deciduous; stamens 4; style 1; stigma blunt; berry 2-celled; cells 1-seeded.

M. bifolium has a stem with two alternate, stalked, triangular, cordate leaves; the stem is from 6 to 8 inches high; root filiform; leaves very deeply cordate; raceme terminal, resembling a spike; flowers small; segments reflexed; berry yellow with brown spots. It is found in woods in the north of England.

MAIDENHEAD. [Berkshire.]

MAILATH, JANOS NEPOMUK, an ingenious Hungarian poet and historian, was born at Pesth on the 14th of October 1786, and was the fourteenth child of a family of eighteen. He received an excellent education at Erlau and Raab, and his father, Count Joseph Mailath, an Austrian minister of state, introduced him into the same service, which he was compelled to relinquish after ten years, from increasing weakness of eye-sight. For two years he was forbidden to read and write, and it was during this time that he resolved to devote himself to literature. His works of poetry and history are numerous. Many of his poems and one of his histories, that 'Of the Religious Dissensions in Hungary,' are in the Hungarian language; most of the others are in German. He translated with success into German the 'Himfy' of Kisfaludy. His 'History of the Magyars' (5 vols., 1828-31), and his 'History of the Austrian Empire' (5 vols., 1834-50), are the most important of his historical works: the latter contains the result of his investigations during a period of eighteen years. Count Mailath, who returned to the public service and held the office of a counsellor of the Hungarian Chancery and some others at Pesth, was a member of the Hungarian Conservative party, and in his history mentions his own name, along with that of Count Stephen Szechenyi, as those of the only two magnates who opposed what he characterises as the violent and oppressive proceedings of the Magyars in forcing their language on the six million inhabitants of the country, whose languages were entirely different. The whole of his narrative of the conduct of the Kossuth party in Hungary before the outbreak is deserving of attention, as a statement of one side of the question which is little known in England. The results to unfortunate Mailath were most disastrous. Deprived of the posts he held in Hungary by the revolution of 1848, he appears to have been unable to obtain a compensation from the Austrian government. His literary labours did not prove remunerative, and his fortitude gave way under the combined afflictions of poverty, exile, old age, and blindness. The old man, whose productions have earned him a permanent and honourable place in the literature of both Hungary and Germany, was driven by the pressure of extreme destitution to drown himself in the Lake of Starnberg in Upper Bavaria, and with him his daughter, who had for some time acted as his amanuensis. This most painful catastrophe took place in the early part of January 1855.

MAINTENON. [Eure-et-Loir.]

MALACANTHUS. [Labridæ.]

MALACHITE. (*Green Malachite, Carbonate of Copper, Monoclinite.*) Usually in incrustations, with a smooth tuberose botryoidal or stalactitic surface. Structure finely and firmly fibrous; also earthy. Colour light green; streak paler. Usually nearly opaque. Crystals translucent. Lustre of crystals adamantine, inclining to vitreous; but fibrous incrustations silky, on a cross fracture. Earthy varieties dull. Hardness, 3·5 to 4. Specific Gravity, 4. Composition :—

Carbonic Acid	18
Oxide of Copper	70·5
Water	11·5

Dissolves with effervescence in nitric acid. Decrepitates and blackens before the blow-pipe, and becomes partly a black scoria. With borax it fuses to a deep green globule, and ultimately affords a bead of copper. It is readily distinguished by its copper-green colour and its association with copper ores. It resembles a siliceous ore of copper, *Chrysocolla*, a common ore in the mines of the Mississipi valley; but it is distinguished by its complete solution and effervescence in nitric acid. The colour also is not the bluish-green of Chrysocolla. Green Malachite usually accompanies other ores of copper, and forms incrustations, which when thick have the colours blended, and extremely delicate in their shades and blending. Perfect crystals are quite rare. The mines of Siberia, at Nischne Tagilsk, have afforded great quantities of this ore. A mass partly disclosed measured at top 9 feet by 18 feet; and the portion uncovered contained at least half a million pounds of pure Malachite. Other noted localities are Chessy in France, Sandlodge in Shetland, Schwartz in the Tyrol, Cornwall, Australia, and the island of Cuba. This mineral receives a high polish, and is used for inlaid work, and also ear-rings, snuff-boxes, and various ornamental articles. It is not much prized in jewellery. Very large masses are occasionally obtained in Russia, which are worked into slabs for tables, mantel-pieces, and vases, which are of exquisite beauty, owing to the delicate shadings and radiations of colour. In the Great Exhibition of 1851 there were magnificent specimens of this material in the shape of doors and vases sent thither by the Emperor of Russia. At Versailles there is a room furnished entirely with tables, chairs, &c., wrought in Malachite, and the same are to be found in other European palaces. At Nischne Tagilsk, a block of Malachite was obtained weighing 40 tons. Malachite is sometimes passed off in jewellery as turquoise, though easily distinguished by its shade of colour and much inferior hardness. It is a valuable ore when abundant, but it is seldom smelted alone, because the metal is liable to escape with the liberated volatile ingredient, carbonic acid.

MALACHIUM, a genus of Plants belonging to the natural order *Caryophyllaceæ*. It has 5 sepals; 5 bifid or entire petals; 10 stamens and 5 styles; the capsules opening with 5 bifid valves.

M. aquaticum, Water Chickweed, has a decumbent stem, angular, ascending, and covered with glandular hairs; cordate-ovate leaves, acuminate, sessile, the lowest one stalked; flowers scattered, solitary, in the forks of the stem; petals bipartite, rather exceeding the calyx; capsule exceeding the calyx. It is usually found in wet places in Great Britain.

MALICIOUS INJURIES TO PROPERTY. [Law, Criminal, *S.* 2.]

MALLARD. [Ducks.]

MALLOW, MARSH. [Althæa.]

MALTHACITE. [Mineralogy, *S.* 1.]

MAN. In classifying the races of men, it must be remembered that the divisions and subdivisions which are employed do not resemble those which are used in the systematic classification of plants and animals. When the whole of the species of the vegetable or the animal kingdom have to be arranged, then we divide them into various primary and subordinate groups, which are called Classes, Families, or Orders, Genera, Species, and Varieties. Now Man himself is but a species; he belongs to a subordinate group of a large division of the animal kingdom. Zoologically considered, Man is an animal belonging to the class *Vertebrata*, the order *Mammalia*, the sub-order *Hominidæ*, the genus *Homo*, and species *sapiens*. The characters of this species as given by Blumenbach have been stated elsewhere. [Man.]

The following is the arrangement of the races of men, with the definitions given by Dr. Pickering, an American traveller and writer, in his work 'On the Races of Men :'—

a. White.

1. *Arabian.*—The nose prominent, the lips thin, the beard abundant, and the hair straight or flowing.

2. *Abyssinian.*—The complexion hardly becoming florid, the nose prominent, and the hair crisped.

b. Brown.

3. *Mongolian.*—Beardless, with the hair perfectly straight and very long.

4. *Hottentot.*—Negro features, and close woolly hair; and the stature diminutive.

5. *Malay.*—Features not prominent in the profile, the complexion darker than in the preceding races, and the hair straight or flowing.

c. Blackish-Brown.

6. *Papuan.*—Features not prominent in profile, the beard abundant, the skin harsh to the touch, and the hair crisped or frizzled.

7. *Negrillo.*—Apparently beardless, the stature diminutive, the features approaching those of the negro, and the hair woolly.

8. *Indian*, or *Telingan.*—The features approaching those of the Arabian, and the hair, in like manner, straight or flowing.

9.—*Ethiopian.*—The complexion and features intermediate between the Telingan and Negro, and the hair crisped.

d. Black.

10. *Australian.*—Negro features, but combined with straight or flowing hair.

11. *Negro.*—Close woolly hair, the nose much flattened, and the lips very thick.

The most recent writer and greatest authority on the races of men is Dr. R. G. Latham, who, in his work on the 'Varieties of Man,' proposes the following arrangement. In the first place, like Cuvier and other previous writers, he adopts but three primary varieties of the human species :—

I. *Mongolidæ*. II. *Atlantidæ*. III. *Japetidæ*.

The termination in 'idæ' employed here seems preferable to the use of terms such as class, order, family, tribe, or other words which have another use, either in this or other departments of natural history. It must not however, be supposed that by using these terms any of the varieties of man can be traced up to a common ancestry, so that we could say all the *Mongolidæ* originated with this man, or all the *Atlantidæ* with that man. In tracing back races we have no evidence so conclusive that any particular variety originated with a particular pair of human beings, as we have that all the families of mankind have originated in a single pair. The terms *Mongolidæ*, *Atlantidæ*, and *Japetidæ* are not derived from a community of meaning in the things they express. Thus, the first comes from a nation, the Mongols, who occupied a portion of eastern Asia, and were at one time the conquerors of the world, and are regarded as typical of a large portion of the human race. The *Atlantidæ* are entirely found in Africa; hence their name. The *Japetidæ* include the races of men in Europe, who are traditionally descended from Japheth; hence the name selected to express them.

I. Mongolidæ.—The people comprised under this variety have the following physical conformation:—The face is broad and flat, which either arises from the great development of the zygomatic arches, or from the distance between the parietal bones on each side of the head. There is often also a great depression of the nasal bones, which contributes to give a flat appearance to the face. The profile of the forehead is retiring or depressed, seldom found perpendicular. The profile of the jaws is prognathic or projecting, seldom found on a level with the forehead. The eyes frequently present the peculiarity called oblique. The skin is of a mixed character, never truly white, and very rarely of a jet-black; still it often presents what would be called a black or white colour. The eyes are generally of a dark colour. The hair, as a general rule, is straight, long, and black; in some instances it is curly—rarely woolly— and more rarely still light-coloured.

The languages of the people belonging to this variety are either characterised by the absence of cases (aptotic), or having inflections, they can be shown to have arisen out of the union of different words (agglutinate). They are very rarely amalgamate.

The distribution of this variety is very wide over the surface of the earth. It finds its greatest development on the continent of Asia; although even there it is found not to be entire possessor of the earth. The Persians of northern and western Persia, the Kurds, the Beloochi, the Afghans, the Tajiks of Bokhara, and the Siaposh must all be regarded as belonging to the *Japetidæ*. On the other hand, although we shall find the *Japetidæ* the principal occupants of Europe, there seems to be little doubt that the Lapps and Fins of Scandinavia, the Magyars of Hungary, the Turks of Turkey, the Basques or Euskaldunes of Biscay and Navarre, and probably even the Albanians or mountaineers of ancient Illyria and Epirus, all belong to the *Mongolidæ*.

From the analogy of language this variety is made by Dr. Latham to include the whole of the inhabitants of the Polynesian Islands, as well as those of America. Although at first sight the physical differences between the Asiatic *Mongolidæ* and the inhabitants of the islands of the South Seas and the continent of America might look as great as that between many of the *Mongolidæ* and *Japetidæ*, yet it has been found that even physical characters fail to afford a line of demarcation. Thus, the late Dr. Morton, of America, thought that "the squared or rounded head, the flattened and vertical occiput, the high cheek-bones, the ponderous maxillæ, the large quadrangular orbits, and the low receding forehead," were characters that would distinguish the American from all other varieties. When however we examine the languages of the American continent we shall find that the Esquimaux present so strong a relation to that of the other races that we cannot deny their affinity to the American races; and it is amongst the Esquimaux that we find a departure from the physical type of a peculiar American form, and a strong relationship with the Asiatic *Mongolidæ*. It is considerations such as this which have induced recent ethnologists to regard the American Indian as a form of the variety of mankind to which the followers of Genghis-Khan belong.

The influence of the races included under the variety of *Mongolidæ* must be regarded as rather material than moral. They undoubtedly form by far the largest portion of the human race, and occupy a considerable space in the history of the world. They have, by the sword, established some of the largest empires that the world has seen. China is at this moment an example. Their empires have however crumbled to pieces, and left no deep impression on the world. Such is not the history of the *Atlantidæ* and *Japetidæ*, the first of which includes the Jews and the Mohammedans, and the last the Greeks, Romans, and modern European races.

The *Mongolidæ* are divided by Dr. Latham into groups as follows:—

A. Altaic Mongolidæ.—The term Altaic is taken from the Altai Mountains in Central Asia, these being a convenient geographical centre for the different nations and tribes comprising this division. It embraces two stocks, the Seriform, and the Turanian.

The Seriform stock has the physical conformation of the Mongol; and its languages are either wholly aptotic or with only the rudiments of an inflexion. The area inhabited by these people is China, Tibet, and the Indo-Chinese or Trans-Gangetic Peninsula as far as Malaya; the Himalayan and parts of the Sub-Himalayan range of mountains.

In this stock the chief people are Chinese, Tibetans, Anamese, Siamese, Kambogians, Burmese, the Indu; and several unplaced tribes are added by Dr. Latham.

The Turanian stock has the physical conformation of the Mongols; the languages are not monosyllabic. They are found from Kamtchatka to Norway, and from the Arctic Ocean to the frontiers of Tibet and Persia. The countries included are the northern parts of the Chinese empire, the greater part of Siberia, Mongolia, Tartary, Eastern Turkistan, Asia Minor, Turkey, Hungary, Esthonia, and Lapland. They are divided into four groups:—

1. The Mongolian branch, including the Mongols proper, the Buriats, the Kalmuks of Russia, and the Eimak of Persia.

2. The Tungusian branch including the Tshapojirs on the Lena, the Lamuts on the Sea of Okhotsk, and the Mantshu rulers of China.

3. The Turk branch: this includes the Uighurs, the Turks of the Sandy Desert, Turks of Khoten, &c., the Kirghis, Uzbeks, Turkomans, Osmanli, Nogays, Turks of the Russian empire, and the isolated Yakuts of the Lena.

4. The Ugrian branch includes the Voguls, the Permians, Tcheremiss, Finlanders, Esthonians, Laplanders, and Hungarians.

B. Dioscurian Mongolidæ.—The term Dioscurian is taken from the ancient sea-port Dioscurias. The tribes included in it have a modified Mongol organisation, the languages are (paucosyllabic) few-syllabled and agglutinate. Of all the languages not belonging to the Seriform stock of the last section they approach nearest to the aptotic state. They embrace—1, the Georgians; 2, the Lesgians; 3, the Mizjeji; 4, the Irôn; and 5, the Circassians.

Of this group, Dr. Latham observes, "To have used the word 'Caucasian' would have been correct, but inconvenient. It is already misapplied in another sense, that is, for the sake of denoting the so-called Caucasian race, consisting or said to consist of Jews, Greeks, Circassians, Scotchmen, ancient Romans, and other heterogeneous elements. In this sense it has been used in more than one celebrated work of fiction. In such and in such only, it is otherwise than out of place."

C. Oceanic Mongolidæ.—The epithet Oceanic is applied to this group, because, with the exception of the peninsula of Malacca, the tribes belonging to it are the inhabitants of islands exclusively. With the exception of Mauritius, the Isle of Bourbon, Ceylon, the Seychelles, the Maldives, and the Laccadives in the Indian Ocean, and the Japanese empire, with the islands to the north thereof in the Chinese Sea, every inhabited spot of land in the Indian and Pacific Oceans is inhabited by tribes of one and the same race which are embraced by this division. Not only is this race to be found spread over these islands, but apparently nowhere else. "In the peninsula of Malacca," says Dr. Latham, "and on no other part of the mainland of Asia, is an oceanic tribe to be detected." Although united by Dr. Latham, oceanic races exhibit two types. One class is yellow, olive, brunette, or brown, with long, black, and straight hair. Another class is black rather than yellow; the hair is sometimes long and straight, but in other cases crisp, curly, frizzy, or even woolly. The social, moral, and intellectual difference between these two classes is not less than their physical. The black division inhabits New Guinea, Australia, Tasmania, New Ireland, and the islands between it and New Caledonia. The brown division occupies all the rest of the oceanic area, Sumatra, Borneo, Java, the Moluccas, the Philippines, the South Sea Islands, the Carolinas, &c. The names given to these divisions are as follows:—

1. For the lighter-complexioned straight-haired type—Malay.

2. For the type that partakes of the character of the African negro inhabiting New Guinea, Australia, and what may be called the continuous localities for the unmixed black—Negrito.

3. The tribes with any or all of the Negrito characters, dwelling side by side with Malays in Malay localities, or in localities disconnected with the true Negrito area—the blacks of the Malayan area.

D. Hyperborean Mongolidæ.—The physical conformation of this section is that of undersized Mongolians. Their languages are agglutinate, neither monosyllabic, nor paucosyllabic. They are all subject to either Russia or China. Their religion is either Shamanism or an imperfect Christianity. They are found on the coasts of the Arctic Ocean, and the courses of the Yenisei and Kolima. The principal divisions are the Samoides, the Yeniseians, and the Yukahiri.

E. Peninsular Mongolidæ.—This section comprises races very widely distributed. Some of these lie within the arctic circle, others as far south as 26° N. lat. Their physical conformation is Mongol. Their languages are agglutinate, and in some cases excessively monosyllabic. The area occupied by these races are the islands and peninsulas of the north-eastern coast of Asia. The people embraced in it are the Koreans, the Japanese, the Aino, the Koriaks, and the Kamtchatdales.

F. American Mongolidæ.—This section embraces the original inhabitants of the whole continent of America. By most writers on ethnology, the races of America are regarded as a distinct family. Their connection with *Mongolidæ* seems however to be established by the Eskimo, who are physically Mongol and Asiatic, but philologically American. Of the Eskimo Dr. Latham remarks:—

"Unimportant as are the Eskimo in a political and historical view, their peculiar geographical position gives them an importance in all questions of ethnology; since one of the highest problems turns upon the affinities of this family.

"It has long been known that the nation which inhabits Greenland and Labrador is the nation which inhabits the north-western parts of Russian America as well. It is found on the American side of Behring's Straits, and it is found on the Asiatic side also. So that the Eskimo is the only family common to the Old and New World; an important fact in itself, and one made more important still by the Eskimo localities being the only localities where the two continents come into proximity. Now if these facts had stood alone, unmodified by any phenomena that detracted from their significance, the peopling of America would have been no more a mystery than the peopling of Europe. Such however is not the case. They neither stand alone, nor stand unmodified. The reasons that lie against what is at the first blush the common sense answer to the question 'How was America peopled?' are chiefly as follow:—

"1. The distance of the north-eastern parts of Asia from any probable centre of population—cradle of the human race, so called. For these parts to have been the passage, Kamtchatka must have been full to overflowing before the Mississippi had been trodden by the foot of a human being.

"2. The physical differences between the Eskimo and the American Indians.

"3. The difficulties presented by the Eskimo language.

"It is only these two last reasons to which I attribute much validity. The first of the three I put low in the way of an objection; that is, not much higher than I put the systems founded upon the Icelandic and Welsh traditions, the drifting of Japanese junks, and the effects of winds and currents upon Polynesian canoes. Without at present doubting whether the occurrences here alluded to have happened since America was peopled by the present race, I limit myself to an expression of dissent from the doctrine that by any such unsatisfactory processes the original population found its way; in other words, I believe that our only choice lies between the doctrine that makes the American nations to have originated from one or more separate pairs of progenitors, and the doctrine that either Behring's Straits or the line of islands between Kamtchatka and the peninsula of Aliaska, was the highway between the two worlds—from Asia to America, or vice versâ. I say vice versâ, since it by no means follows that because Asia and America shall have been peopled by the same race, the original of that race must necessarily have arisen in Asia; inasmuch as the statement, that the descendants of the same pair peopled two continents, taken alone proves nothing as to the particular continent in which that pair first appeared. Against America, and in favour of Asia, being the birth-place of the human race—its unity being assumed—I know many valid reasons; reasons valid enough and numerous enough to have made the notion of the New World being the older of the two a paradox. Nevertheless I know no absolutely conclusive ones. Omitting however this question, the chief primâ facie objections to the view that America was peopled from north-eastern Asia lie in the—

"1. Physical Differences between the Eskimo and the American Indian.—Stunted as he is in stature, the Eskimo is essentially a Mongol in physiognomy. His nose is flattened, his cheek bones project, his eyes are often oblique, and his skin is more yellow and brown than red or copper-coloured. On the other hand, in his most typical form, the American Indian is not Mongol in physiognomy. With the same black straight hair, he has an aquiline nose, a prominent profile, and a skin more red or copper-coloured than either yellow or brown. Putting this along with other marked characteristics, moral as well as physical, it is not surprising that the American should have been taken as the type and sample of a variety in contrast with the Mongolian.

"2. Philological arguments.—Few languages, equally destitute of literature, have been better or longer known than the Eskimo. For this we have to thank the Danish missionaries of Greenland—Egede more especially. From the grammar of Fabricius the Eskimo was soon known to be a language of long compound words, and of regular though remarkable inflections. It was known too to be very unlike the better-known languages of Europe and Asia. Finally, it has been admitted to be, in respect to its grammatical structure at least, American."

We need not here enumerate the various tribes embraced in this section, as it includes the whole of the original races found on the American continent.

G. Indian Mongolidæ.—The races belonging to this section are found in Hindustan, Cashmere, Ceylon, the Maldives and Laccadives, and part of Beloochistan. They are found mixed or contiguous to the Japetidæ of Beloochistan and Cabul, and various Seriform tribes. They present two extreme forms of physical conformation, one with the skin dark or even black, the other of a brunette colour, with a skin of great delicacy and clearness. The social condition of caste prevails amongst them. The principal religions are Brahminism and Buddhism, with a variety of intermediate creeds. Their ancient literature is in the Sanscrit, and their alphabets are derived from that language. They embrace the following divisions:—1, the Tamul; 2, the Palinda; 3, the Brahúi; 4, the Indo-Gangetic; 5, the Purbutti; 6, the Cashmirian; 7, the Cingalese; and 8, the Maldivian.

II. The Atlantidæ.—In their physical character the face is not so broad and flat as in the *Mongolidæ*. The jaws project, are prognathic, whilst the nose is generally flat; the forehead is retiring; the cranium dolikocephalic, that is, there is less space between the parietal bones of the skull, whilst its length remains the same, than there is in the last variety; the eyes only rarely open obliquely; the skin is mostly jet-black, presenting however lighter shades, and very rarely approaching a pure white; the hair is crisp, woolly, very rarely straight, and still more rarely light-coloured. The languages amongst the Atlantidæ belong to the agglutinate class. They are seldom or never found with a truly amalgamate inflection.

The great district of the development of the natives which are brought together under the above definition, is Africa. Perhaps there is no quarter of the globe that presents a greater diversity of inhabitants than Africa, or races of men who at first sight appear so evidently distinct. All previous ethnologists have placed the Hottentot, the Negro, and the Bushman in a very different position to the Assyrian, the Babylonian, the Mohammedan, and the Jew; but in Dr. Latham's classification we find these brought together under the common variety *Atlantidæ*. The analogy of language has led to this conclusion; and the transition from the lowest to the highest of these races is so gradual that no investigation of their physical structure with which we are at present acquainted, would be sufficient to break down the affinity discovered in their languages. No part of Africa seems to be inhabited by any races but those of the Atlantidæ. The Syro-Arabian or Semitic nations, however, which are now classed amongst the Atlantidæ, are found occupying a considerable area in the south-western part of Asia. The people of these races are far removed from the Negro and the Hottentot, and present great symmetry of form, and considerable cerebral development.

However small may have been the influence of the lower types of this race on the world, there can be no doubt of the vast impression produced by the Semitic nations. We may pass over the early civilisation indicated by the Assyrian and Babylonian empires, and fix attention on the religious history of the Jews. Here, amidst the surrounding Paganism, we find the worship of the one true God maintained by this small race amongst the Semitic nations; and through them the religion of Christ, which is destined to react on all the other races of mankind. It is also among these races that that compound of Judaism and Christianity, Mohammedanism, has sprung up; and however inferior it may be to the Christian religion, there can be little doubt of the beneficial influence it has exerted on the races who have embraced it.

The following is Dr. Latham's division of this group:—

A. Negro Atlantidæ.—The negroes have a black, unctuous, and soft skin; the hair woolly; lips thick; maxillary profile prognathic, frontal profile retiring; nasal depressed. They inhabit the low lands, sea-coasts, and the deltas and courses of rivers, chiefly the Senegal, Gambia, Niger, and Upper Nile. They are nearly limited to the tropic of Cancer. They are divided into Western Negroes, Central Negroes, and Eastern Negroes.

B. Kaffir Atlantidæ.—The language of the Kaffir supplies a broad distinction between them and other African races. They are prefixional and alliterational. Their physical conformation is modified negro. They occupy a district in Africa (east and west) from the north of the equator to the south of the Tropic of Capricorn. The chief divisions are, 1, Western, 2, Southern, 3, Eastern.

C. Hottentot Atlantidæ.—"The Hottentot stock," says Dr. Latham, "has a better claim to be considered as forming a second species of the genus *Homo* than any other section of mankind. It can be shown however that the language is no more different from those of the world in general than they are from each other." The Hottentots occupy the southern extremity of Africa. They are of a low stature; limbs slight; colour more brown or yellow than black; cheek-bones prominent; nasal profile depressed; hair in tufts rather than equally distributed over the head. They are divided into the Hottentots proper and the Saabs. The latter are found between the Roggeveld and the middle portion of the Orange River.

D. Nilotic Atlantidæ—These people have a modified negro conformation, and inhabit the water-system of the Upper and Middle Nile. Their chief divisions are, 1, Gallas; 2, Agous; 3, Nubians; 4, Bishari.

E. Amazirgh Atlantidæ.—Amazirgh is a term equivalent to Berber. These people are found on the coasts of the Mediterranean and the whole north-western quarter of Africa. They present modifications of both the negro and Arab types. Their chief divisions are, 1, the Siwahs of the Oasis of Siwah, the ancient Ammonium; 2, Kabyles of the range of Atlas; 3, Tuaricks of the Sahara; 4, Guanches of the Canary Islands.

F. Ægyptian Atlantidæ.—This section includes the ancient Egyptians, the subjects of the Pharaohs and the Ptolemies, and the modern Copts as far as they are of unmixed blood. They dwell in the valley and delta of the Nile, from Essouan to the Mediterranean. The physical conformation of the ancient Egyptians is gathered from their mummies. The modern Copts have the hair black and crisp or curled; the cheek-bones projecting; lips thick; nose depressed; nostrils wide; complexion from a yellowish to a dark-brown; eyes oblique; frame tall and fleshy.

G. Semitic Atlantidæ.—This section embraces the most highly developed forms of the *Atlantidæ.* The Semitic races are found in Abyssinia, Arabia, Palestine, Syria, Mesopotamia, and parts of Kurdistan. They are light-complexioned, and referrible to three types—the Arab, the Jew, and the Kaldani. Their influence on the world has been pre-eminently moral, spiritually as well as intellectually. Their religions are pre-eminently monotheistic in the later parts of their history. Their alphabet is the earliest in the world, and, with the exception of the Ethiopic, is written from right to left. The chief divisions, which are more or less artificial, are Syrians, Assyrians, Babylonians, Phœnicians, Beni-Terah, Arabs, Æthiopians, Solymi Cappadocians, Elamites, Cyprians, Philistines, Canaanites.

With the Beni-Terah (sons of Terah), father of Abraham, are found the Jews, who are remarkable amongst the nations of the earth for their early intellectual culture, and for the moral and religious influence their writings have produced on the world.

III. JAPETIDÆ.—This variety includes most of the nations of modern Europe. Physically, they present characters superior to the two other varieties. Their face is not flat, and is moderately broad. The jaws project but little, the nose is often very prominent, and the frontal profile is not unfrequently nearly vertical. The skull is shaped generally as the last variety; the opening of the eyelids is straight, and very rarely oblique; the skin is white, or brunette: the hair is never woolly, varying much in colour, frequently very light; the eyes are black, blue, or gray.

The languages of the great European races are never aptotic. They are mostly anaptotic, or having amalgamate inflections. In a few instances they are agglutinate.

Although the *Japetidæ* form the principal part of the nations of Europe, they do not exclusively occupy this district of the earth, nor are they confined to it. We have before mentioned the Lapps and Finns of Scandinavia, the Euskaldunes of the Basque Provinces, the Magyars, and Turks. It appears not to be improbable that the former were the original inhabitants of Europe, and are the remnants of a race driven away successively by the Celts and the Indo-Germanic races that now occupy this part of the world. As also we find evidence of the origin of the *Japetidæ* in the east, so we find traces of their existence in various parts of Asia: as in the Persians, Kurds, Beloochi, Afghans, Tajiks, and Siaposh. It is not improbable, also, that the Armenians ought to be classed with the Japetidæ.

The influence of this variety of mankind on the history of the world, has been much greater than that of the other two. If we are indebted to the Semitic races for the truth of Christianity, its adoption and propagation in a pure form has been mainly due to European nations. It became early identified with the civilisation of Greece and Rome; and passing from the nations where it obtained its early triumphs, it has become, in later times, the religion of the great Anglo-Saxon race, which on both sides of the Atlantic is increasing with extraordinary rapidity.

Dr. Latham divides the *Japetidæ* into two divisions—Occidental and Indo-Germanic.

A. Occidental Japetidæ include the races called Celts or Kelts. The Keltic languages were separated from the common mother-tongue subsequent to the evolution of the persons of verbs, but anterior to the evolution of the cases of nouns. These languages are evidently agglutinate. The present area of this race is Brittany, Wales, the Highlands of Scotland, the Isle of Man, and Ireland. The original area occupied by the Kelts, which have been constantly removed, is the Scottish Lowlands, England, Gaul north of the Loire, and part of Switzerland. It is probable also that they occupied parts of Baden, Bavaria, and northern Italy. The Taurisci of the Tyrol, the Scordisci of Illyria, the Galatians of Asia Minor, the Celt-Iberians of Spain, and the Cimbri of Jutland are generally regarded as Kelts. They have two types of complexion in the British Islands: the Silurian type having eyes and hair black, complexion dark with a ruddy tinge, and chiefly found in South Wales; the Hibernian type with gray eyes, yellowish, red, or sandy hair, and light complexion; they are found in Ireland. Dr. Latham gives the following as their chief divisions:—

1. Kelts of Gaul, falling into—*a.* the proper Celtæ; *b.* the Belgæ. Both extinct or incorporate.

2. British Kelts, falling into—*a.* the Cambrians; *b.* the Picts, which are extinct or incorporate.

3. Gaels. *a.* Scotch Gaels; *b.* Irish Gaels; *c.* Manxmen, or Gaelic Kelts of the Isle of Man.

4. The Cisalpine Kelts of northern Italy.

5. The Ligurians, extending from the Etruscan to the Iberian frontier.

Their line of population seems to have been from Calais and Dunkirk to England, from England to Scotland, and from Scotland to Ireland.

B. Indo-Germanic Japetidæ.—The languages of this group were separated from the common mother-tongue subsequent to the evolution of the cases of nouns. They are less evidently agglutinate than the Keltic. This and the previous group are sometimes called Indo-European, and thus embracing all the Japetidæ. The Indo-Germanic *Japetidæ* are divided into two classes:—

1. European Indo-Germans.—These are divided into—1. Gothic; 2. Sarmatian; 3. Mediterranean.

1. The Goths embrace—

a. The Teutons, which are again divided into—
  α. Mesogoths.
  β. High Germans, including Hessians, Thuringians, Franks.
  γ. Low Germans, including—
   1. Batavians.
   2. Saxons, embracing—
    * Saxons of Hanover, and Anglo-Saxons of England.
    ** Saxons of Osnaburg and Westphalia.
    *** Nordalbingians. Extinct.
   3. Frisians.

b. Scandinavians, embracing—
  1. Icelanders.
  2. Faroe Islanders.
  3. Norwegians.
  4. Swedes.
  5. Danes.

2. Sarmatians. This comprises the Lithuanic and Slavonic divisions, and these are its primary sections.

Of the Lithuanians Dr. Latham says—

1. Of all the Japetidæ they preserved their original paganism longest.
2. Of all the Japetidæ they have had the least influence on mankind.

3. Of all the Japetidæ they speak a language nearest in structure to the Sanscrit.

The Slavonic division includes—

α. Russians.
β. Servians.
γ. Illyrians.
δ. Tcheks.
ε. Poles.
ζ. Serbs.
η. Polabic Slavonians.

3. Mediterranean Indo-Germans. These include the Greeks and Romans of antiquity, and their modern descendants.

II. Iranian Indo-Germans.—Dr. Latham says "the whole of this class is hypothetical." It includes the Persians, who embrace the Kurds, the Beloochi, the Afghans, the Siaposh, and other contiguous races in Asia. The unplaced stocks are the Armenians and Iberians.

(Dr. R. G. Latham, *Varieties of Man;* Lawrence, *Lectures on Man;* Dr. Lankester, *On the Physical History of Man*, in *Family Tutor;* Nott and Gliddon, *Types of Mankind;* Dr. Latham, *Ethnology of British Colonies, Ethnology of British Islands, Migrations of Man, Ethnology of Europe;* Dr. Pickering, *Races of Men;* Dr. Prichard, *Physical History of Mankind;* Cuvier, *Règne Animal.*)

MAN, FOSSIL. [ANTHROPOLITES, *S.* 2.]

MANBY, CAPTAIN GEORGE WILLIAM, the author of several inventions applied to the saving of life in shipwreck, was born at Hilgay in Norfolk, on November 28th, 1765, and died at his residence Pedestal House, Southtown, near Great Yarmouth, on November 18, 1854, thus having nearly completed his eighty-ninth year. He adopted the military profession, but appears to have retired from any active duty after he had attained the rank of captain in 1803, when however he was appointed barrack-master at Great Yarmouth. Here in February 1807 occurred the loss of the Snipe gun-brig, when he saw sixty-seven persons drowned within a few yards of the beach; and, in the same gale, so many other disasters occurred that one hundred and forty-seven dead bodies were cast upon a line of coast of about thirty miles in extent. Such calamities induced him to devise means of assistance by throwing a line over the vessel. This was at first proposed to be done by a balista; but a successful experiment with a small mortar, when he threw a line over a church, led him to prefer the use of gunpowder. The great difficulty to be overcome was as to the connection of the shot with the rope. Chains broke on the discharge. At length, after repeated trials, stout strips of raw hide closely platted, were found to answer, and on the 12th of February 1808, when the crew of the brig Elizabeth were in imminent danger, about one hundred and fifty yards from the beach, having lashed themselves to the rigging with the sea breaking over them, and in what would have been a hopeless position, Captain Manby threw a line over the vessel, a boat was hauled off by it, and the crew of seven men were brought to land. In the same severe winter Captain Manby rescued the crews of several vessels by similar means. In 1810 his services were brought before the House of Commons. A committee was then appointed on the subject of the saving of life in shipwreck. The merits of previous inventions for the same object were brought before that committee, especially by the friends of Lieutenant Bell of the Royal Artillery, who in 1792 had communicated to the Society of Arts a plan for throwing a rope from a mortar from the vessel itself, and to whom 50 guineas had been awarded after some experiments at Woolwich. That plan however would have been obviously very difficult of application in the case of a vessel in a raging sea. Captain Manby having been reported of with high approval by the Committee, received a pecuniary recompense from the Exchequer, and was employed to report upon the dangerous parts of the coast from Yarmouth to the Frith of Forth. He advised that mortars, constructed on his principle, should be stationed at various points; in 1814 the House of Commons addressed the Prince Regent on the subject; and within two years afterwards fifty-nine stations were provided with the requisite apparatus. The attention which was thus given to the subject of the preservation of life in cases of shipwreck, was further expressed through associations which were formed throughout the country chiefly by Captain Manby's exertions. He also contrived means of obtaining a sight of a vessel on a dark night, by the use of a description of firework throwing stars to burn at a certain height; and he suggested the use of shells, filled with a burning composition, to allow the crew to discover the flight of the rope. He also devised an improvement in the manufacture of ropes to prevent mildew and rot, disusing vegetable mucilage, and using a solution with sugar of lead and alum in equal parts; and he suggested various improvements in life-boats. Late in life he visited the Northern seas, chiefly in order to test the efficacy of a new form of harpoon which he had invented. For his various inventions, which were the means of saving upwards of a thousand lives, he received at various times 7000*l.* from the British nation, and the thanks of the chief sovereigns of Europe.

MANDAMUS. The Writ of Mandamus, mentioned P. C. v. xiv., p. 347, and which can only be obtained in the Court of Queen's Bench, is now usually termed the Prerogative Writ of Mandamus, in order to distinguish it from the writs of mandamus obtainable in certain cases in all the other Superior Courts of Law.

The proceeding by Prerogative Writ of Mandamus may be resorted to, as has been already pointed out, in cases where a public inconvenience or a private wrong is occasioned by the omission of a public duty, and no sufficient remedy is afforded by an action for damages. This remedy was originally confined in its operation to a limited class of cases affecting the administration of public affairs; such as the election of corporate officers, or compelling inferior courts to proceed in matters within their jurisdiction, or public officers to perform duties imposed upon them, as to make a rate and the like. But in more recent times it has been extended to cases in which the rights of private individuals only are concerned. In every session of Parliament a number of Acts are passed for making railways, docks, bridges, improving towns, &c., &c., and, in almost all of such Acts, there are provisions directing the company obtaining the Act to do certain works for the benefit of individuals; such as substituting new buildings for others necessarily removed, making new communications in lieu of old ones, and other works of a similar nature. In the event of noncompliance with these enactments, the remedy is by mandamus. This mode of proceeding having been found uncertain, tedious, and expensive, the procedure therein has been very materially altered and amended by the Common Law Procedure Act, 1854, the proceedings being now assimilated as much as possible to those in an ordinary action.

The remedy hitherto afforded by this prerogative writ, in cases where the public were interested, has, by the same statute, been extended to cases in which private rights only are concerned. The plaintiff may claim in his writ the performance of any duty in which he is interested, and this claim must be repeated in the declaration, which must set forth sufficient grounds for the claim, and show that the plaintiff is personally interested therein; that he sustains or may sustain damage by the nonperformance of the duty, performance of which is demanded; and that performance thereof has been demanded by him, and refused or neglected by the defendant.

Where judgment is given that a mandamus do issue, the court, if it shall see fit, besides issuing execution in the ordinary way for the costs and damages, may also issue a peremptory writ of mandamus, commanding the defendant forthwith to perform the duty to be enforced, which the defendant must obey; for no return, except that of compliance, will be allowed, although time to return the writ may, upon sufficient grounds, be obtained.

If the defendant fails either to obey or to return the writ, two courses are open to the plaintiff. He may cause the defendant to be attached; or instead of proceeding by attachment, the court may, upon his application, direct the act required to be performed by the writ to be done by the plaintiff himself, or some other person appointed by the court, at the expense of the defendant; and upon the act being done, the amount of such expense may be ascertained by the court, who may order payment of the amount of such expenses and of the costs, and enforce payment thereof by execution.

MANGO-TREE. [MANGIFERA.]

MANIHOT. [JANIPHA, *S.* 2.]

MANIN, DANIELE, a distinguished Italian politician and patriot, was born at Venice in 1804, the son of Pietro Manin, a respectable advocate. His grandfather, Lodovico Manin, bore the same name as the last doge of Venice, whose weak behaviour at the time of the extinction of the ancient republic by Bonaparte (1797) had attached a certain discredit to the name. Young Manin, who from the first showed great abilities, was bred up to his father's profession of the law, and graduated as Doctor of Laws at the University of Padua at a very early age. He married in 1825, and shortly afterwards commenced practice as a lawyer at Mestre, a small town near Venice. Here he led a quiet domestic life, employing his leisure in historical and legal studies, and occasionally in writings of a kindred character. From the first however he shared fervently in the general discontent of his countrymen with Austrian rule, and the general aspiration after restored liberty and independence for Venice. Though not affiliated to any of the revolutionary societies then existing in Italy, he often discussed with several intimate friends—especially Alexandre Zanetti, Leopold Cicognara, Giovanni Minotto, and Francesco degli Antoni—the wrongs of his native country, and the possibility of remedying them by insurrection or other means. Once or twice—as during the time of the excitement caused by the affair of the brothers Bandiera in 1844—these secret communings were on the point of bursting out into open action; but, on the whole, it was felt by the friends that no movement was practicable, and Manin continued in the ordinary exercise of his profession, varying it by occasional contributions on economical topics to journals. As a speaker, he was distinguished for a logical, direct, positive, and incisive manner, different from the ordinary eloquence of his countrymen. As on several important public trials he acted a vigorous part on the liberal side, he came into collision with the Austrian government; and in the early part of 1848 he was imprisoned. But this year was to witness a change in his fortunes, and in those of Italy. On the 18th of March the spirit of insurrection with which the whole peninsula was charged, broke forth in Milan; the news of the expulsion of the Austrians from Milan acted immediately on Venice, and on the 23rd of March the Austrian commander of the city, Count Zichy, was obliged to surrender, and the republic was declared. It was at this time that Manin stepped forth as a man born to lead. The progress of events was for a time complex—the fate of the Venetians being involved in that of the other Italians. "What we *preferred*," Manin afterwards said, "was to be an independent republic, in confederation with the other Italian states; but what we would have *accepted* was, to become a portion of one great kingdom comprising all Italy."

The war of Charles-Albert, the king of Piedmont, against the Austrians in the name of Italy, as a whole seemed for a while to give likelihood to the latter expectation. The Venetians, willing to show their trust in Charles-Albert agreed to the fusion of their little republic with Lombardy and Piedmont, so as to form a united independent kingdom of Northern Italy. But the battle of Custoza having ended that dream, and restored Lombardy to the Austrian dominion, the Venetians again fell back upon their own resources and prepared for a separate defence. The republican standard of St. Mark was again hoisted; a triumvirate was appointed to carry on the executive government, Manin being the chief of the three; and the military command was intrusted to the Neapolitan general Pepé, who had thrown himself into Venice two months before, rather than obey the order that he should return to Naples. Though the Austrians kept up a blockade against Venice, it was not till March 1849, when the second attempt of Charles-Albert was brought to an end by the defeat of Novara, and when the Austrians were thus free to reconquer all that still remained to be reconquered of their lost territories in Italy, that the Venetians endured the full agony of the struggle. By that time the patriotic movement had been completely crushed in every part of Italy besides, with the exception of Rome. The two republics of Rome and Venice were the sole remains of the insurrectionary work of the previous year; and against the one of these the French were mustering their power in conjunction with the Austrians and Neapolitans, while the other was assailed by the Austrians alone. Both republics behaved bravely. What Mazzini was to Rome, Manin was to Venice. From March 1849 he was invested with all the powers of the dictatorship. The defence of Venice conducted by him is one of the most gallant and obstinate in recent history. It was on the 3rd of July that the French entered Rome; but Venice did not surrender till the 24th of August, after it had suffered a dreadful bombardment. With the fall of Venice the subjugation of Italy was complete. The terms of the surrender were such that Manin was able to go safely into exile. He afterwards resided chiefly in Paris, supporting himself honourably. He died September 22, 1857.

MANIOC. [Cassava.]

MANNHEIM. [Manheim.]

MANTELL, GIDEON ALGERNON, a palæontologist and geologist of extensive and varied acquirements, was born at Lewes, in Sussex, about 1790. For several years he practised as a medical man at Lewes, in a district which he rendered classical by his researches into its geological structure. He was a memorable instance of a man of genius, constantly and diligently occupied in discharging the duties of a laborious profession—in which he acquired great provincial reputation, especially for the delicacy of his manipulation in surgical cases, and for the tenderness of his demeanour to his patients—nevertheless reaching great eminence as a man of science, and finding time to pursue his favourite studies with distinguished success. During his residence at Lewes he collected a vast number of interesting fossils, and formed a private museum, such as has rarely, if ever, been equalled. Here also he published his principal separate works, 'The Fossils of the South Downs,' and 'The Illustrations of the Geology of Sussex.' The former appeared in 1822, simultaneously with that of Cuvier and Brongniart upon 'The Geology of the Environs of Paris;' and many of the organic remains of the chalk were described in both works simultaneously, though independently. Whilst at Lewes also he called attention to the interest and beauty of the remains of fishes found in the chalk, and it was there he commenced the series of observations which placed him in a prominent position among British geologists. His attention was early directed to the phenomena exhibited by the assemblage of clays, sands, and subordinate limestones which immediately underlie the cretaceous system in the Weald district, happily designated by his friend Mr. P. J. Martin as the 'Wealden Formation.' His location being exceedingly favourable for researches in that group of rocks, he became the original demonstrator of the fresh-water origin of the mass of Wealden beds, thus making a great step in British geology; and it is remarkable and instructive that this resulted from the direct application of the knowledge of existing causes and phenomena to the investigation of the past. Dr. Mantell's observation of the conditions under which existing fresh-water shells were imbedded in the alluvium of the valley of the Sussex Ouse, and even alternated with marine exuviæ, suggested the probability of the occurrence of similar, but immensely more ancient, phenomena in the clays and sands of the Weald; and careful research fully confirmed his conjecture. His chief and very memorable palæontological discoveries are connected with the Wealden. But the particular circumstances under which researches in fossil osteology have been pursued in England for many years past render it difficult, with a due regard to brevity, to define accurately the character, and to delineate the extent, of Dr. Mantell's labours in that department of science. The following view of the subject is from the impartial pen of Mr. William Hopkins, F.R.S., and forms a part of an obituary notice contained in his 'Anniversary Address' from the chair of the Geological Society, on the 18th of February 1853, on which the present article is founded.

Out of the Wealden, Mr. Hopkins states, Dr. Mantell "procured the most interesting of the relics of prodigious extinct reptiles, which owe to him their scientific appellations, and whose remains will long constitute some of the chief attractions of the great collection originally amassed by him, and now displayed in the galleries of the British Museum. Whether we regard his discovery and demonstration of the *Iguanodon* and its colossal allies in a geological point of view, as characterising distinctly an epoch in time, or, with respect to their zoological value, as filling up great gaps in the series of *Vertebrata*, and elucidating the organisation of a lost order of reptiles, at once highest in its class, and most wonderful, we must, as geologists and naturalists, feel that a large debt of gratitude is due to the indefatigable and enthusiastic man out of whose labours this knowledge arose. In the group of Dinosaurian reptiles were some of the largest of terrestrial animals. In their organisation, whilst truly Reptilian, they approached [by a direct relation of analogy] the Mammalian type. Their characters were so peculiar, that of the value and distinctness of their order there can be no question. Their osteology has been elaborated with skill and care, and has worthily occupied the attention of the most eminent anatomists. They give a feature to the herpetology of the middle portion of the secondary epoch. Now, of the five marked genera constituting this group, as at present known, we owe the discovery and demonstration of four—viz., *Iguanodon, Hylæosaurus, Pelorosaurus*, and *Regnosaurus*—to Dr. Mantell. Worthily then were the Wollaston Medal and Fund adjudged to our lamented colleague in 1835, 'for his long-continued labours in the comparative anatomy of fossils, especially for the discovery of two genera of fossil reptiles, *Iguanodon* and *Hylæosaurus*.' That he did not rest from his labours, after having received this honourable reward, the discovery of two additional genera mentioned above can testify. Nor did he cease from continually seeking to perfect his knowledge of the wonderful animals brought to light during his earlier career. Thus, whilst the announcement of the *Iguanodon* dates as far back as 1825, his account of the jaw of this reptile was given to the world fifteen years afterwards. His paper on *Pelorosaurus*, in the 'Philosophical Transactions,' was published in 1850."

Dr. Mantell was equally interested in all other branches of palæontology. One of his earliest papers, communicated to the Linnæan Society, and published in its 'Transactions,' vol. xi., related to the bodies called by him and now well-known as *Ventriculites*, found in the chalk, and referred by him to *Alcyonia*. On fossil *Mollusca* and *Radiata* he wrote many valuable papers, especially those that concern the *Belemnites* and their allies. Mr. Henry Deane of Clapham, afterwards president of the Pharmaceutical Society, having detected the soft bodies of *Foraminifera* (*Rotaliæ*) in an extraordinary state of preservation in the chalk of Folkstone, and prepared illustrative specimens of them for the microscope, called Dr. Mantell's attention to them, who devoted much time to their investigation, and, uniting the observations made by Mr. Deane and himself with the results of some of his own previous researches, communicated a paper to the Royal Society on the general subject of the 'Fossil Remains of the soft parts of Foraminifera, discovered in the chalk and flint of the South-east of England,' which was inserted in the 'Philosophical Transactions' for 1846. Among his most recent labours was the account of the remarkable reptile from the Old Red-Sandstone, named by him *Telerpeton Elginense*, an animal of singular interest, regarded, until very recently, as the most ancient unquestionable relic of its class. At the time he died he was occupied with a description of a very singular fish from the chalk, to which he intended to give the name of *Rynchonichthys*.

Dr. Mantell was elected a Fellow of the Royal Society in 1825, shortly after his discovery of the Iguanodon, and in 1849 he received from the Council the royal medal, as an acknowledgment of his palæontological researches. He was also enrolled as a Fellow of the Royal Society of Physicians, London, in recognition of his scientific eminence, he not having been originally connected with the College. In 1835 he removed from Lewes to Brighton, and four years later, after the purchase of his collection of fossils by the trustees of the British Museum for 5000*l*., to Clapham, near London. Some years having elapsed, he disposed of his medical practice at that place, and removed to Chester-square, London, where he continued to reside and practise for the remainder of his life. For many years he endured severe illness and excruciating pain, owing to a spinal disease, the result of an accident. But no torture could destroy his love for science, or his energetic pursuit of geological research. He died at his residence in Chester-square on the 10th of November 1852, aged sixty-two.

Dr. Mantell's scientific character has two distinct features; those of an original discoverer, and of a public teacher. His influence in science depended less perhaps upon the former, brilliant as it was, than upon the latter. As a popular expounder of geological facts he was unequalled; as a lecturer, within his own particular field, he had no rival; fluent, clear, eloquent, and elegantly discursive, he riveted the attention of his audience, and invariably left them imbued with a love for the science he had taught them. His popular writings, of which the 'Wonders of Geology' and the 'Medals of Creation' are among the most useful, had a wide circulation, and are held in high esteem by general readers. They have a considerable reputation also on the Continent, and have been translated into German. The 'Medals of Creation' is almost the only book in the English language, in which a comprehensive survey of the fossil world, and a perspicuous and satisfactory outline of British palæontology, both adapted to the educated and general reader, can be met with. He was likewise the author of several interesting views of the geological structure and physical geography of Sussex and Surrey, or of portions of those counties, as well as of the adjacent county of Kent (into which his favourite Wealden also extends), which were inserted in topographical works, as introductory to the general history of the districts described. One of these forms a portion of the prefatory matter in the 'County History of Surrey,' by the late Edward Wedlake Brayley, F.S.A. In the 'Bibliographia Zoologiæ et Geologiæ' of Agassiz and Strickland, no fewer than sixty-seven works and memoirs of various degrees of importance and length, are enumerated as having proceeded from Dr. Mantell's pen; to these must be added some antiquarian papers, and several professional disquisitions.

MARABOU. [Herons.]

MARE. [Horse.]

MARE'S TAIL. [Hippuris, *S.* 1.]

MARECA. [Ducks.]

MARGARAMIDE. [Chemistry, *S.* 1.]

MARGARIN. [Tissues, Organic, *S.* 1.]

MARIGOLD. [Calendula, *S.* 1.]

MARKET-BOSWORTH. [Bosworth.]

MARKET-HARBOROUGH. [Leicestershire.]

MARKET-RASEN. [Lincolnshire.]

MARMOLITE. [Mineralogy, *S.* 1.]

MARMONT, AUGUSTE FREDERIQUE LOUIS VIESSE DE, MARECHAL DUC DE RAGUSE, the son of the Chevalier de Marmont, an old officer of distinction, was born at Châtillon-sur-Seine, on the 20th of July 1774. He entered the army as sub-lieutenant of infantry in 1789; but his father wishing him to receive a sound military education, sent him, in 1792, to the Artillery School of Châlons. Towards the end of that year he served in the campaign of the Alps, under General Montesquieu. He was present at the siege of Toulon, December 1793; and having been noticed by Bonaparte for his skill in directing his guns, was chosen as his aide-de-camp, and made a captain in 1794. In this capacity he accompanied his general to the army of Italy, during the campaign of that year. After the great insurrection of the Sections, on the 13th Vendémiare (October 6, 1795), Marmont, having been apppointed chef-d'escadron, went a second time to Italy, in March 1796, as principal aide-de-camp to General Bonaparte. In this famous campaign he was present in almost every field: at Lodi, at Castiglione, and at the battle of Saint-Georges, his intrepidity, his skill, his aptitude and invention were alike conspicuous; he was created colonel, and sent to Paris with 22 colours taken from the enemy. Next, he took part in the expedition to Egypt, and was made a general of brigade for his services during the investment of Malta. During the campaign of Syria, in 1799, he was appointed commander in Alexandria, and defended that city against the English and Turks, in a season of famine and pestilence. When General Bonaparte set sail for France, on his return from Egypt, August 22, 1799, General Marmont was one of the seven officers selected to bear him company in his perilous enterprise.

During the crossing of Mount Saint-Bernard in the spring of 1800, Marmont's plans for the conveyance of the guns having been adopted, he superintended the entire transport, and by his persevering efforts the passage of this important arm was effected. He fought with much distinction at the battle of Marengo, June 14, 1800, and was immediately after raised to a division. After the peace gained by this victory, he was made inspector-general of artillery; he then applied himself zealously to various reforms in the service, especially for the accelerating of the transit of the artillery train. All these improvements were sanctioned by the First Consul, though the young military reformer was only in his twenty-seventh year.

In the campaign of 1805, General Marmont was present at the capture of Ulm, October 20, 1805; and he was next successfully employed in the reduction of the province of Styria. Henceforth he commanded armies. In 1806 he was sent to command the army in Dalmatia, where he acted as general-in-chief for several years. On the 2nd of October, with an army of 6000 men, he defeated an allied corps of 9000 Montenegrins, Greeks, and other troops, sustained by a second corps of 7000 Russians. During his occupation of the duchy, Marmont carried out a beneficial system of public works, including a great line of roadway, 210 miles in length, for which useful improvement he received his title of Duc de Raguse in 1808. When the campaign of Wagram opened in 1809, Napoleon called this general to support his main army. Marmont took the field with a corps of 9500 infantry, only 300 cavalry, and 12 pieces of cannon. With this force he defeated an Austrian army of 20,000 men in several severely contested engagements; and then encountering General Giulay, at the head of 35,000 troops, posted on the Drave, compelled that general to retreat into Hungary. After these successes he joined Napoleon the day before the great battle of Wagram, July 5, 1809, took part in the action, and received his marshal's bâton for his conduct in that arduous engagement. This decisive victory being followed by the treaty of Vienna, the Austrian government made over to France the provinces of Dalmatia, Istria, Ragusa, and Croatia, with other adjacent lands, which Napoleon formed into a single state, under the title of the Illyrian Provinces, and placed them under the direction of Marshal Marmont as governor-general. In this high office he continued nearly sixteen months, giving proofs of superior capacity as an administrator, whilst he was honourably distinguished from other marshals by his integrity and disinterestedness. Towards the close of 1810 he stood so high in the esteem of his master, that he was sent into the peninsula to supersede Marshal Massena in the command of the army of Portugal. Though independent in his command, he hastened to unite his army to that of Soult, placed himself under the orders of that eminent leader, and assisted him in relieving Badajoz. Less fortunate at the battle of Salamanca, July 22, 1812, he displayed however many proofs of skill as a general before he retreated, nor did he leave the field until he and the two generals who succeeded him had been disabled by severe wounds. In the campaign of 1813 the marshal, though scarcely recovered, took the command of the second corps, and was present at Bautzen, May 20, 1813; at Dresden, August 26, and at Leipsic on the 16th, 17th and 18th of October. In this last battle he defended the village of Schönfeld, which was taken and retaken seven times. Eight of his generals were either killed or wounded in the action; four horses sank under him, and he was twice wounded.

His name appears again in almost every battle fought on the French soil, in 1814, for the defence of his country. He terminated this campaign, perhaps the most brilliant in his career, by the battle before the walls of Paris, on the 30th of March 1814. The enemy, consisting of Russians, Prussians, and Austrians, were more than four to one, yet Marmont maintained his post for several hours, not surrendering even when the heights of Montmartre had been taken, and the first Russian guns had begun to sweep the Boulevards within the city; and it was not till some hours after receiving a letter from Joseph Bonaparte authorising them to capitulate, that Marmont and Mortier called a council of general officers at an inn within the suburb of La Villette, when they agreed to the evacuation of Paris.

The army of the allies entered the French capital on the 31st of March, and Marshal Marmont, on the 4th of April, after a short correspondence with Prince Schwartzenberg, stipulating for the retirement of the French troops into Normandy, with arms, baggage, and artillery, entered the allied lines, and thence marched to Versailles. It was this step, taken without the sanction of Napoleon, which afterwards drew down upon him so much odium.

The Duc de Raguse was now wedded to the cause of the restored dynasty. He accompanied Louis XVIII. to Ghent in 1815, returned to Paris with that sovereign after the battle of Waterloo, and was employed repeatedly both by that monarch and Charles X. in offices of great trust. At the outbreak of the July revolution in 1830, he was charged with the invidious duty of quelling the revolt, and having failed, became a second time the mark of almost universal obloquy. To satisfy the popular indignation, he was struck off the list of the French army, and exiled from France. He spent his years of banishment in visiting different countries, and in writing works of considerable merit on the military systems of Russia, Austria, and other states. Nearly twenty-two years after his disgrace, he died at Venice, on the 2nd of March, 1852, in his seventy-eighth year. The publication of the 'Mémoires du Duc de Raguse,' from his original manuscript, in 9 vols. 8vo., Paris, was completed in 1857.

MARRAST, ARMAND, who succeeded Carrel as chief editor of 'Le National,' was born in 1802, in the south of France. After a careful education at the College of Pont-Levoy, he went to Paris in 1827, and immediately commenced his career of politics by writing pamphlets against the government. The pungency and playful humour of these light productions drew notice upon the author, and he at once made for himself a distinct position among the young politicians of the day. When he arrived in the French capital, a vivid contest was being waged between the practical school of philosophy, conducted by Laromiguière, and the eclectic school, presided over by Cousin. Marrast entered the ranks of the former, and month after month amused and excited the public by the light artillery of his pleasant brochures against Cousinisme.

In 1830 Marrast established the newspaper 'La Tribune.' It became the organ of the ultra-liberal party, and as such organ it was constantly quoted by foreign as well as French journals. It contained very bitter articles against the government of Louis Philippe, and the fines to which it was condemned, together with the law-expenses attending its defence, put an end to its publication after a few years. Armand Marrast, on one occasion, was called to the bar of the Chamber of Deputies on account of two articles in 'La Tribune.' On another occasion he was arrested and sent to prison as one of the conspirators concerned in the 'complot d'Avril.' He was soon released, when he published his celebrated pamphlet, 'Vingt Jours de Secret,' which produced a great sensation, and much increased his popularity. Proceedings were taken against him by the ministry. He sought refuge in England, remained several months in London, remitting every week one or more letters of great ability to 'Le National,' and married an English lady during his sojourn in this country. These letters were the origin of that long connection with Armand Carrel and 'Le National,' which afterwards gave to Marrast the influence he possessed over his countrymen. He became sub-editor of 'Le National' in 1834; and on the death of Carrel, July 24th, 1836, he succeeded him as chief editor. From this time until the revolution of February 1848, a period of nearly twelve years, Marrast conducted that journal, and maintained it in the high position it had acquired under Thiers, its first editor, and then under Carrel.

During 1847, a series of exciting incidents rapidly followed one another, highly favourable to Marrast's satirical ability. At one time, it was a course of ministerial prosecutions; at another, rumours of bribery and corruption among men high in office; next, these rumours were succeeded by flagrant exposures or confessions; and lastly, came the scandal of an assassination in the mansion of a great noble. The republican journals made the most of these incidents, and 'Le National' took the lead in denouncing the government and the court. The revolution of February, and the abdication of Louis Philippe followed. Pending the crisis of this event, the office of 'Le National' became for a few days the seat of government; and deputations visited Marrast, and received their instructions from him. His name was now on every tongue; and when Lamartine was placed by the rapid progress of events at the head of the provisional government, Marrast became secretary, afterwards maire de Paris, and finally president of the National Assembly. This last office was limited by a new regulation to one month; but the urbanity of the new president, and his extraordinary influence over the 900 members in consequence of his tact in calling them to order by humorous appeals, caused him to be re-elected several times. To him likewise was committed the task of drawing up the new constitution. But the red republican party soon found that Marrast was not advanced enough for them; they began to stigmatise him as a moderate, and his popularity fast declined. On the 15th of May 1848 the insurgents, headed by Barbès and Blanqui, forced their way into the Hôtel-de-Ville, their first cry being "Where is Marrast? We must make an end of that soft-handed republican!" But he had withdrawn for concealment to a private chamber which was not searched. After the insurrection of June, and the consequent dissolution of the Lamartine cabinet, Marrast retired into private life. We believe that he still contributed to 'Le National' without any longer being its editor, until the paper was suppressed by the government of Louis Napoleon. He died on the 10th of March 1852.

MARRIAGE. Provision is made for the licensing of district churches and chapels for the celebration of marriage, by the stat. 7 & 8 Vict. c. 56. The notice given to the Superintendant Registrar must now be accompanied by a solemn declaration as to the consents required by law having been obtained. This is provided for by the statute 19 & 20 Vict. c. 119, which also enables parties who have entered into the contract of marriage merely before the Superintendant Registrar, to have the ceremonies of the church or of their own persuasion added at any time afterwards. The object of this enactment is to permit the parties to satisfy any religious scruples which, after the merely civil form of the contract has been resorted to, may arise or be suggested to them. (Blackstone's 'Commentaries,' Mr. Kerr's ed., vol. 1, p. 464.)

MARRYAT, FREDERICK, was born in London on the 10th of July, 1792. His father, Joseph Marryat, Esq., of Wimbledon, Surrey, was a wealthy West India merchant, and M.P. for Sandwich, and traced his descent from a French Protestant refugee, who had come over to England in the 16th century. His mother was the daughter of an American loyalist. After being educated at various schools in and near London, young Marryat entered the naval service in September, 1806, as a midshipman on board the Impérieuse, 44 guns, commanded by the cebrated Lord Cochrane. Under this daring commander he was engaged in upwards of fifty actions, of more or less importance, off the French and Mediterranean coasts during the next three years. In one he was left for dead on the deck of a ship which he had boarded, and only recovered when a fellow midshipman, who had a grudge against him, touched his supposed dead body with his foot, and began to moralise in rather uncomplimentary terms on his premature exit from life. The reputation for gallantry and ability which he acquired under Lord Cochrane, was amply sustained by his conduct under other commanders during three additional years of service as a midshipman. On four or five occasions he saved men from drowning by leaping overboard, at the risk of his own life. On one such occasion he saved the life of a son of William Cobbett, then his fellow midshipman. At another time, on jumping overboard in an attempt to save a sailor's life, he found to his horror the man bleeding from the maw of one of three sharks that were following the ship; and he had given himself over for lost before he was picked up. In 1812 he was appointed to his lieutenancy on board the Espiègle sloop, whence he removed to the Newcastle, sent under Lord George Stuart, to cruise off the American coast. He attained a commander's rank in 1815. In 1820 he commanded the Beacon sloop off St. Helena, whence he exchanged into the Rosario, in which he brought home duplicate despatches announcing the death of Napoleon. After being employed for some time in the preventive service, he was appointed in March 1823 to the Larne, 18 guns, and proceeded to the East Indies. He was senior naval officer in the attack on Rangoon, and in December 1824 he accompanied Sir Robert Sale in the expedition up the Bassein River. His good services in the East Indies procured him the thanks of the governor-general and much distinction at home. In June 1825 he received the decoration of C.B., and at the same time the Royal Humane Society awarded him its medal for having saved so many lives from drowning. From November 1828 to November 1830 he commanded the Ariadne in the Channel service; and it was at this time, when he was approaching his fortieth year, that he began his career as a novelist by the publication of his 'Frank Mildmay.' This was followed at brief intervals during the next sixteen years by his other well-known writings, most of them novels of sea-life—'Peter Simple,' 'Jacob Faithful,' 'Japhet in Search of a Father,' 'The King's Own,' 'Mr. Midshipman Easy,' 'Newton Forster,' 'The Pacha of Many Tales,' 'Rattlin the Reefer,' 'Snarly-yow, or the Dog-Fiend,' 'The Children of the New Forest,' 'Olla Podrida,' 'The Pirate and the Three Cutters,' 'The Phantom Ship,' 'Poor Jack,' 'The Poacher,' 'Masterman Ready,' 'Percival Keene,' 'The Narrative of Monsieur Violet in California, &c.' 'The Settlers in Canada,' 'The Mission, or Scenes in Africa,' 'The Privateer's Man,' and 'Valérie.' The merits of these works as amusing works of adventure and description are universally known. Besides these, he published in 1837 a work of a different class, 'A Code of Signals for the use of vessels employed in the Merchant Service,'—which was adopted by government, and is now in general use by our own and all foreign navies, and which procured him the cross of the Legion of Honour from Louis Philippe. He also published in 1839 in two series of three volumes each, 'A Diary in America, with remarks on its Institutions,' a work which gave great offence to the Americans by its satirical spirit. It is said that the free expression of opinions by Captain Marryat against the practice of impressment was the cause of his not having been raised to higher professional rank. For a year or more before his death he was laid aside from duty and literary labour by an illness arising from the bursting of several blood-vessels. He died at his residence at Langham, Norfolk, on the 2nd of August, 1848, aged fifty-six years. By his marriage with Catherine, daughter of Sir Stephen Shairp, once chargé-d'affaires at the court of Russia, he had six children. Of two of his sons who had entered the navy, one perished, before his father's death, in the Avenger steamer; one of his daughters has since appeared as a writer of novels. Captain Marryat was a Fellow of the Royal Society.

MARS, ANNE-FRANÇOISE-HYPPOLITE BOUTET, known as MADEMOISELLE MARS, was born in Paris on the 9th of February, 1778; her father being the actor Monvel of the Théâtre Montansier; her mother a country actress named Mars-Boutet. She appeared before she was ten years old in juvenile parts, and in 1793 she already filled at the Théâtre Feydeau, what on the French stage are called 'les rôles d'ingénues.' She met with a generous patroness in Mademoiselle Contat, then the leading actress in comedy, and received from her the best training for the cast of characters which her early talents pointed out as her own. After she had made herself familiar with these parts of the young girl, she was induced, still directed by Mademoiselle Contat, to attempt 'les jeunes amoureuses;' in which character she succeeded to the first place, after the retirement of Mesdemoiselles Mézéray and Lange in 1798. She was then twenty. Her fine talent was very gradual in its development, nor did the public at all foresee what she would become. It was not until 1803 that her first marked success had been obtained. In that year the part of a deaf and dumb pupil of the Abbé de l'Epée, in the piece of that name, having been assigned to her, she displayed so much feeling, ingenuousness, and grace in its performance, that from that night she took rank as one of the great comic actresses. Her talents rapidly increased under the influence of cordial encouragement. Her kind instructress, Mademoiselle Contat, took leave of the stage in 1809, leaving the inheritance of her 'répertoire' to be divided between Mademoiselle Mars and Mademoiselle Leverd, which gave rise to a long contest between the rival stars. The former however soon distanced all competitors, and for a space of thirty years stood at the head of all French actresses in genteel comedy, gaining a new success in every new part, down to that of Mademoiselle de Belle-Isle, in Dumas's drama, which she played for the first time on the 2nd of April, 1839, when she had passed the age of three-score.

Yet, although she never refused to take the leading characters in plays of the new school, and in each achieved a new triumph, she was to the last opposed to the modern romancists, and generally required extensive changes to be made in her own parts. Victor Hugo and the elder Dumas were sometimes embarrassed by her criticisms and strictures, and the latter, in his 'Mémoires,' has described some piquant disputes of this nature between the actress and the dramatists. But her grandest delineations were in the earlier drama, especially in the comedies of Molière. In the lady of fashion, in the coquette of the beau monde, every spectator felt the collected self-possession, the fulness of attention with which she performed these characters. It was her resolute will and extraordinary ability which alone kept alive a respect for the earlier dramatic literature in the house to which she belonged, when a dozen theatres and fifty modern dramatists were endeavouring to subvert it.

Those who never saw Mademoiselle Mars on the stage, can form no idea of the simplicity, the seeming artlessness, the graceful elegance of her acting; nor of the music of her voice, so distinct that the very letters seemed printed in it, nor of the exquisite expression of her smile. Her form was very fine, her gait easy yet majestic, her costume remarkably elegant and distinguished. She was one of the shareholders of the Théâtre Français, and her yearly rent from this source amounted to 40,000 francs; and, in 1816, Louis XVIII. settled on her as well as on Talma a pension of 30,000 francs. The hotel in which she lived was open to the most celebrated foreign as well as native artists and literati, some of whom were daily to be seen paying their court to her. She was sedulously attentive to the critics and feuilletonists, all of whom vied with each other in describing her performances. On the night of the 7th of March 1841 she appeared for the last time on the boards of the Théâtre Français, in the 'Misanthrope' and the 'Fausses Confidences.' It was of course a benefit night, and for the last time she performed the parts of Célimène and Araminte. She died on the 20th of March 1847, her death having been accelerated, if not caused, by the habit of having her hair dyed every ten days. She left behind her a fortune of 800,000 francs.

MARSHALSEA. The Court of the Marshalsea and the Palace Court were abolished by the statute 12 & 13 Vict., c. 101. Their procedure and the costs of actions therein had for some time before been the object of animadversion by the press, whose remarks, however apparently well founded, amounted to no more than the universal complaint of the costs incident to legal proceedings. The Palace Court had not long before been reputed by Royal Commissioners to be one of the best in the metropolis.

MARSHFIELD. [GLOUCESTERSHIRE.]

MARSILEACEÆ, or RHIZOCARPEÆ, *Pepperworts* or *Rhizocarps*, a natural order of Aquatic Plants, with creeping stems bearing leaves, which are usually divided into three or more cuneate portions, and have a circinate vernation. The fructification is produced at the base of the leaf-stalks, and consists of sporocarps and involucres inclosing clustered organs, which consist of antheridian and pistillidian cells. The germinating body has an oval form, and occasionally a mammilla on one side, whence roots and leaves proceed. The species are all inhabitants of ditches or inundated places. They do not appear to be affected so much by climate as by situation; thus they have been detected in various parts of Europe, Asia, Africa, and America, chiefly however in temperate latitudes. Their position is between *Lycopodiaceæ* and *Jungermanniaceæ*. The species number about 20, the principal of which are—*Pilularia*, *Marsilea*, *Azolla* and *Salvinia*. (Balfour, *Class-Book of Botany*.)

MARTAGON. [LILIUM, *S.* 1.]

MARTIN, JOHN, was born at a house called the Eastland Ends, Haydon Bridge, near Hexham, Northumberland, on the 19th of July, 1789. His early ambition being to become a painter, his father, as the best way of turning his desire to profitable account, apprenticed him to a coachmaker at Newcastle (whither the family had removed) to learn herald-painting. Here however he only remained a few months; and, his indentures having been cancelled, he was then placed with an Italian painter named Bonifacio Musso, the father of Charles Muss, who acquired some distinction as an enamel painter. With him young Martin removed to London in September, 1806, and soon after, not getting on very pleasantly in his master's family, took lodgings for himself; and, as he relates in some autobiographical notes contributed to the 'Athenæum' (see 'Ath.' for 1854, p. 246, to which we are indebted for the leading facts contained in this notice), "at this time, by close application till two or three o'clock in the morning, in the depth of winter, I obtained that knowledge of perspective and architecture which has since been so valuable to me. I was, at this time, during the day employed by Mr. C. Muss's firm painting on china and glass, by which, and making water-colour drawings and teaching, I supported myself: in fact, mine was a struggling artist's life when I married, which I did at nineteen."

His marriage stimulated him to a bolder course. He determined to paint a large picture, and by a month's application produced in 1812 his first work, 'Sadak in search of the Waters of Oblivion.' Before it left his hands his hopes received a severe blow: he "overheard the men who were to place it in the frame disputing as to which was the top of the picture." It was a mistake easy enough to make; but once in the frame the top of the picture would not be again in danger of being taken for the bottom. It found a place in the Royal Academy Exhibition, and, what was better, a purchaser for 50 guineas, in Mr. Manning, a bank director. He followed up his success by sending to the British Institution an 'Expulsion from Paradise,' and to the Academy in 1814 'Clytie,' a work which was hung in the ante-room, as was also his larger and more ambitious picture, 'Joshua commanding the Sun to stand still.' At the British Institution, where the 'Joshua' was again exhibited the following spring, it was placed in a post of honour, and awarded the prize. Martin was excessively angry with the Academy for this treatment of his "grand work," and the breach was never healed: he removed his name from the Academy's books as a candidate for membership, and as a necessary consequence, according to the laws of the Academy, he never received any academic distinction. With the picture itself, and the success it met with, he was however abundantly satisfied. "The confidence I had in my powers," Martin writes, "was justified, for the success of my 'Joshua' opened a new era to me. In 1818 I removed to a superior house, and had to devote my time mainly to executing some immediately profitable works; but in 1819 I produced the 'Fall of Babylon,' which was second only to the 'Belshazzar' in the attention it excited. The following year came 'Macbeth,' one of my most successful landscapes; then, in 1821, 'Belshazzar's Feast,' an elaborate picture, which occupied a year in executing, and which received the premium of 200*l.* from the British Institution."

These works, and especially the 'Belshazzar's Feast,' were of a kind then quite new, and took the London public by storm. A sturdy opposition was raised; but for the time it was borne down by the swelling tide of popularity. It was loudly declared—and pretty widely believed—that a new era was opened to art, as well as to the painter's self; and the engravings quickly made the artist's "sublime style" familiar from one end of the island to the other. Nor was he slow to follow up his success: 'The Destruction of Herculaneum' appeared in 1822; the 'Seventh Plague' and the 'Paphian Bower;' in 1824, the 'Creation;' in 1826, the 'Deluge;' and in 1828 the 'Fall of Nineveh,' perhaps the most popular of all his pictures after the 'Belshazzar.' He was now, however, so much engrossed with engraving, and with various schemes for the improvement of London, and other engineering projects, that for a while his pencil was somewhat less diligently employed, and when he resumed its exercise he discovered that the spell was broken. His later pictures indeed found admirers, but they were few as compared to those which greeted his earlier works, and infinitely less enthusiastic. Yet he went on to the last painting subjects no less awful than those which had originally captivated the public eye. Thus during the last twelve or fourteen years of his life he painted—'The Death of Moses,' and 'The Death of Jacob,' 1838; 'The Eve of the Deluge,' 'The Assuaging of the Waters,' 1840; 'The Celestial City and River of Bliss,' and 'Pandemonium,' 1841; 'Flight into Egypt,' 1842; 'Christ stilling the Tempest,' and 'Canute the Great rebuking his Courtiers,' 1843; 'Morning,' and 'Evening,' 1844; 'The judgment of Adam and Eve,' and 'The Fall of Adam,' 1845; 'Evening—coming Storm,' 1846; 'Arthur and Ægle in the Happy Valley,' 1849; 'The Last Man,' 1850; 'Valley of the Thames viewed from Richmond Hill,' 1851.

The last picture he exhibited during his life was a 'Scene in a Forest—Twilight' (1852). He was now engaged on a series of three grand paintings, illustrative of the 'Last Judgment,' which he fondly hoped would be his master-work, and he laboured steadily at these till a few weeks before his death. Then suffering under a paralytic attack he set out in the hope of improving his health to Douglas, Isle of Man, where, at the house of Thomas Wilson, Esq., he died February 9th, 1854. His remains were interred in the lonely cemetery of Kirk Bradden, on the Strang Road, a few miles from Douglas. His three pictures, 'The Last Judgment,' 'The Great Day of Wrath,' and 'The Plains of Heaven,' have since his death been exhibited in London and the provinces. As might be expected from the nature of the subjects, and the circumstances under which they were painted, suffering under the infirmities of age, with mind and body both enfeebled, they are comparative failures, having all the worst faults and mannerisms of the painter's earlier pictures, and only few of their redeeming excellences.

Martin was undoubtedly an original painter, and possessed a very considerable share of imagination; and in the expression of material grandeur and terror,—the vastness and might of nature, in contrast with the weakness and littleness of man,—he was eminently successful. At least until by repetition the conception had been rendered common-place and unimpressive, this was unquestionably the case; and the unparalleled popularity of his early pictures, while the manner was new, can be readily understood. But Martin did not perceive that his was a trick of style which would not bear often repeating; and he kept on covering acres of canvas with interminable vistas of buildings, pile upon pile, as buildings never could have existed in reality, and crowding the roads and fields with myriads of little insignificant figures, and clothing the whole in floods of stormy gloom and twilight, with flashes of jagged lightning or streams of dazzling sunshine; never advancing beyond a harsh and niggling touch, or attaining to anything better than a crude and conventional system of colour. Seeing only two, or at most three, of his pictures, he might be pronounced a man of genius; seeing all, while acknowledging his talent, it is difficult not to feel surprise at his deficiencies of taste, observation, and judgment.

It has been said that during many years the subject of the improvement of London occupied much of his time and thought. As early as 1828 his ideas had taken a definite shape, and he gave them to the public in a 'Plan for supplying with pure water the Cities of London and Westminster, and improving the western end of the metropolis;' and he continued to publish new and revised editions almost down to his death. The following is his own account of his labours in this line, contained in his contribution to the 'Athenæum' already referred to: "My attention was first occupied in endeavouring to procure an improved supply of pure water to London, diverting the sewage from the river, and rendering it available as manure; and in 1827 and 1828 I published plans for the purpose. In 1829 I published further plans for accomplishing the same objects by different means, namely, a weir across the Thames, and for draining the marshy lands, &c., &c. In 1832, 1834, 1836, 1838, 1842, 1843, 1845, and 1847, I published and republished additional particulars, being so bent upon my object that I was determined never to abandon it, and though I have reaped no other advantage, I have at least the satisfaction of knowing that the agitation thus kept up constantly, solely by myself, has resulted in a vast alteration in the quantity and quality of the water supplied by the companies, and in the establishment of a Board of Health, which will, in all probability, eventually carry out most of the objects I have been so long urging. Amongst the other proposals which I have advanced is my railway, connecting the river and docks with all the railways that diverge from London, and apparently approved by the Railway Termini Commissioners, as the line they intimate coincides with that submitted by me, and published in their report;—the principle of rail adopted by the Great Western line; the lighthouse for the sands, appropriated by Mr. Walker in his Maplin Sand Lighthouse; the flat anchor and wire cable; mode of ventilating coal mines; floating harbour and pier; iron ship, and various other inventions of comparatively minor importance, but all conducing to the great ends of improving the health of the country, increasing the produce of the land, and furnishing employment for the people in remunerative works." He also took out patents for water and sewer-pipes, &c.

Besides his great pictures, Mr. Martin painted a great number of water-colour landscapes, very elaborately wrought out; he also made some drawings for books, including 'Paradise Lost,' and 'Paradise Regained,' the 'Pilgrim's Progress,' &c., for which he received large sums, but which, though popular in their day, now seem for the most part strangely infelicitous as illustrations. For the Milton illustrations he is said to have received 2000 guineas.

MARTINSITE, a Mineral, which is composed of 91 per cent. of chloride of sodium and 9 per cent. of sulphate of magnesia. It comes from the salines of Hassfurth. (Dana, *Mineralogy*.)

MARTOCK. [SOMERSETSHIRE.]

MARYSVILLE. [CALIFORNIA, *S.* 2.]

MASHAM. [YORKSHIRE.]

MASSICOT. [LEAD.]

MATERIA MEDICA. [THERAPEUTICS, *S.* 2.]

MATHEW, THE REV. THEOBALD, the Apostle of Temperance in Ireland, was born at Thomastown, county of Tipperary, October 10, 1790. His father, an illegitimate member of the family of the earls of Llandaff, died while his children were young, and Theobald was enabled by the kindness of the Countess of Llandaff and Lady Elizabeth Mathew, to proceed to the academy of Kilkenny, and afterwards to St. Patrick's College, Maynooth, where he remained until he was ordained a priest of the Roman Catholic Church in 1814. He was appointed to a missionary charge at Cork, where his influence was great among the rich and the poor alike: on his appointment to this mission he received from the pope, Gregory XVI., the degree of D.D., with a dispensation enabling him to hold property. Among other benefits which Father Mathew conferred upon the inhabitants of Cork was the establishment of a religious society for the purpose of visiting the sick and needy, on the model of the societies of St. Vincent de Paul: this institution obtained the warm approbation of the Irish Poor-Law Commissioners in 1834. About four years later he was requested to lend his aid to a temperance association formed in Cork. He joined the association and became its president; and devoting himself heart and soul to the peaceful agitation, he had the satisfaction to see within a few months no less than 150,000 converts in Cork alone. Extending his sphere of action he commenced a 'progress' through the west of Ireland, where proportionate results were seen; wherever he went the crowds that flocked to 'Father Mathew' to take the pledge of temperance were so numerous, that they could only be kept in control by the military and police. The same results followed in all the towns which he visited in the north of Ireland, and at Dublin, and to a considerable extent in Liverpool, Manchester, and London, where, regardless of creed and country, he went about doing good, and raising the squalid objects of pity and compassion to self-respect, independence, and industry. It ought to be added, that in the execution of his mission Father Mathew did not scruple to sacrifice his temporal prospects; a distillery in the south of Ireland which belonged to his brother, and formerly provided him with almost all his income, being shut up in consequence of his preaching against the use of ardent spirits. His services in the cause of morality and religion having been recognised by statesmen of all shades of opinion, her Majesty granted to Father Mathew out of the civil list an annuity of 300*l.* a year—a sum, which though ample in itself, is understood to have been little more than sufficient to keep up the payments on policies of assurance upon his life obtained for the sake of securing his creditors; and a private subscription was entered upon for his assistance. He died on the 8th of December 1856: having from the state of his health been for some years incapacitated for active labours.

MAYACACEÆ, *Mayacs*, a natural order of Endogenous moss-like Plants, creeping over damp places, with narrow leaves, resembling Spider-Worts, but differing in their 1-celled anthers, carpels opposite the inner divisions of the perianth, 1-celled ovary and capsule, and parietal placentas. The species, four in number, are natives of North America. They are of no known use. (Balfour, *Class-Book of Botany*.)

MAYO, HERBERT, M.D., a distinguished medical writer, whose works on Physiology, although now to some extent superseded, were in considerable advance of his time. The first by which he made himself known was, 'Anatomical and Physical Commentaries,' published in 8vo in 1822; followed by a smaller work in 12mo in 1825, 'A Course of Dissections for the Use of Students.' In 1827 he published in 8vo, 'Outlines of Human Physiology,' of which several editions have been published; and in the same year, in folio, 'A Series of Engravings intended to illustrate the Structure of the Brain and Spinal Cord in Man.' On the establishment of King's College he was appointed Professor of Anatomy and Physiology, which office he held till 1836, when he left in consequence of having become a candidate for a similar office at University College. In 1837 he issued 'The Philosophy of Living,' in 8vo and 12mo; and the 'Management of the Organs of Digestion,' in 12mo; in 1840, in 8vo, 'A treatise on Syphilis;' and in 1842, 'The Nervous System and its Functions.' About this time he became a convert to the theory of mesmerism, and wrote many papers in the 'Medical Gazette,' strongly advocating his newly-adopted opinions. Subsequently he also adopted hydropathy. His practice as a medical man fell off, and he at length removed to Germany, in order to follow his profession as a hydropathist. He settled at Bad-Weilbach, near Mainz, on the Rhine, and there died on August 15, 1852. The product of his later opinions was the 'Cold-Water Cure, its use and misuse examined,' published in 1842; and 'Letters on the Truths contained in Popular Superstitions,' issued at Frankfort in 1849, and re-issued in London in 1851, with 'An Account of Mesmerism.'

MECINUS. [CIONUS.]

MEDICINE. [PHYSIC, PRACTICE OF, *S.* 2.]

MEERUT, the chief town of one of the Regulation Provinces into which the sub-presidency of the North-Western Provinces in Hindustan is divided. The town is situated in 28° 57′ N. lat., 77° 45′ E. long., 38 miles N.E. from the city of Delhi. It is an ancient walled town of considerable size, and is one of the military stations of the British army. The town contains a British Protestant church, which is 150 feet long, 84 feet wide, and has a lofty and handsome spire; it is of brick, covered with stucco, and whitewashed, and is altogether a very striking building. There is also a British free school. Here occurred, May 10, 1857, the first important outbreak of the great mutiny of the

Sepoys in Hindustan. From Meerut the mutineers marched direct to the city of Delhi, where they were joined by others, and where the aged nominal King of Delhi was proclaimed Emperor.

MEHEMET ALI, Pasha of Egypt, was born in the town of Cavalla, in Roum-ili, about the year 1769. He began life as the keeper of a small shop in his native town; but having volunteered into the army, he gained the good opinion of the governor of Candia by his zeal in suppressing a rebellion of the pirates of that island. In 1799 he headed a contingent of 300 Candian soldiers in an expedition to Egypt, where he co-operated with the British forces for the expulsion of the French. Here he laid the foundation of his military renown and of his political ascendancy. On the evacuation of Egypt by the troops of the Emperor Napoleon I., the Sultan nominated, as viceroy of Egypt, Mohammed Khosrew; but the Mamelukes, having risen to assert their ancient rank and influence, of which they had been deprived during the occupation of their country by the French, chose Mehemet Ali as their viceroy. In 1806 he was made Pasha of Cairo, to which in the following year was added the Pashalic of Alexandria, as a reward for his services rendered to the Ottoman Empire. No sooner however had he gained this pitch of power than he turned against his old confederates the Mamelukes—470 of whom he murdered in the citadel of Cairo, while the rest, to the number of 1200, were massacred through the country: an end was thus put to a turbulent and formidable race which had kept Egypt in a state of anarchy and warfare for upwards of 400 years. After the destruction of the Mamelukes, Mehemet Ali made himself master of Upper Egypt. He obtained from the sultan the government of that part of the country, the revenue of which he considerably increased by raising the land-tax and the custom duties on its internal trade. In 1811 he was sent against the Wahabis, a fanatical sect of the Moslems, who had pillaged the holy cities of Mecca and Medina, and whom he subdued after six years of constant warfare, and at a vast sacrifice of men and money. When the Greek insurrection against the Porte broke out, he offered to take part in the reduction of that country: his fleet accordingly sailed for the Morea in the summer of 1824, under Ibrahim Pasha, who however was obliged to retire after the battle of Navarino in 1827. In 1830 the administration of the island of Candia was confided to Mehemet Ali; but he had greater schemes in his view. He aimed at obtaining possession of Syria; and pleading as an excuse his desire to recover possession of some Egyptians who had settled in that country, he invaded Syria, with a large army under Ibrahim Pasha, and soon reduced it to submission. Syria as well as Egypt was an integral part of the Ottoman Empire; but the Viceroy of Egypt could not remain content with his own viceregal territory; and peace was only made between the viceroy and the sultan [Mahmud II.] by the interference of the European powers in 1833. Syria was ceded to Mehemet Ali on his acknowledging himself a vassal of the Porte. He remained in quiet possession of Syria as well as Egypt until 1839, when his nominal master, the Sultan, jealous and weary of the sway of so formidable a rival, sent an army and fleet to expel him from Syria; and when he found that this was impossible, he sought and obtained the co-operation of England and the other European powers. In the summer of 1840 the combined fleets appeared before the coast of Syria; in the autumn of the same year the Egyptian army was defeated near Beyrut, and both that city and Acre were captured, and Alexandria itself blockaded. Mehemet Ali was obliged to come to terms, and abandoned his claim to Syria, on condition of the Pashalic of Egypt being made hereditary in his family. He continued to administer the affairs of the country until September 1848, when he resigned the reins of government into the hands of his son Ibrahim Pasha, on whose death they passed to Abbas Pasha his grandson. Mehemet Ali himself lived only a few months after these changes, as he died August 2, 1849, at the age of about eighty years. By his wives and concubines he had sixteen children; two of his sons he sent to Paris for the sake of education. He was buried at Cairo with great pomp and splendour.

Mehemet Ali was tolerant in matters of religion to an extent rarely known among Mohammedans. His constitution was strong, his stature short; his features, though dark and stern, were animated and expressive. He was very ambitious, yet particularly sensitive to the opinions formed by others as to his public policy. His government has been extravagantly praised by some writers; but it certainly was more rational, orderly, and enlightened than that of most of the dominions of the Porte. He administered justice without partiality, established police and law-courts, abolished torture, and encouraged education. He did his best to remove the prejudices felt by his countrymen against the introduction of the arts and sciences of Europe; he even went so far as to establish European manufactures and machinery in his dominions, including a printing office for the publication of a periodical journal. He also formed schools and colleges for teaching the arts and sciences and naval and military tactics. But with all these liberal measures, his government was essentially despotic and absolute; and in order to support the expenditure necessary to maintain the institutions already mentioned as having been introduced by him, he was obliged to have resort to a heavy forced taxation, and for his army to an enormous conscription.

Upon the whole, however, it must be admitted that the Albanian peasant was in his day a great benefactor not only to his country but to society at large. Gifted with an admirable talent for organisation, he introduced into one of the most neglected and disorganised of countries the first conditions of a civilised state, *order* and *security*, to such an extent that it is said that a traveller, laden with gold, "could traverse without fear the immense territories under his sway, from the Taurus to the frontiers of Abyssinia, between sea and Nile and desert." In the administration of justice and the general management of his empire he introduced more of equity and settled principle than exists at the present time in any Oriental state. He did his best to curb the fanaticism of his subjects and to protect the Christian population. He not only encouraged commercial intercourse with Europe, but in a great measure created it; and by various enterprises of a grand and striking character, awakened that beneficial spirit of industry which for many a long century had lain dormant in Egypt. He first called into life the cultivation of cotton, indigo, and sugar, which has since been pursued with increasing success—a large portion of the produce being manufactured in his own dominions, in factories erected for that purpose at his expense. At the same time he gave a great impetus to the cultivation of silk in Syria by the plantation of mulberry-trees on an extensive scale. He founded a system of national education, of which no one for centuries past had conceived the idea in the East, and he devoted immense sums to that purpose. In fact he projected and founded more useful institutions than any Egyptian ruler since the days of Saladin. In addition to this, though at his accession to power he found Egypt without a ship or a drilled and disciplined soldier, he found means to build a fleet and to form an army trained after the European fashion. Such are the means by which the Albanian peasant, who only learnt to read in his thirty-fifth year, and who often, during his eventful life, did not know where to lay down his head in safety, became a powerful prince, who twice made the Ottoman Sultan tremble on his throne at Constantinople, and whose personal energy and public importance gave him a place among the potentates of the earth.

MELAM. [Chemistry, *S.* 1.]

MELAMINE. [Chemistry, *S.* 1.]

MELAMPYRINE. [Chemistry, *S.* 2.]

MELANOSPERMEÆ, or FUCALES (Harvey), the first sub-class of the class *Algæ*. It consists of plants of an olive-green or olive-brown colour. Fructification monœcious or diœcious; spores olive-coloured, either external, or contained singly, or in groups, in proper conceptacles, each spore enveloped in a transparent skin (perispore), simple, or finally separating into several sporules; antheridia, or transparent cells, filled with orange-coloured vivacious corpuscles, moving by means of vibratile cilia. It includes the following orders:—

Fucaceæ.—Spores contained in spherical cavities immersed in the frond. [Fucaceæ.]

Sporoclinaceæ.—Spores attached to external jointed filaments, which are either free or compacted together in knob-like masses.

Laminariaceæ.—Spores forming indefinite cloud-like patches, or covering the whole surface of the frond.

Dictyotaceæ.—Spores forming definite groups (sori) on the surface of the frond.

Chordariaceæ.—Frond cartilaginous or gelatinous, composed of vertical and horizontal filaments interlaced together. Spores immersed.

Ectocarpaceæ.—Frond filiform, jointed. Spores external. (Harvey, *British Marine Algæ.*)

MELASSIC ACID. [Chemistry, *S.* 2.]

MELBOURNE, the capital of the colony of Victoria, or Port Phillip, Australia, is situated on the Yarra-Yarra River, near the head of Port Phillip Bay, 600 miles distant from Sydney by the overland route, and about 500 miles from Adelaide, the capital of South Australia. Melbourne has sprung into existence within the last 20 years; it increased rapidly after the discovery of gold in the colony in 1851, and is now a large and important city, the seat of an extensive commerce. The streets are spacious and laid out with great regularity. Melbourne contains several fine buildings, among which may be named the cathedral, and several places of worship, including chapels for Episcopalians, Independents, Presbyterians, and Wesleyan Methodists; a court-house, the governor's residence, a post-office, a custom-house, a jail, the government offices, several boarding-houses, hotels, baths, and large commercial establishments. Extensive improvements are being effected, including an ample supply of water which has been brought into the city from a distance of 20 miles. The total revenue of the city of Melbourne amounted in 1853 to 109,636*l.* 6*s.* 5*d.* Of this revenue the corporation expended the principal part in public improvements. Melbourne is the seat of a bishopric; a corporate town with a mayor; the residence of the lieutenant-governor; and the seat of government.

The gold finding in the colony, which appears to continue without much diminution, attracts numerous emigrants to Melbourne, especially from Great Britain. The population of the city is probably now more than 40,000. Vessels of 200 tons can ascend the river to Melbourne, larger vessels lie in Hobson's Bay. *Williamstown*, the port of Melbourne, is a small town built on a low sand-flat at Point Gellibrand, on the west side of Hobson's Bay, about 8 miles S.W. from the city. It contains some good houses. A railway connects Williamstown with Melbourne city. By means of a pier at Williamstown, having a communication with the railway terminus, passengers and goods may be landed and sent on to Melbourne.

MELDRUM. [Aberdeenshire, *S.* 1.]

MELILLA, a sea-port town of Marocco belonging to Spain, is situated 11 miles S. from Cape Ras-ud-Dir, or Tres-Forcas, in 35° 8′ 15″ N. lat., 2° 56′ 2″ W. long., and has about 3000 inhabitants. The town stands on a peninsula about 40 feet above the sea, and united to the mainland by a rocky isthmus. Melilla is one of the Spanish presidios on this coast. It is impregnable on the land side, and towards the sea it is defended by strong ramparts. The fortress has large magazines and cisterns, and small vessels can enter the harbour. The presidios of Peñon-de-Velez and Alnzemas, or Alhucemas, two strongly fortified rocky islands between Cape Tres-Forcas and Ceuta, are also under the governor of Melilla. The Spanish garrison of Melilla numbers about 1000. The rest of the inhabitants are for the most part convicts and exiles. Melilla is said to derive its name from the Spanish word for honey, which is gathered of superior quality on the mountain slopes along this coast.

MELISSIC ACID. [Chemistry, *S.* 2.]

MELISSYLE. [Chemistry, *S.* 2.]

MELITTA (Kirby), a name for a genus of Insects belonging to the order *Hymenoptera*, and to the tribe *Mellifera* of Latreille. The genus as originally constituted by Kirby embraced all the Honey Bees known at that time. This genus is now split up into numerous smaller ones. Leach divides the *Mellifera* into two families, *Andrenidæ* and *Chrysididæ.*

The Andrenidæ include the following genera:—

1. *Colletes.*
2. *Prosopis.*
3. *Sphecodes.*
4. *Halictus.*
5. *Andrena.*
6. *Cilissa.*
7. *Macropis.*
8. *Panurgus.*
9. *Dasypoda.*
10. *Megachile.*
11. *Osmia.*
12. *Anthocopa.*
13. *Stelis.*
14. *Ammobates.*
15. *Epeolus.*
16. *Nomada.*
17. *Cœlioxys.*
18. *Melecta.*
19. *Anthidium.*
20. *Heriades.*
21. *Chelostoma.*
22. *Eucera.*
23. *Saropoda.*
24. *Anthophora.*
25. *Apathus.*
26. *Bombus.*
27. *Apis.*

The Chrysididæ—

1. *Cleptes.*
2. *Chryris.*
3. *Euchræus.*
4. *Hedychrum.*
5. *Elampus.*

MELITTIS, a genus of plants belonging to the natural order *Labiatæ.* It has anthers approaching in pairs and forming a cross bursting longitudinally. The upper lip of the corolla flat, entire, straight; lower lip with 3 rounded nearly equal lobes; calyx membranous, bell-shaped, ample, variously lobed.

M. Melissophyllum, Bastard Balm, has oblong, ovate, or slightly cordate leaves. The upper lip of the calyx with 2 or 3 teeth; flowers purple, with a white margin, or variegated in different ways, large. Stem 1 or 2 feet high. *M. grandiflora* (Smith) is only a slight variety. They are both found in woods in the south of England.

MELKSHAM. [Wiltshire.]

MELOSIREÆ, a family of *Diatomaceæ*, formed by Kützing. The species are striated, not having a central opening on the secondary side. The striæ are interrupted in the median line. It includes the genera *Gallionella*, *Melosira*, *Podosira*, and others. Meneghini, in his 'Natural History of Diatomeæ,' makes the following critical remarks on this group:—

"The *Melosiræ* in general may be regarded as polypariform associations of *Cyclotellæ*, and the comparison prevails principally in the second sub-genus. The distinction of the two sub-genera is also proposed by Hassall (*Sphærophora*, *Meloseira*); but it is to Kützing we are indebted for establishing it upon the important character of the carina, which occurs only in the first two species (*M. salina*, *M. nummuloides*), a character on whose organographic value we cannot decide anything, but which merits some consideration in a morphological point of view: for that projecting ring bounds the lateral surfaces; whilst in the other species, with sides more or less convex, these are continuous, as it were, with the primary surfaces. In all the species we may notice the double furrow, which forms a ring connecting the body of each individual laterally to the interstitial ring; this furrow or canal presents apertures disposed in a regular manner. Kützing believes these supposed apertures to be sections of the canals themselves, that is, portions of them seen in projection. This opinion is the only one consistent with the fact that the filament being cylindrical, and therefore presenting itself indifferently on every side, these apparent apertures are always seen arranged near the margin. Ehrenberg's assertion that they are more numerous in some species, does not seem to be confirmed. This appearance is still more complicated, inasmuch as these fine tubular canals project from the internal surface of the shield, and a slight furrow externally corresponds with them. This condition is evident in *Melosira distans*, in which, owing to the greater depth of the furrow, the apparent perforations remain separated from the margin. The interstitial ring presents peculiarities of which we have no instance in the preceding genera. Its tenuity and the great variety of its extension are important characters. But here we must add the very important one of the changes it undergoes during observation. It is not uncommon to see the two halves of the articulation separate themselves slowly, and enlarge at the same time with the ring. This fact is not decisive in respect to the great question of the animal nature of these beings; for it is not subject to a subsequent contraction, and because in plants we have the analogy of *Spirogyræ*, in which, on the rupture of the outer tube, the extremities of the articulation, which were inflected like the finger of a glove, expand themselves as if by elasticity; but many facts controvert this inference. In support of the opposite opinion is the frequent enlargement of a particular articulation, in a manner similar to that of the *Œdogonia.* But Hassall justly observes, 'for this endochrome . . . never becomes condensed into a distinct organ or sporangium.' For this reason, the resemblance is reduced to a mere appearance. As to this supposed endochrome, proofs are certainly wanting that it is an ovary, as Ehrenberg supposes; but they are also wanting to show that it consists of gum, starch, or chlorophyll, which would be necessary were it a gonimic substance, as advanced by Kützing; and analogy even is wanting, for we do not see in any *Alga* a similar disposition of the internal substance. The often-quoted resemblance to the *Confervæ* cannot even be deemed apparent; for in no *Confervæ* are distinct spherules met so regularly, or disposed so symmetrically.

During desiccation it happens in the marine species, as in the *Podosiræ* already described, that the internal substance adheres to the inner wall in the form of oily globules surrounded by a distinct transparent margin, and compressed one against another in the form of regular polygons. Ehrenberg also speaks of diaphanous vesicular spaces, which he regards as stomachs. Kützing enumerates, figures, and describes nineteen species, marine, freshwater, and fossil, besides the four doubtful ones placed at the end, and the famous *Ferruginea* (*M. ochracea*, Ralfs), which he proves not to belong to the class of *Diatomeæ*.

"We shall find, as a character common to them all, the circular figure of the vertical section parallel to the lateral surfaces; a character which, as well as the other, of a radiated disposition of the striæ upon the lateral surfaces, we shall find repeated in the family of *Coscinodisceæ*, which, having the shield of a cellular structure, belong to the tribe of *Areolatæ*. Perhaps we may suspect some *Melosiræ* (*sulcata, decussata, lirata*), to be furnished with the same organic condition, and hence arises a fresh doubt respecting the systematic value that has been ascribed to it.

"In general we may also say, that in the *Melosireæ* the development of the lateral surfaces prevails over that of the primary ones, which we find finally to disappear in certain genera (*Pyxidicula, Podosira*), as well as in some species of *Melosira* (*varians, orichalcea*), the increased length of the articulations involving the corresponding development of the primary surfaces: and it is to be observed, that although in this family the primary surfaces differ precisely as much in form as they do in the three preceding ones, yet we find in these the same organic character as in the greater number of the other genera, namely, the presence of longitudinal furrows or canals. The separation of one lateral surface or valve from the other, with the consequent dilatation of superficies, which the primary surfaces exhibit before the duplication takes places (though verified to some degree in other genera, yet in the *Melosiræ* better than elsewhere), presents an undeniable analogy with the reduplication of *Desmidieæ*, which Brèbisson distinguishes from the deduplication of *Diatomeæ*. The particular disposition of the internal substance, the currents or mucous threads radiating from a centre, the enlargement of some articulations, and the dilatation of the interstitial ring, are isolated facts, which however merit particular attention in the paucity of our knowledge."

MENACCANITE. [Titanium.]

MENÆTHIUS. [Maidæ.]

MENDELSSOHN. Felix Mendelssohn-Bartholdy, one of the greatest musicians of the present century, was born at Hamburg on the 3rd of February 1809. He was the grandson of the celebrated Moses Mendelssohn. His father, who was the head of a great banking-house, on his marriage adopted the name of his wife's family in addition to his own. He had embraced the Lutheran faith, in which his children were brought up. When Felix was in his infancy, his father removed from Hamburg to Berlin, where he resided till his death, enjoying a distinguished place in the society of the Prussian capital. He bestowed the utmost care upon the education of his son, who showed, at a very early age, singular attainments, not only in the art to which his genius especially directed him, but in various branches of literature and science. While yet a child, he gained the affections of Göthe, who was a friend of the family; and the published letters of that illustrious man contain many touching expressions of his love for the youthful Felix and prognostications of his future greatness. He was even then remarkable for his amiable disposition and simplicity of mind; qualities which he retained unimpaired to the end of his too short life.

As in the case of almost every great musician—of almost every great artist indeed of any description—Mendelssohn's genius showed itself even in infancy. He tried to play almost before he tried to speak. His talents received the best and earliest culture. Zelter, the friend and correspondent of Göthe, was his chief instructor in music, and his progress was almost as marvellous as that of Mozart. Indeed his first works, which were afterwards published, were in advance of anything produced by Mozart at an age equally tender. His three quartets for the pianoforte, violin, and violoncello, written before he was twelve years old, are not merely surprising juvenile compositions, but masterly works, which continue to be constantly performed, and hold their place among the classical music of the age. He was in his sixteenth year when his opera, 'The Wedding of Camacho,' was produced on the Berlin stage, more, it has been said, from the wish of his proud and happy parents than his own, for the most unaffected modesty always formed a part of his character. It was favourably received; but, as it betrayed some inexperience in composition for the stage, it was withdrawn by his friends. It was however published; and, though it is not generally known to the public, many copies of it are in the hands of amateurs. The music is not only charming, but full of the dramatic element. Every personage speaks in his own characteristic language, from the solemn pomp of Don Quixote and the grotesque humour of Sancho, to the passionate tenderness of the young lovers, whose wedding and its crosses form the subject of Cervantes's delightful story. This most interesting piece shows what great things Mendelssohn might have done for the music of the stage, had he not left this branch of his art to tread the highest of all—that in which he followed, and at no great distance, the footsteps of Handel. Another proof of the dramatic character of his genius at that early age was the composition of the overture to 'The Midsummer Night's Dream,' which breathes in every bar Shakspeare's own inspiration. Its popularity has now become unbounded: and no listener can fail to trace in its passages, in which the fanciful, the delicate, and the grotesque are so exquisitely blended, the various conceptions of the poet. The rest of the music for 'The Midsummer Night's Dream' was not written till many years afterwards, for the purpose of accompanying the performance of the play at Berlin. Its effect, thus introduced, was found to be so delightful, that in Germany the play is never represented without it, and the same thing is beginning to be the case in this country.

Mendelssohn had just reached his twentieth year when he made his first visit to England; a visit which deeply influenced the whole course of his life. He arrived in London in April 1829. His reputation was not unknown to our most eminent musicians, by whom he was cordially received. At the first concert after his arrival of the Philharmonic Society, his overture to 'The Midsummer Night's Dream' was performed, and received with enthusiasm by an audience, most of whom could never have heard of his name. It was immediately published. In a little memoir of his life, published a few years ago by Mr. Benedict, the eminent German musician so long resident among us, there are some valuable remarks on his London début. "The effect," says Mr. Benedict, "of the first performance of the overture to 'The Midsummer Night's Dream' in London was electrical. All at once, and perhaps even when least expected, the great gap left by the death of Beethoven seemed likely to be filled up; and I am happy to adduce this success as another proof of the much underrated taste of the English public, and its discernment in appreciating and even discovering new-born musical talent. Not to speak of the Elizabethan era—of Orlando Lasso, Luca Marenzio, the great madrigal writers—did not Handel compose his immortal works almost exclusively in England and for an English audience? Were not Haydn's finest symphonies written to gratify the London amateurs before a note of them was heard or known in Germany or France? Was not Beethoven known and revered by English artists, by English musical societies, when almost forsaken and neglected in Germany? And so it was with Medelssohn. His renown, after the enthusiastic but just reports of his reception in London, both as a composer and pianist, spread like wildfire all over Europe, and gave the young and ardent maestro a new stimulus to proceed on his glorious path."

In the same year Mendelssohn visited Scotland. In Edinburgh he was warmly welcomed by a literary and musical society well able to appreciate his genius and attainments, and his stay in that city was always regarded by him as one of the most agreeable incidents of his life. He afterwards made an extensive tour through the Highlands and the Western Isles; and many reminiscences of the days spent in Scotland are to be found in his compositions. He was deeply impressed with the wild and romantic beauty of the old Caledonian music, even in its rudest and most primitive form, and especially admired the Highland bagpipe and those antique strains, which though harsh and discordant to "ears polite," and scarcely allowed by dainty connoisseurs to deserve the name of music, yet reach the heart of every true Scotsman. Such music Mendelssohn could understand and value. A Scottish friend carried him to witness the "Competition of Pipers," as it is called, a gathering of masters of the national instrument, who are chiefly retainers of great families, and assemble annually in the Edinburgh theatre to contend for the palm of minstrelsy in the presence of the most brilliant company of the metropolis—a relic of Scottish feudalism still preserved. To the surprise of his cicerone, who merely wished to give him half an hour's amusement, Mendelssohn remained to the last, immersed in what he heard, and earnestly comparing the merits of the various pibrochs and the powers of the performers. Many years afterwards, the same friend heard the celebrated symphony in A minor (now called the Scottish symphony) performed for the first time, under the author's own direction, at a concert of the Philharmonic Society. Struck with the strains of Highland melody which characterise that piece—the festive dance, the gathering, the warlike march, the lament—he was about to make some remark to Mendelssohn, when he said with a smile, "You remember the pipers?" His fine orchestral piece too, 'The Isles of Fingal,' is full of the impressions made upon his mind by the wild and stormy shores of the Hebrides.

In the following year he was for some time in Italy; and two years afterwards he visited Paris. From thence he came a second time to London; and from that time, we believe, to the end of his life, there was scarcely a season in which he did not visit England. He began even then to feel that he was more justly appreciated in our country than even in his own; and thenceforth England became, as it were, his adopted country, and was associated with the most important circumstances of his artistic life. His treatment at that time by his own countrymen appears to have inspired him with different feelings, and we have the authority of Mr. Benedict for saying, that "the mean cabals which were always at work against him at Berlin increased his dislike to that city so much as to induce him to leave it, as he then thought, for ever." He left Berlin for Leipzig, where he accepted the directorship of the famous Gewandhaus Concerts, and where he remained till the year 1844, when he was induced, by the pressing request of the King of Prussia, to return to Berlin.

His entrance upon his glorious career as a composer of sacred music may be fairly ascribed to the committee of the Birmingham Festival; for he set about the composition of his first oratorio, 'St. Paul,' under the arrangement that it should be performed under his own direction at the festival of 1837. And it was so performed accordingly, having been previously produced at Düsseldorf and Leipzig.

The performance of this oratorio in the Town-hall of Birmingham on the 20th of September 1837, was an event memorable in the annals of music in England. It was got up with the unrivalled magnificence for which the musical festivals of that town are distinguished. The impression which it made upon an immense assemblage will long be remembered by those who were present. Mendelssohn was again at the Birmingham Festival of 1840, when the 'Lobgesang,' or 'Hymn of Praise,' composed expressly for that festival, was performed under his own direction. This remarkable work, called a 'Sinfonia-Cantata,' in which the powers of vocal and instrumental music are equally employed in developing a grand design, had a great success, and like 'St. Paul,' was speedily reproduced in the metropolis, and at all the great music-meetings in the kingdom.

His third and last oratorio, the greatest of them all—'Elijah,' was also written expressly for Birmingham. Though he undertook it immediately after the production of 'St. Paul' in 1837, it was not performed till 1846: and during these nine years, it occupied a large share of his thoughts and his labours. When the time for its production drew near, he resigned his post at Berlin and gave up every other occupation, in order to devote his whole powers to this work. The poem, in which the principal events in the life of the Hebrew Prophet are related in the language of the Bible, was constructed by Mendelssohn himself; and the English version was executed and adapted to the music with admirable skill by Mr. Bartholomew. The first performance took place on the 26th of August 1846, the performance being conducted by the author. The enthusiasm it excited cannot be described. It was pronounced by the general voice to be not only the masterpiece of the composer, but the greatest oratorio given to the world since 'The Messiah:' and this judgment has ever since been strengthened and confirmed, not merely by the opinions of connoisseurs and critics, but by the united voice of the British nation.

The production of this immortal work was the crowning glory of Mendelssohn's career. He was again in London, in 1847, to superintend its performance at Exeter Hall by the Sacred Harmonic Society. It was four times performed there, and afterwards, under his own direction, at Birmingham and Manchester. Soon afterwards he left England, never to return. His health had for some time been declining. Shortly after his arrival at home, he received a shock in the sudden death of his sister, who strongly resembled him in character and talents, and to whom he was fondly attached. From this blow he never recovered. He was persuaded to visit Switzerland, where, living quietly in the bosom of his family, he regained his strength and returned home to Leipzig, seemingly convalescent. But he soon relapsed, and at length sank under his malady, an affection of the brain, and expired November 4th, 1847, before he had completed his thirty-ninth year. He left many manuscript compositions, which, it is understood, were placed in the hands of several eminent musicians, friends of his family, with a view to selection and publication; but none of them have been given to the world except a fragment of an Oratorio, entitled 'Christus,' and some scenes of a romantic opera. The suppression of all the others, some of which were known to be works of magnitude and importance, has excited much surprise and dissatisfaction.

In a sketch like this, it is impossible to speak in detail of Mendelssohn's works. They are very numerous, and embrace every branch of his art; but it was in sacred music that his highest powers were displayed; and 'St. Paul' and 'Elijah' will descend to posterity along with 'The Messiah' and 'Israel in Egypt.'

Mendelssohn was exposed to none of the cares, struggles, and vicissitudes which genius is too often heir to. Happy in all his domestic relations, in the enjoyments and triumphs of his art, and above all, happy in a pure mind and blameless life, few men have had a more enviable lot than Felix Mendelssohn.

MENDLESHAM. [Suffolk.]

MENILITE. [Opal.]

MENISPERMINE. [Chemistry, *S.* 2.]

MENYANTHINE. [Chemistry, *S.* 2.]

MERCANTILE MARINE. [Ships, *S.* 2.]

MERCHANT-SHIPPING. [Ships, *S.* 2.]

MERE. [Wiltshire.]

MERLANGUS, a genus of Fishes belonging to the family *Gadidæ*. It is distinguished from the genus *Morrhua*, to which the Cod-Fish belongs, by the absence of the barbule at the chin. [Morrhua.]

M. vulgaris (*Gadus vulgaris*, Linnæus), the Whiting. This fish is well known for the excellence and delicacy of its flesh. The pearly whiteness of its flaky muscles, added to its extreme lightness as an article of food, recommend it particularly to invalids as an article of diet. It is caught in great abundance all round our coast, and may be traced from the Orkneys to Cape Clear. Whitings of several pounds weight have been caught as far north as the Dogger Bank; they have also been taken of nearly equal size on the coast of Cornwall, and on the Nymph Bank along the extended line of the south coast of Ireland. In that country they have also been found on the eastern coast, from Waterford to Antrim, and from thence north and west as far as Lough Foyle. The fishing for Whiting with lines is pursued nearly all the year through, but the fish is most plentiful in the months of January and February, when it comes in large shoals towards shore for the purpose of depositing its spawn, and is taken in abundance within half a mile and seldom exceeding three miles from land. The whiting is a voracious feeder, and seizes indiscriminately *Mollusca*, worms, small *Crustacea*, and young fishes. Though occasionally occurring in the London market of three or four pounds weight, the most usual size is from 12 to 16 inches in length, and weighing about one pound and a half. The body of the Whiting, like the bodies of those belonging to this division, is longer for its depth than that of the Cod-Fish; the scales small, oval, and deciduous; the lateral line dark and straight posteriorly, but rising gradually throughout the anterior half; the head elongated; the mouth and gape large, the tongue white and smooth; the upper part of the head and the back above the lateral line pale reddish-ash brown; sides and belly silvery white; pectoral, caudal, and dorsal fins pale brown; ventral and anal fins almost white, the pectoral fins each with a decided dark patch at the base.

M. albus (*Gadus albus*, Risso), Couch's Whiting. It is mentioned by M. Riss, in his volume on the 'Ichthyology of

Nice,' published in 1810, but was not caught in the British seas until 1840 by Mr. Couch. His description is as follows:—"Length 15 inches; the depth in a straight line 2½ inches; from the base of the first dorsal fin to the vent along the curve, 3 inches; from the mouth to the edge of the gill-covers 3 inches; from the same to the anterior edge of the eye one inch; the eye large, the form a perpendicular oval; under jaw the longest; the upper maxillary bone terminal, the snout receding from it backward, contrary to the form of the Whiting, in which the upper jaw is under a projection. The general form of the body resembles that of the Whiting, but rather more slender; the back rounded as if the specimen was plump, thus showing its slender form not to be the result of emaciation. The distinctions between this fish and the Whiting are obvious, in the jaws, fins, lateral line, colour, and vertebræ."

M. carbonarius (*Gadus carbonarius*, Linnæus), the Coal-Fish. This is decidedly a northern fish, but being a hardy species, is not without considerable range to the southward. It was the only fish found by Lord Mulgrave on the shores of Spitzbergen, and the fry, only 4 or 5 inches long, were caught with the trawl-net on the west coast of Davis's Strait, during the first voyage of Captain Sir E. Parry. It is found on the coast of the United States. It abounds in all the northern seas, and in the Baltic, and may be said to swarm in the Orkneys, where the fry all the months of summer and autumn are the great support of the poor. As an article of food it is more prized when small than when of large size. The flesh of specimens weighing from 15 to 20 lbs. is usually dried or salted. This fish has more provincial names than any other species, some of which only refer to it when of a particular size. Among the Scotch islands the Coal-Fish is called Sillock, Piltock, Cooth or Ruth, Harbin, Cudden, Sethe, Sey, and Gray Lord. In Edinburgh and about the Forth the young are called Podleys; at Newcastle the fry are called Coalsey, and when 12 inches long Poodlers. The Coal-Fish may be traced on the Irish coast from Waterford along the eastern shore to Belfast. When detained and well-fed in a salt-water pond they attain a large size, and are very bold and voracious. The head and body are elegantly shaped; the scales small and oblong; the lateral line silvery white and nearly straight; the upper part of the head and back above the lateral line almost black, much lighter in colour below the line, becoming grayish-white with golden reflections on the sides and belly; pectoral, caudal, and dorsal fins bluish-black; ventral and anal fins grayish-white; the upper jaw rather the shortest, the lips tinged with purple red, the mouth black, the teeth very small, the irides silvery white, the pupil blue.

M. Pollachius (*Gadus Pollachius*, Linnæus), the Pollack. This fish is much less abundant on some parts of the coast than the Coal-Fish, but like that species is an inhabitant of the seas all round our shores. The fish is called Lythe in Scotland, but whether from its supple pliant activity, or from 'lithos,' a stone, in reference to its living among the rocks, is not decided. The Pollack is caught at Hastings and Weymouth, also in Devonshire, where it is sometimes sold as Whiting. When only 12 or 14 inches long it possesses a considerable portion of the flavour and delicacy of that fish. It is also caught along the Irish coast under the names of Pollack, Laith, and Lythe. The body is elongated; the upper part of the head and back above the lateral line olive brown, the sides dull silvery white mottled with yellow, and in young fish spotted with dull red; the lateral line dusky, curved over the length of the pectoral fin, then descending and passing in a straight line to the tail; the dorsal fins and tail brown; the pectoral and anal fins edged and tinged with reddish-orange.

M. virens (*Gadus virens*, Linnæus), the Green-Cod. This fish was first added to the list of British fishes by Sir Robert Cullum, and if a distinct species, as some doubt it, is not only abundant, but has an extensive range. It is mentioned as an inhabitant of the northern seas by Linnæus and others, and is taken on the coast of Scotland, the Isle of Man, and on the Cornish coast. By some it is thought to be the young of the Coal-Fish, and by others as the young of the Pollack. The northern naturalists, who have opportunities of making constant comparison between this fish and the Coal-Fish from the abundance of both, consider them as distinct species. It seems to combine in itself the colouring of the Pollack, with some of the peculiarities of the Coal-Fish, but appears also to be deeper for its length than either, though if the young of a large species, judging by analogy, that would not be the case. The subject in its present state is open to investigation, and invites the attention of those who are so located as to be able to obtain examples of both.

(Yarrell, *British Fishes.*)

MERTENSIA, a genus of Plants belonging to the natural order *Boraginaceæ*. It has a calyx in 5 deep segments; corolla bell-shaped, with a short thick cylindrical tube with 5 minute protuberances in its throat; stamens protruded beyond the throat; filaments elongate; style simple; nuts smooth, inflated, rather drupaceous, attached laterally near their base by a flat surface; seeds free.

M. maritima has a procumbent branched stem; leaves ovate-acute, rough, with callous dots, glabrous, fleshy, glaucous; nuts smooth; flowers in racemes, purplish-blue; protuberances in throat of the corolla yellow; leaves with a flavour resembling that of oysters; nuts free, forming a pyramid longer than the calyx; pericarp membranous; seed smaller than the cavity. It is found on the northern sea-shores in Great Britain.

MERULA. [BLACKBIRDS.]

MESACONIC ACID. [CHEMISTRY, *S.* 2.]

MESITINE SPAR, *Brünnerite*, a native Carbonate of Iron and Manganese. It occurs in yellowish rhombohedrons. Its hardness is 4·0, and its specific gravity 3·3 to 3·6. It includes much that is called Rhomb-Spar, or Brown Spar, which becomes rusty on exposure to the atmosphere. (Dana.)

MESITYLOLE. [CHEMISTRY, *S.* 2.]

METACETONE. [CHEMISTRY, *S.* 1.]

METEOROLOGY. To the article in the 'Penny Cyclopædia' on this union of sciences applied to the investigation of the atmosphere as the physical medium between the earth and the heavens, may now be added some account of two or three important subjects, our acquaintance with which has recently been greatly improved.

METEOR, METEORITE. The following is a condensed statement of the present condition of knowledge upon these subjects, which are connected in a remarkable manner with cosmical science, and with almost every department of physics and of the study of inorganic nature. It includes also a notice hitherto unpublished of a branch of the history of science to which little attention has yet been given—the explanation and interpretation by means of our present knowledge, of the numerous relations of such phenomena which occur in ancient history, both classical and mediæval, as well as in the popular historical literature of more recent periods.

The spaces through which the bodies of the solar system and the comets revolve about the sun, appear also to be traversed by celestial bodies comparatively minute, but in number incalculable; which, in common with the smaller true planets of the system have received from certain astronomers and physicists the appellation of *Asteröids*, or star-like bodies,—the word *star* being taken in its universal and ancient sense of any luminous object seen in the heavens. These smaller asteröids, when they approach within a certain comparatively small distance from the earth, are, or subsequently become, the objects termed shooting-stars, fire-balls, and igneous meteors; new series of phenomena being successively presented by them as they come nearer to the earth's surface, and especially in many instances, in consequence of their finally passing through a great extent of the atmosphere in an oblique direction, so as to experience the effects of its increasing density, both physical and chemical, throughout a trajectory of great length. But in this general statement it is not pretended to deny that objects and phenomena very different in their origin and nature, as well from each other as from those now under review, may probably be included also under the popular or only half-scientific designations of meteors and shooting-stars.

The appearance of these meteors is in many cases attended or succeeded by the fall of solid bodies, either stones or metallic iron, or in some cases both mingled together in the same block, forming a series of bodies collectively termed *Meteorites* (or AEROLITES, 'Penny Cyclopædia'), consisting, mineralogically, of two principal groups, graduating into each other, namely, *meteoric stones*, and *meteoric iron*.

The visible meteor, when observed at those distances which must be within the atmosphere, and possibly indeed when at much greater, must consist of *flame*, or gaseous matter in an ignited or incandescent state, and undergoing combustion, but arising, as may be inferred from Sir H. Davy's researches on flame, not from the combustion of matter which under ordinary circumstances can exist in a gaseous state at the surface of the earth, but from that of matter which is there solid, consisting, doubtless, of the metallic or other combustible bases which meteorites are found to contain. Among these it may be remarked are sulphur and phosphorus, both which Davy particularised as capable of combustion in air rarefied to a degree equal to that of the regions of the atmosphere in which meteors had been observed to display their phenomena; no particular stress, however, can be laid upon this circumstance, as meteorites contain other combustible bases which very probably have the same property, including the metal magnesium, an element of almost every meteoric stone, in considerable proportion. The extraordinary intensity of light also which attends the combustion of magnesium in oxygen, may be connected with the brilliant phenomena of the meteors.

The luminous extensions in the direction opposite to that of the meteor's motion, ordinarily called *tails*, as observed in many, if not in all igneous meteors, are manifestly referable to the elongation of the mass of flame constituting the visible meteor, by the resistance of the atmosphere to their progress through it with planetary velocity, as well as in some degree by the adhesion of the air to it; the passage from the intense white light of the head or body and proximate portions of the tail, to the red light of the distant and extreme portions of the latter, being attributable to the cooling down of the flame during its course, and in proportion to its distance from the most intensely heated part of the meteor.

It would appear, both from theory and observation, that the figure of the meteors must approach in their course more or less closely to that of the solid of least resistance. The meteorites which fall, or are cast down from them, when unbroken, especially those consisting of metallic iron, retain approximately the form which had thus been imparted to the meteors of which they were the nuclei, by the resistance of the air,—a form resembling that of the more perfect volcanic bombs, and which they have received from the same cause. These effects of the resistance of the atmosphere to the meteor's motion were first pointed out by Mr. Brayley.

The persistent *track* or *trail* of less vivid light often continuing to be seen for several minutes, or for a considerable fraction of an hour, or even for more than an hour, after the disappearance of the meteor itself, must be attributed to the deposition in the atmosphere, in the meteor's path, of a kind of *beam* of finely-divided solid matter,—mingled probably with vapour, and no doubt in part produced by the condensation of vapour,—resulting from the combustion proceeding in the meteor, and the particles of which, being originally deposited at insensible distances from each other, continue to preserve, during their slow and uniform descent in the tranquil regions of the air, where they originate, the aggregate form in which they were deposited; while the low conducting power for heat of the rare atmosphere permits them also to retain their high temperature and consequent luminosity for a comparatively long period of time. The continued action of gravity, and the disturbing agency of currents in the lower regions of the atmosphere, will, however, eventually convert the at first rectilinear beam into a more or less curved and waved figure, and at length produce the *serpent of fire* of the superstitious ages, accurately reproduced in the case of the meteor of the 7th of January, 1856, as witnessed at Tunbridge Wells, and represented by a correspondent of the 'Illustrated London News,' of the 12th. These views are supported by reference to telescopic observations of the trails, particularly by those of the late Professor Pictet, of that left visible for seven or eight minutes by the meteor seen in France and Switzerland on the 15th of May, 1811, the most luminous part of which "did not appear to be continuous, but composed of distinct and separate particles."

The production, continuance, gradual change of form and descent, and final dissolution of these trails, may be familiarly, but correctly, illustrated by comparison with the similar succession of phenomena characterising the trail of smoke and soot issuing from the funnel of a steam-ship during its progress in its course; in which also a rectilinear beam of finely divided solid matter separated from flame and smoke, and often several miles in length, becomes a persistent trail, and gradually changes into a waved or serpentine form. In many cases the trail of a meteor must have been originally a cylindrical beam, constituted as now explained, having a diameter of many hundred yards (equal to or greater than that of the meteor itself), and a length of many miles, deposited, in an inclined direction, at heights of some miles above the earth's surface.[*]

An objection founded on the assumed solidity of the particles, and the considerable specific gravity which must be attributed to them as results of the combustion going on within the meteors, which, it might be inferred, are inconsistent with their long suspension in the manner supposed, is at once obviated by applying to the subject the results of Professor Stokes's researches on the effects of the internal friction of fluids (noticed in the concluding division of this article) as applied by himself to the suspension of fine powders in a fluid of widely-different specific gravity, and to that of the suspension in the air of the minute globules of water constituting the clouds. The trails of meteors are suspended like the clouds, though, at first, probably, in higher regions of the atmosphere, and like them they consist of excessively minute particles, which, as in all probability their dimensions will be very nearly the same in all directions, may be regarded as spherules also, and will, consequently, be suspended temporarily, like the globules of the clouds, by the resistance to their downward motion arising from the internal friction of the air. The degree in which they partake of the projectile motion of the meteor itself, will also tend to their longer suspension, by converting the perpendicular fall which the mere action of gravity would cause into an oblique curvilinear descent.

The two great causes of all the phenomena now described, are evidently the *motion* and the *heat* of the meteors. The origin of the former is doubtless involved in that of the portions of matter constituting the nuclei of the meteors themselves, a subject noticed below. Dr. Chladni, the earliest philosophical investigator of the subject of meteors and meteorites (as a whole), and in later times Sir H. Davy and Sir John F. W. Herschel, have ascribed the heat to the compression and friction of the air, resulting from the enormous velocity, of from six to thirty miles in a second, or more, of the meteors, supposed to be solid when they enter the atmosphere. Still more recently, in a paper read before the Royal Society on the 19th of June 1856, Mr. Joule and Professor William Thomson have inferred from their own experiments on the thermal effects of fluids in motion, to which those of solids carried through fluids must be equivalent, the great probability that meteors really acquire all the heat they manifest from the friction of the air.

In the present state of cosmical and meteorological science, it is unnecessary to enter upon the question of the origin of meteors and meteorites further than to urge, that, the computed enormous magnitude of the former,—the actual diameter of the visible meteor, however constituted, being often many hundred yards, while in some instances its dimensions must probably be expressed in miles,—their planetary velocity—and the pregnant fact that they give out a more intense light than any objects in nature except the sun,—(an assemblage of characters explicitly claimed by the writer of this article for the particular meteors from which meteorites have been observed to descend, as well as for many, if not all of those from which their fall is not known), must at once disprove nearly all the hypotheses which have been framed specifically to explain the *origin* of meteorites; and especially, among others, that of their projection from lunar volcanos. The cogency of this argument will remain essentially unimpaired if it shall be found, according to recent suggestions, that the actual magnitude of many of the meteors is considerably less than that hitherto ascribed to them. The problem of their origin must, in fact, be regarded as the same with that of the origin of the greater asteroïds and planets themselves.

It is right to state that Mr. R. P. Greg, F.G.S., who has given much attention to the subject, is of opinion that there is a distinction between luminous meteors and those from which meteorites have fallen; an opinion which, so far as the (apparently) smaller meteors, called shooting-stars, are concerned, he shares with the American Professor Olmsted, and others. Mr. Greg is the author of a valuable essay on meteorites, entitled, 'Observations on Meteorolites or Aërolites, considered Geographically, Statistically, and Cosmically; accompanied by a complete Catalogue of meteoric falls.' It was first published in the 'Philosophical Magazine' for November and December, 1854, and in a separate form in November of the following year.

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[*] These views of the physical constitution of meteors and their trails were in substance originally stated by Mr. Brayley in a paper read in 1824 before the Meteorological Society, then recently formed, and published in the *Philosophical Magazine*, first series, vol. lxiv. p. 288, &c. With the additions and modifications required by the progress of science, they have been subsequently repeated by him in lectures, together with the views on the historical parts of the subject which are given in the sequel of this article. The latter were explicitly treated and graphically illustrated in a lecture delivered at a Soiree of the London Institution on the 16th of January, 1856; in which also the subject of the persistent trails of the meteors was more definitely explained.

The views of the entire subject which have been enunciated in this article, have resulted from long attention to it by the writer. Others will be found, together with an invaluable assemblage of facts, in Arago's 'Astronomie Populaire,' liv. xxvi., 'Météores Cosmiques;' tome iv. p. 181–322; and also in the reports on meteors annually communicated for some years past to the Reports of the British Association, by Professor the Rev. Baden Powell.

The last recorded fall of meteorites appears to have taken place in 1857, on the 28th of February, when two large stones fell at Parnallee, in the Madura district, Madras, as related by the Rev. H. S. Taylor, in a communication to the Asiatic Society of Bengal.

The purely physical history of the subject having now been generally considered, we may proceed to notice the manner in which the extraordinary relations produced in former times, of the appearance in the sky of blazing torches, sceptres, bundles of rods, fiery swords, trumpets, and other objects, may be rationally interpreted, agreeably to our present knowledge of meteoric phenomena. This subject belongs to a field in the history of science and literature, hitherto but little cultivated. It may be elucidated by examining the figures and accounts of such appearances which are given in the works of old writers, especially in those of Zahn, Conrad Wolfhart, and their contemporaries, and also by Ambrose Parey, and comparing them with similar phenomena as witnessed in more modern times, and depicted by observers whose only object was to represent the actual configuration of the luminous appearances. The circumstance that from the enormous rapidity of the meteors, all the visible phenomena (except the persistent trail) would have been seen and have ceased to appear within the limits of a few seconds of time (so that in all cases the figures must have been produced from memory alone), which must have led to the representation of many appearances as simultaneous that in reality occurred in succession, and the manner in which during the transit of the meteor, impressions on the retina of past phenomena must have been mingled with those actually present, have led to the production of many of the singular representations that are extant. It would not be difficult to trace the mental process by which natural objects, thus witnessed for a few seconds only, would by uninformed observers prepared to regard them with superstition, be supposed to be really preternatural types of the familiar objects to which the outlines of their forms were comparable; the meteors, thus supposed to be torches, swords, and the like would naturally be described and depicted with all the appendages and accompaniments of those objects. These accompaniments, however, were not in all cases merely supposititious, as may be evinced by reference to the great meteor of 1758, which exemplified the ringed sceptre of the mediæval figures, the rings on the shaft being manifestly the smaller meteors, the production of which is the first visible result of the explosion, seen as projected upon the tail of the parent meteor; either because, as is evidently the fact in many instances, they were really enveloped in the flames composing it, or on account of the blending upon the retina of the observer of past and actual appearances. The fiery sword dipped in blood is the meteor in its normal form, at the middle of its visible course, the distant part of the tail shining with red light, being cooled down to the temperature of simple ignition, as already indicated. In a similar manner, the bull's heads, flying-eagles, and other monstrous appearances may be consistently explained, care being taken, when the authorities permit, to identify them with the actual meteor otherwise recorded. The blazing and interlaced serpents, moving in the air may be explained, by reference to the actual phenomena of the persistent tracks or trails already described, as witnessed in various cases by Pictet and others, as well as by the published representations of the meteor of January 7, 1856; one instance may be cited, in which a large and beautifully luminous serpentine train continued for some minutes after the disappearance of a meteor which threw down a stone at Angers, in 1822. The ensanguined tresses attached to blazing stars are evidently the trails under another phase, and in their later condition, emitting red light only, but retaining their linear or band-like form.

The *Lampades volantes* and *Dracones volantes* of former ages may be similarly understood, by reference to other characters and phenomena of meteors: one of the contemporary figures of the fire-ball seen in London on November 13, 1803, (described under other phases by Dr. Firminger in the 'Philosophical Magazine' for the following year,) exemplifies the particular configuration of the meteors to which the latter appellation was given. This is contained in Nicholson's 'Philosophical Journal' for 1804.

From the latter division of the subject now summarily reviewed, an inference may be drawn, which—though suggested also by other objects of science and literary history united—arises, it is conceived, in a particular manner out of the ancient history of Igneous Meteors and Meteorites. Many of the prodigious sights and supposed portents of moral or historical events, which are described in old chronicles and other works, may be explained, it has been shown, by our present acquaintance with the true nature of such phenomena. The inference is this,—that the superstitious notions and ideas of preternatural manifestations and their significance, held in former times, were often founded in mere ignorance of certain natural phenomena; and that there may be little either of superstition or intentional misrepresentation even in some of the apparently wildest recitals. It would appear, further, that the marvellous relations on such subjects of classical antiquity, and of the middle and later past ages, are not all to be peremptorily discarded; for the resources of modern science may enable us to divest of exaggeration the really accurate observations they frequently include, and to separate from them the erroneous views with which they have been mingled; and thus to render the observations themselves, in numerous instances, available in the advancement of true knowledge.

SUSPENSION OF THE CLOUDS. The most recent view of this subject, apparently a very simple one, but which really involves a variety of physical principles, is that of Sir John F. W. Herschel, stated in the following terms (Ency. Brit. Edit. 8, vol. xiv. p. 656):

"When the sun shines on a cloud, which absorbs its heat, the cloud itself is necessarily partially evaporated, and the vapour by its levity tends to produce an upward current, and thus to counteract the effect of gravity on the globules of which it consists. A globule of water 1-4600ths in. in diameter, in air of five-sixths of the density on the surface, or at the height of about 5000 feet, would have its gravity counteracted by resistance, with a velocity of descent of one foot per second (supposing no friction and no drag); and even if the terminal velocity were reduced to half that quantity by these causes, would still require some such upward action to enable it to maintain its level—a circumstance which sufficiently accounts for the lower level generally observed of cloud during the night. It is more than probable, however, that, when not actually raining, cloud is always in process of generation from below, and dissolution from above, and that the moment this process ceases, rain, in the form of 'mizzle,' commences. In a word, a cloud in general would seem to be merely the visible form of an aërial space in which certain processes are at the moment in equilibrio, and all the particles in a state of upward movement."

To complete this view of the subject nothing seems to be required but an adequate estimate of the effects of the 'friction' and the 'drag,' which are supposed not to exist. But it appears to have escaped the attention of Sir J. Herschel, that Professor Stokes had already shown that the internal friction of the air, together, of course, by implication, with the 'drag' which it occasions, is itself one of the causes—in his opinion, indeed, the main cause,—of the suspension of the clouds. As this particular subject is new, and (as we have seen in the previous division of this article, with respect to one department), of great importance in meteorology, we shall treat it at some comparative length.

Clouds consist of an aggregation of separate minute globules of water; and the resistance to such a globule falling through the air with its terminal velocity depends almost wholly on the cause just stated. "Since the index of friction of air is known from pendulum experiments, we may," Professor Stokes observes, "easily calculate the terminal velocity of a globule of given size, neglecting the part of the resistance which depends upon the square of the velocity. The terminal velocity thus obtained is so small in the case of small globules, such as those of which we may conceive a cloud to be composed, that the apparent suspension of the clouds does not seem to present any difficulty. . . . Since in the case of minute globules falling with their terminal velocity the part of the resistance depending upon the square of the velocity is quite insignificant [as will presently be shown], compared with the part which depends on the internal friction of the air, it follows that were the pressure equal in all directions in air in the state of motion [which according to the common theory of the fundamental assumption in hydrodynamics, it would be], the quantity of water which would remain suspended in the state of cloud would be enormously diminished."

To render this view of the subject complete, and to explain the value of the last observation, it must here be stated that Professor Stokes had before shown that the fundamental assumption of hydrostatics and hydrodynamics, that the pressure of a fluid is equal in all directions, though fully justified by experiment in the case of a fluid at rest, is not true in the case of a fluid in motion. The viscosity attributed to water by Dubuat, and the inherent property "analogous to that of viscidity in liquids," ascribed to elastic fluids by Capt. (now Major-General) Sabine, from their respective pendulum experiments, were generalized by Professor Stokes as consequences of the internal friction of fluids in general, all fluids exerting a resistance to bodies passing through them, independently of their density; and when this is taken into account, it is evident that the pressure cannot be equal in all directions.

The suspension of the globules of water forming the clouds, is only a particular case of the more general fact that fine powders remain nearly suspended in a fluid of widely different specific gravity. Professor Stokes has demonstrated that the resistance of the fluid, whether liquid or gaseous, is proportional, not to the surface, but to the radius of the spherule, and consequently the quotient of the resistance divided by the mass,—in other words, the accelerating force of the resistance,—increases much more rapidly as the radius diminishes, than if the resistance varied as the surface: on which principle the suspension, or proximate suspension, of the particles or globules depends. When the downward motion of a globule is so slow, that the part of the resistance which depends on the square of the velocity may be neglected, the terminal velocity of a globule of water forming part of a cloud may be determined. For a globule the one-thousandth of an inch in diameter, we have the velocity 1·593 inch per second. For a globule the one ten thousandth of an inch in diameter, the terminal velocity would be a hundred times smaller, so as not to amount to the one-sixtieth part of an inch per second.

The amount of that part of the resistance which varies as the square of the velocity, and which is the only kind of resistance that could exist if the pressure were equal in all directions, for the velocity 1·593 inch per second, is not quite the one four hundredth part of the weight; and for a sphere only the one ten thousandth of an inch in diameter, the ratio of the resistance to the weight would be ten times as small. Both these proportions, it is manifest, are quite insignificant.

The conclusion thus arrived at by Professor Stokes as to the cause of the suspension of the clouds, illustrates in a remarkable manner the connection of different branches of science. It is an application by him of the theory of internal friction, as applied to the ball pendulum, and verified by recorded experiments on that instrument; and is contained in his memoir 'On the Effect of the Internal Friction of Fluids on the Motion of Pendulums,' published in the 'Transactions of the Cambridge Philosophical Society,' vol. ix. The erroneous extension of the fundamental law of hydrostatics had been discussed by him in a paper 'On some Cases of Fluid Motion' inserted in the preceding volume of that work.

METHIONIC ACID. [CHEMISTRY, *S.* 2.]

METHWOLD. [NORFOLK.]

METHYL. [CHEMISTRY, *S.* 1.]

METHYMNA. [LESBOS.]

MEVAGISSY. [CORNWALL.]

MEWAR. [RAJPOOTANA.]

MEYRICK, SIR SAMUEL RUSH, K.H., LL.D., celebrated for his antiquarian knowledge, particularly in matters relating to ancient armour, was born on the 28th of August, 1783, and was the son of John Meyrick, Esq., of Great George Street, Westminster, and Peterborough House, Fulham, who was descended from the Meyricks of Bôdorgan in Anglesea. Samuel Rush Meyrick took the degree of B.A. at Queen's College, Oxford, but we have little other information of his early life, beyond the statement that he married when about twenty years of age; and thus offended his father, who in consequence so arranged the inheritance of his family property, that it should chiefly pass to the next generation. It thus happened that the large collections of armour which were commenced by the subject of this notice at his residences No. 3, Sloane Terrace, and No. 20, Upper Cadogan Place, were purchased with the money of his son, and were known as those of Llewelyn Meyrick, Esq. The original intention as to property was however frustrated ultimately by the death of that son in 1837.

Samuel Rush Meyrick adopted the branch of the legal profession connected with the Ecclesiastical and Admiralty Courts, in which, as Dr. Meyrick, he practised for many years. Prior to this, in 1810, he had published 'The History and Antiquities of the County of Cardigan.' In 1812, he was engaged upon a history on the plan of that of Dr. Henry, relating to the period of the monarchs of the British blood, before their abdication in 703. The materials, which were collected for a work of great extent, were however not published in the form intended. But in 1814, with Captain Charles Hamilton Smith, he produced a work on the 'Costume of the Original Inhabitants of the British Islands,' which was published in 4to with plates. His great work on Arms and Armour was published in 1824 in three 4to volumes, under the title, 'A Critical Inquiry into Ancient Armour as it existed in Europe, but more particularly in England from the Norman Conquest to the reign of King Charles II., with a Glossary of Military Terms of the Middle Ages.' A new edition of this work appeared in 1843, under the care of Mr. Albert Way, with corrections, much required, in the documents and quotations. Dr. Meyrick assisted the Rev. T. D. Fosbroke in the compilation of his 'Encyclopedia of Antiquities,' of which the first edition appeared in 1825. In 1826, the assistance of Dr. Meyrick was sought in the arrangement of the collection of arms and armour at the Tower of London ('Gentleman's Magazine,' 1826, 1827): and in 1828 he was called on by George IV. to arrange the collection at Windsor. For these services, the Hanoverian order was conferred upon him by William IV. in January 1832, and he was made a knight-bachelor on the 22nd of February following. Meanwhile, about the year 1827, Dr. Meyrick had endeavoured to purchase the ruins of Goodrich Castle, on the Wye; but being then unable to succeed, he commenced in 1828, on the opposite hill, a mansion of which Mr. Blore was the architect, and which is now well known as Goodrich Court. The main part of the plan was arranged specially for the display of the collection of armour,—the whole suite concluding with a chamber, where was represented a grand tournament. The chief scenes in the display are shown in a work published, by Mr. Joseph Skelton, F.S.A., in 2 vols. 4to. in 1830, and entitled 'Engraved Illustrations of Ancient Armour,' &c., to which Dr. Meyrick supplied drawings and descriptions. In 1834, when High Sheriff of Herefordshire, he revived a procession of the javelin-men in armour, and with mediæval pageantry. In 1836 he contributed the descriptive matter to Mr. Henry Shaw's 'Specimens of Ancient Furniture.' Sir Samuel Meyrick's last important work was 'Lewis Dwnn's Heraldic Visitation of Wales' which he completed in 1846. He had continued a frequent contributor to the Proceedings of the Society of Antiquaries (of which body he was elected a Fellow in 1810). Some of his contributions are printed in the 'Archæologia,' and others are referred to in the 'Gentleman's Magazine,' in which work also he wrote many papers from 1822 to 1839 ('Gent. Mag.,' New Series, vol. xxx., p. 94). Latterly he also contributed to 'The Analyst,' the 'Cambrian Quarterly Magazine,' and the 'Cambrian Archæological Journal.' Sir Samuel Meyrick died on the 2nd of April, 1848, in his sixty-fifth year. His collection and his domain in Herefordshire, which last he had largely extended by purchase a few months before his death, devolved upon his second cousin Colonel Meyrick.

MEZZOFANTI, JOSEPH CASPAR, celebrated for his extraordinary powers as a linguist, was born at Bologna, on the 17th of September, 1774. His father, Francis Mezzofanti, was a carpenter; and he himself, being destined for the same humble career, was placed at one of the free schools of the Oratory in his native city. Father Respighi, a priest of that congregation, observed the remarkable talents of the boy, and saved him for literature. He was removed to a higher school—one of the so-called 'Scuole Pie' of Bologna—and eventually to the archiepiscopal seminary, where, after completing the usual course of letters, philosophy, divinity, and canon law in the university, he was admitted to priest's orders in September 1797. Of the details of his progress in the study of languages during these early years no accurate record is preserved; but it is known that, like most eminent linguists, he was gifted, even in childhood, with a very wonderful memory; and that, partly under the various professors in the university, partly by the aid of foreign residents in the city, partly by his own unassisted studies, he had acquired, before the completion of his university career, the Latin, Greek, Hebrew, Arabic, Spanish, French, German, and Swedish languages. In September 1779, at the early age of twenty-two, he was appointed Professor of Arabic in the university, and commenced his labours in the December of that year; but he did not long enjoy what would have been a most congenial office. On the annexation of Bologna, as one of the papal legations, to the newly established Cisalpine Republic, he refused to take the oaths of the new constitution, and was set aside from the professorship. After the conclusion of the concordat between Pius VII. and the first consul, the ancient constitution of the university was restored. In 1803 Mezzofanti was named to the higher professorship of Oriental Languages, and in the same year he became assistant librarian of the public library of the city. The professorship of Oriental Languages, however, being suppressed in 1808, Mezzofanti was for some years reduced to great distress, and became dependent for his own maintenance, and that of the orphan family of his sister, mainly upon the casual income derived from private tuition. The elder brother of the late Archdeacon Hare is said to have been one of his pupils, and a living English countess received lessons in English from him at a later period.

Meanwhile Mezzofanti steadily followed in private what had become his engrossing pursuit—the study of languages. A letter of his, dated in 1804, to the celebrated Orientalist John Bernard de Rossi, whose personal acquaintance he subsequently formed during a short visit to Modena in 1805, inclosed a composition in twelve languages, which he submitted for the judgment of his correspondent; and before 1812 his reputation as a linguist had become thoroughly established. The well-known Pietro Giordani, in several of his letters to his friends, calls him "the divine Mezzofanti," and declares that his skill in living and dead languages entitles him to be regarded as "a man of all ages and all nations." The war of which Northern Italy was so long the theatre had afforded Mezzofanti many opportunities of extending his stock of languages. In the hospital of Bologna, to which he was attached as volunteer chaplain, were to be met—among the invalids of the Austrian, Russian, and French armies—Germans, Hungarians, Bohemians, Wallachians, Servians, Russians, Poles, and Croats. Partly in the desire to offer these sufferers the consolations of religion, partly from his love of the study itself, Mezzofanti laboured assiduously to turn these and all similar opportunities to account; and several instances are recorded in which, without the assistance of a grammar or dictionary, he contrived to establish a mode of communication with a stranger who was utterly ignorant of every language except his own, and eventually to master that language sufficiently for all the purposes of conversation. He has left an account of his mode of study during these years, which is not a little curious and interesting. "The hotel-keepers," he says, "were in the habit of notifying to me the arrival of all strangers at Bologna; and I never hesitated, when anything was to be learnt thereby, to call upon them, to interrogate them, to make notes of their communications, and to take lessons in the pronunciation of their several languages. There were a few learned Jesuits too, and several Spaniards, Portuguese, and Mexicans residing in Bologna, from whom I received valuable assistance, both in their own and in the learned languages. I made it a rule to learn every strange grammar, and to apply myself to every new dictionary that came within my reach. I was constantly filling my head with new words. Whenever a stranger, whether of high or low degree, passed through Bologna, I tried to turn the visit to account, either for the purpose of perfecting my pronunciation, or of learning the familiar words and turns of expression. Nor did all this cost me so much trouble; for, in addition to an excellent memory, God had gifted me with remarkable flexibility of the organs of speech."

In the year 1812 Mezzofanti was appointed assistant-librarian of the university; in 1814 he was reinstated in his professorship; and in 1815 he became chief librarian. From this period, especially after the peace, his reputation rapidly extended. Every visitor of Bologna related fresh marvels regarding his prodigious attainments. Tourists from every nation, whether of Europe or of the East, united in representing him as perfect, each in his own language. Mr. Stewart Rose, in 1817, reported him as reading twenty languages, and speaking eighteen. Baron Zach, in 1820, sets down the number at thirty-two. Lord Byron, about the same time, pronounced him "a walking polyglot, a monster of languages, and a Briareus of parts of speech." When Lady Morgan saw him, in 1822, common report described him as speaking no less than forty languages; but when she inquired from himself the truth of the report, he replied that he had only gone over the outline of that number. M. Molbech, a Danish traveller of the year 1820, reports the number of his languages at "more than thirty," and testifies to his speaking Danish "with almost entire correctness." French, German, Spanish, Polish, Russian, Greek, and Turkish travellers concur in the same report, not only with regard to their own, but also to many other languages.

During all these years—except a short visit to Pisa, Leghorn, Florence, and Rome—he had resided altogether at Bologna, though invited, with many flattering offers, to transfer his residence to Paris, to Vienna, to Florence, and to Rome. At length, having come to Rome, as a member of the deputation sent by the Bolognese to offer their submission to the pope, Gregory XVI., after the revolution in 1831, he was induced by the pope to settle permanently in Rome, and to accept a prebend in the church of St. Mary Major, which was soon after exchanged for a canonry in St. Peter's; and, on the promotion of the celebrated Angelo Mai, then keeper of the Vatican Library, to the secretaryship of the Propaganda, Mezzofanti was appointed to succeed him in the important charge of the Vatican. He held this office till 1838, in which year, conjointly with Mai, he was elevated to the cardinalate.

His residence in a great centre of languages, such as Rome, and especially the facilities of intercourse with the various races represented in the college of the Propaganda, gave a new impulse to Mezzofanti's linguistic studies. The reports of his visitors at Rome are still more marvellous than those of the Bolognese period. An eminent German scholar, Herr Guido Görres, who had much intercourse with him in the year 1841, writes thus: "He is familiar with all the European languages; and by this I understand not only the ancient classical tongues, and the modern ones of the first class, such as the Greek and Latin, or the Italian, French, German, Spanish, Portuguese, and English—his knowledge extends also to the languages of the second class, viz., the Dutch, Danish, and Swedish—to the whole Slavonic family, Russian, Polish, Bohemian, or Czechish—to the Servian, the Hungarian, the Turkish; and even to those of the third and fourth classes, the Irish, the Welsh, the Wallachian, the Albanian, the Bulgarian, and the Illyrian. Even the Romani of the Alps and the Lettish are not unknown to him; nay, he has made himself acquainted with Lappish. He is master of the languages which fall within the Indo-Germanic family, the Sanscrit and Persian, the Koordish, the Georgian, the Armenian; he is familiar with all the members of the Semitic family—the Hebrew, the Arabic, the Syriac, the Samaritan, the Chaldee, the Sabaic—nay, even with the Chinese, which he not only reads, but speaks. Among the Hamitic languages, he knows Coptic, Ethiopic, Abyssinian, Amharic, and Angolese."

What is especially notable in this marvellous gift possessed by Mezzofanti is, that his knowledge of each among this vast variety of languages was almost as perfect as though his attention had been devoted to that language exclusively. The reports of the representatives of all the great families of language concur in describing him as speaking in each always with the precision, and in most cases with the fluency, of a native. His pronunciation, his idiom, his vocabulary, were alike unexceptionable. Even the familiar words of everyday life, and the delicate turns of conversational language, were at his command; and in each language he was master of all the leading dialects, and even of the provincial peculiarities of idiom, of pronunciation, or of expression. In

French, he was equally at home in the pure Parisian of the Faubourg-St.-Germain or in the Provençal of Toulouse. He could accommodate himself in German to the rude jargon of the Black Forest, or to the classic vocabulary of Dresden; and he often amused his English visitors by specimens of the provincialisms of Yorkshire, Lancashire, or Somersetshire. With the literature of these various countries too he was well acquainted. He loved to talk with his visitors of the great authors in their respective languages; and his remarks are described as invariably sound and judicious, and exhibiting careful and various reading, often extending to departments with which it would never be supposed that a foreigner could be familiar. A Dutch traveller, for instance, Dr. Wap, was surprised to find him well acquainted with his own national poets, Vondel and Cats; a Dane, with the philological works of Rask; a Swede, with the poetry of Ochsenstjerna; to a Sicilian he would repeat whole pages of the poetry of Meli; and an English gentleman was astounded to hear him discuss and criticise Hudibras, of all English writers the least attractive as well as the least intelligible to a foreigner. He was in the habit too of amusing himself by metrical compositions in the various languages which he cultivated, and often wrote for his visitors a couplet or two in their native language as a little momento of their interview. Dr. Wap, the Dutch traveller just referred to, speaks in high praise of some extempore lines in Dutch by which Mezzofanti replied to a sonnet which Dr. Wap had addressed to him; and the well-known Orientalist, Dr. Tholuck, having asked Mezzofanti for some memorial of his visit, received from him a Persian couplet after the manner of Hafiz, which he composed (although not without some delay) during Dr. Tholuck's visit.

After his removal to Rome, although he had already passed his fiftieth year, he added largely to his stock of languages. His most notable acquisition during this period was Chinese, which he acquired (partly at the Chinese College at Naples, partly among the Chinese students of the Propaganda) in such perfection as to be able not only to write and converse freely in it, but even to preach to the young Chinese ecclesiastics. During the same period he acquired the Abyssinian, the Californian, some of the North American Indian languages, and even the 'impossible' Basque. And it was in Rome, and especially in the Propaganda, that he displayed in its greatest perfection his singular power of instantaneously passing in conversation from one language to another, without the slightest mixture or confusion, whether of words or of pronunciation.

Mezzofanti, as cardinal, was a member of many ecclesiastical congregations in Rome, but he never held any office of state. He died on the 15th of March, 1849, and was buried in the church of St. Onofrio, beside the grave of Torquato Tasso.

It is difficult to determine with accuracy the number of languages known by Mezzofanti, and still more so to ascertain how many of these he spoke, and with what degree of fluency in each. During his lifetime, as we have seen, report varied considerably at different times; nor was he himself believed to have made any very precise statement on the subject. To a Russian traveller, who visited him before the year 1846, and who begged of him a list of all the languages and dialects in which he was able to express himself, he sent a paper in his own hand containing the name of God in fifty-six languages. The author of a memoir which appeared soon after the cardinal's death in a Roman journal, the 'Civiltà Catolica' (who is now known to be Father Bresciani, a Roman Jesuit), states that, in the year 1846, Mezzofanti himself informed him that he was able to express himself in seventy-eight languages. Marvellous as these statements may appear, they seem fully borne out by inquiries (with a view to the preparation of a biography) which have been made since the death of the cardinal. Reports have been received from a vast number of individuals, natives of different countries, whose collective testimony, founded on their own personal knowledge of Mezzofanti, places beyond all question the fact of his having spoken fluently considerably more than fifty different languages. There are others among the languages ascribed to him, regarding which it is difficult to institute any direct inquiry; but, judging from analogy, and relying on the well-known modesty and truthfulness of Mezzofanti, we need not hesitate to accept his own statement as reported by F. Bresciani; the more so, as among his papers now in the possession of his family is a list, drawn up from memoranda contained therein, of no less than a hundred and twenty languages with which he possessed some acquaintance, unaccompanied however by any note specifying those among the number which he spoke, or the degree of his knowledge of each.

In general learning Mezzofanti's attainments were highly respectable. He was a well-informed theologian and canonist, and an impressive though not eloquent preacher. M. Libri, the historian of mathematical science in Italy, found him well acquainted with algebra, and reports an interesting conversation which he had with him on the Bija Gannita (the algebra of the Hindoos), as well as on the general subject of Indian history and antiquities. Other travellers describe him as entering freely into the history as well as the literature of their several countries. But as an author he is almost unknown. He occasionally read papers at various literary and scientific societies in Bologna and Rome; but his only known publication is a short memoir of his friend and brother professor, Father Emmanuel Aponte, which was printed at Bologna in 1820; and he leaves no monument for posterity beyond the tradition that he was incomparably the greatest linguist the world has ever seen.

MICA, a Mineral belonging to the extensive series of Silicates of Alumina. It occurs in oblique rhombic prisms of about 120° and 60°. The crystals usually with the acute edge replaced. The cleavage is very decided, yielding easily thin elastic laminæ of extreme tenuity. It is found usually in thinly foliated masses, plates, or scales: sometimes in radiated groups of aggregated scales or small folia. The colour is from white, through green, yellowish, and brownish shades to black. The lustre is more or less pearly. Transparent or translucent. Tough and elastic. Hardness 2·0 to 2·5. Specific gravity 2·8 to 3·0.

The composition of mica is as follows:—

Silica	46·3
Alumina	36·8
Potash	9·2
Peroxide of iron	4·5
Fluoric Acid	0·7
Water	1·8
	——99·3

A variety in which the scales are arranged in a plumose form is called Plumose Mica; another in which the plates have a transverse cleavage, has been termed Prismatic Mica.

Mica resembles externally talc, and some forms of gypsum. From talc it differs in affording thinner laminæ, and being elastic. It also has not the greasy feel of talc. The same characters except the last distinguish it from gypsum, besides it does not crumble so readily on heating.

Mica is one of the constituents of granite, gneiss, and mica-slate, and gives to the latter its laminated structure. It also occurs in granular limestone. It is found abundantly in the United States, in Russia, in Great Britain, and other parts of the world. It is not often found in large isolated masses, but filling up the veins and fissures of rocks, into the composition of which it enters. It occurs in the oldest rocks, as well as in those which are new and possess a crystalline character.

In Russia it is used extensively as a substitute for glass, and hence it is called Muscovy Glass. The very thin laminæ are employed for examining objects under the microscope. Haüy states that these laminæ are sometimes not more than the 1-300,000th part of an inch in thickness.

Lepidolite, or *Lithia Mica*, occurs in crystals or laminæ of a purplish colour, and often in masses consisting of aggregated scales. It occurs in the Ural. According to Rosales, as quoted by Dana, it consists of the following analysis:—

Silica	47·7
Alumina	20·3
Lime	6·1
Protoxide of Manganese	4·7
Potash	11·0
Lithia	2·8
Soda	2·3
Fluorine	10·2
Chlorine	1.2
	——106·3

Fuchsite is a green Mica from the Zillerthal, containing nearly 4 per cent. of oxide of chromium.

From the crystallisation of Mica two species have been made out of the old species so called. The common Mica has an oblique prism for its primary, but many micas when in perfect crystals have the form of a hexagonal prism. This species has been called hexagonal mica, the dark-coloured micas of Siberia, and the brilliant hexagonal crystals of Vesuvius. There are also hexagonal crystals which have been found by Dové to have two axes of polarisation, indicating that the lateral axes of the primary are unequal, and that the form is a rhombic prism with the acute edges truncated. This species is called *Rhombic Mica*, or *Phlogophite*.

Margarite, or *Pearl Mica*, occurs in hexagonal prisms, having the structure of mica, and also in interrecting laminæ. It has the appearance of talc, but differs from that mineral in being a silicate of alumina instead of magnesia. It is found at Sterzing in the Tyrol, associated with chlorite.

Margarodite, another schistose talc of Zillerthal, is a variety of common mica.

Emerylite and *Euphyllite* are new species, somewhat related to *Margarite*. They are found in Pennsylvania, United States.

Nacrite resembles talc, but contains no magnesia. It is whitish and soft, and has a greasy feel.

Lepidomelane is a black iron mica, occurring in 6-sided scales or tables aggregated together.

Ottrelite is an allied mineral occurring in black scales.

Oderit is probably a black mica. It can be split into thin leaves. It is opaque, black, and has very little lustre. It occurs in Sweden.

MICKIEWICZ, ADAM, the greatest poet that Poland has ever produced, was born in the year 1798 at Nowogrodek, a small town in Lithuania, one of the few in the environs of which the ancient Lithuanian language is still spoken. It is certainly remarkable that a man, the chief effort of whose life was to prevent the language, the nationality, and the religion of Poland from being overpowered by those of Russia, should be the native of a country which had lost its language, its nationality, and its religion by its union with Poland. His father, by birth a noble, was by profession an advocate, and an unsuccessful one, and his brother afterwards became a legal writer of some reputation. Mickiewicz himself had so little respect for the nobility of his family, that in his poem of 'Pan Tadeusz,' in which the scene is laid in Lithuania in the year 1812, he introduces his family name as that of a dissipated and illiterate brawler in a pothouse. It is singular that Pushkin, who acquired the name of the Russian Byron as Mickiewicz did that of the Polish Byron, takes occasion in his play of 'Boris Godunov,' to introduce one of his own ancestors in an odious and contemptible light. The feeling of the two poets in this respect was very different from that of their English prototype.

Mickiewicz after receiving his preliminary education at Nowogrodek and the grammar-school of Minsk, was sent when a youth of seventeen to the University of Wilna, where his uncle, an ex-Jesuit, was one of the professors. The university under the auspices of Sniadecki the mathematician, and the patronage of Prince Czartoryski, then Minister of Public Instruction, was at that time in the full tide of prosperity, the chief seat of learning for eleven millions of the population of Russian Poland, and celebrated for the success with which the exact and natural sciences were taught. Almost the first person whom Mickiewicz saw at Wilna was Thomas Zan, a celebrated Polish patriot, who was occupied with getting up secret societies among the students, of which Mickiewicz at once became a member. The professor of history, Lelewel, was another determined opponent of the Russian government, and to him Mickiewicz addressed the first poem he published. While at Wilna he fell deeply in love with the sister of a fellow student, Maria Wereszczakowna, by whom his addresses were finally rejected for those of a richer suitor. When he left the university, where he had first been noted for his devotion to chemistry and afterwards to poetry, he was appointed professor of classical literature in a college at Kowno, and it was while residing there in 1822 that two small volumes of poems from his pen were published at Wilna. Like those of Burns and Byron, they at one blow made their author famous.

These poems not only at once placed their author at the head of the Polish literature of his own time, but above every other serious poet who had ever appeared in the language. The 'Ballads' they contain, several of which are imitated from the Lithuanian, are of very various degrees of merit, some of them spirited, others pleasing, and others again poor and commonplace. But two poems of the set, 'Graźyna' and 'Dziady,' are of a very high class. In 'Graźyna,' in which the poet takes for his scene the old castle of Nowogrodek, the ruins of which are still remaining near his native town, he tells in a tersely classical and sculpturesque style, which reminds the reader of the happiest effusions of Tennyson, the story of a Lithuanian heroine, who to save the honour of her husband assumes his armour, and meets death on the field of battle. It became the favourite poem of a real Lithuanian heroine, Emilia Plates, who eight years afterwards fought in the Polish ranks in the insurrection of 1830, and to whose memory Mickiewicz devoted a poem. The 'Dziady,' or 'Ancestors,' is a poem of a new kind, an autobiographical drama, in which the poet appears as one of his own characters. In it the poet relates, with this slight veil, the story of his love for 'Maria,' the 'Mary Chaworth' of his life, and except in Byron's 'Dream,' which Mickiewicz afterwards rendered into Polish, it would be difficult to find a love-tale more tenderly and delicately told.

The name of Mickiewicz became at once popular among his countrymen. A valley near Kowno, which he was fond of visiting, and where he wrote some of his verses, received the name, which it still retains, of 'Mickiewicz's Valley.' The enthusiasm of the Poles was heightened by the next intelligence that spread far and wide concerning him, that he was a prisoner in the hands of the Russian government, on suspicion of being concerned in the secret societies which had been found to exist in the University of Wilna. The dedication of the 'Poems,' containing 'Dziady,' had been to Thomas Zan and a few friends, and probably the poet little anticipated the dedication which he was to prefix to another part of the 'Dziady,' published after long years of interval—"To the sacred memory of John Sobolewski, of Cyprian Daszkiewicz, of Felix Kolakowski, my fellow-students, my fellow-prisoners, my fellow-exiles, persecuted for love to their country, who, with a longing for that country in their hearts, died at Archangel, at Moscow, at St. Petersburg, the martyrs of their country's cause." Imprisoned for upwards of a year in the Basilian convent at Wilna, while the examination into the conspiracy went on, under circumstances and incidents which were afterwards delineated with all the force of his genius, Mickiewicz, found guilty of being a member of two secret societies, was condemned, in 1824, to perpetual banishment in the interior of Russia. At the age of twenty-six Mickiewicz left Poland for exile, and he never saw it again.

At St. Petersburg, where he was at first permitted to reside, Mickiewicz found himself, in the latter years of the Emperor Alexander, in the midst of native conspirators against the Russian government. Ruilyeev and Bestuzhev, afterwards so active in the abortive insurrection at the accession of the Emperor Nicolas, were ardent for the Polish cause. In a poem "to his Russian friends," written in after years, Mickiewicz mentions them both by name, as victims of the vengeance of the czar, and alludes apparently to Pushkin, to whom they introduced him, as having deserted the cause of liberty. The 'Russian Byron' and the 'Polish Byron' met at St. Petersburg in the year of the death of the English Byron. Probably the conjunction was not looked upon with favourable eyes by the Russian government, which ordered Mickiewicz to Odessa; there, however, he soon obtained permission for a tour in the Crimea, which gave rise to a series of 'Crimean Sonnets,' the first sonnets in the Polish language. Their subject now gives them an additional interest. One of them is 'On the View of the Mountains from Kozlov,' or Eupatoria; another, 'On the ruined Castle of Balaklava.' These poems have been very popular; and one of them, 'On the Chatuir-Dagh,' has enjoyed the singular distinction of being translated into Persian: but we believe that from no other poems of Mickiewicz could so many instances of false brilliancy and other common-place be selected. They obtained for him an invitation to Moscow from the governor, Prince Golitsuin, and afterwards permission to return to St. Petersburg, where, in 1828, his next great poem, 'Wallenrod,' appeared.

This poem was at once prohibited by the censorship of Warsaw, and to those who have read it, it is an inexplicable problem how it should ever have passed the censorship of St. Petersburg. Under the thin disguise of a story of a Lithuanian of the 14th century, who works his way to the mastership of the order of the Teutonic Knights, the enemies of his country, for the purpose of destroying them in detail, it inculcates the most burning hatred on the part of a crushed nation to its foreign oppressors. Its meaning, which was at once apprehended by every Pole, seems to have escaped every Russian. Two Russian translations were published, and it is even said that the Emperor Nicolas sent a message of compliment to the author. A diplomatic appointment in the Russian service was also, it is said, proffered to him; but the only favour he asked was to be allowed to visit Italy for the benefit of his health, and he obtained it by the intercession of the Russian poet Zhukovsky. He left Russia, as he left Poland, never to return.

After passing through Germany, where he spent some days with Göthe, he resided at Rome, where he became intimate with James Fenimore Cooper. It was at Rome that the news of the Polish insurrection of 1830 reached him, an insurrection which was commenced by a party of the insurgents singing in the streets of Warsaw some lines from his 'Ode to Youth.' The rising was crushed by the time Mickiewicz had reached Posen on his way to join it. He retired to Dresden, and there composed another part of the 'Dziady,' which was first published in 1832 at Paris.

As in the former part of this poem Mickiewicz had told in a dramatic form the tale of his early love, in this he related in a succession of scenes the story of his imprisonment in Wilna before the sentence of banishment. As a lover, he represented himself as having been driven by disappointment to insanity; as a man, he actually delineated himself as possessed by the devil, and the devil as exorcised out of his body by a priest, after the utterance of a proud and presumptuous challenge to Heaven, the impious vanity of which is represented as having called down the chastisement. This strange and repulsive scene is accompanied by others of a less eccentric character, in which the poet's friends and foes are put in action without reserve, and in which the horrors of the Russian sway in Poland are depicted with surprising power and pathos. On the whole, this wild production is one of the most remarkable for poetical power that the literature of the quarter of a century since 1830 has produced.

The last great poem of Mickiewicz, 'Pan Tadeusz,' or 'Sir Thaddeus,' was published in Paris in 1834. It differs as entirely in style and sentiment from the 'Dziady' as 'Waverley' from 'Manfred.' It is a minute delineation of Lithuanian domestic life in the year 1812, the time of the poet's boyhood, in which the somewhat insignificant story of a common-place hero is relieved against the dark background of the approach of Napoleon's invading army on its march to Russia, and the intense excitement it produces amongst the Lithuanians, from the peasant and the publican to the priest and the noble. By some it is regarded as totally unworthy of the powers of Mickiewicz—by many as the finest production of his genius; and there can be no doubt that it is by far the most pleasing and the least objectionable.

Up to this period the career of Mickiewicz had been one to which his Polish admirers had looked with constantly increasing admiration, and he occupied a position in the literature of his country without a rival either in the present or the past. "He is our Byron, our Shakspere," was the verdict of Klementyna Hoffmanowa herself, a staid and decorous writer. None indeed could then have foreseen in what darkness the star of Mickiewicz was to set. In 1832, two years before the appearance of 'Pan Tadeusz,' he had published 'A Book of the Polish Nation and the Polish Pilgrimage,' which presented an unbroken series of dull absurdity and extravagance. It was probably the influence of his name which procured its translation into French by Count Montalembert, and into English by Lach Szyrma, combined with the fact that in it Mickiewicz presented himself to the world in the character of a fervent Roman Catholic, convinced that it was to its toleration of Protestantism that the ruin of Poland was to be ascribed.

Before this period Mickiewicz had fixed his residence at Paris, and it was in that city, in 1834, that he became united to Celina Szymanowska, a Polish lady, to whom he had, in 1828, addressed some verses at St. Petersburg. To Paris and to the French he was strongly attached, but his pecuniary circumstances compelled him to accept, in 1839, an appointment as professor of classical literature at Lausanne. In the next year, when M. Cousin, then minister of public instruction, determined to establish a chair of Slavonic literature and the Slavonic languages at the College of France, it was considered a good fortune for the minister to be able to appoint, for the first professor, the greatest poet of Poland.

The first lectures which he gave were eagerly attended, and were reproduced in the French and German journals; but ere long strange alterations began to develope themselves.

Already in 1841, when Madame Mickiewicz, who was in bad health, had received some benefit from being mesmerised by a Polish fanatic named Towianski, Mickiewicz had allowed himself to become associated with this man as the interpreter of certain dreams, in which Towianski alleged that he was favoured with revelations by the Virgin Mary. In his lectures on Slavonic literature the professor gradually lost sight of Slavonic literature altogether, and preached a series of discourses, in which this Towianski was represented as the new Messiah of a new religion, of which the principal feature was the worship of Napoleon Bonaparte. This Mickiewicz represented as a new and necessary development of improved Christianity. At last, in 1844, the French government interposed, ordered Towianski to quit Paris, and put a stop to the course of lectures which had long excited general scandal and disgust. Mickiewicz's name appeared in the list of professors for some years afterwards, but he lived in obscurity, an object rather of compassion than other feelings. In 1848 the revolution of February again excited his hopes for Poland, and he made a journey to Italy for the purpose of gaining over the pope, and was received with enthusiasm by the insurgents at Florence. In 1851 his name appeared in the French calendars as 'Sub-Librarian of the Library of the Arsenal at Paris,' to which he was appointed by the prince president, who might possibly view as a venial error the inculcation of the worship of Napoleon I.

About 1854 Mickiewicz became a widower, and he afterwards returned in some degree to public life. Soon after the commencement of the war with Russia he headed a deputation to the French emperor, to remind him of the opportunity that presented itself for redressing the wrongs of Poland, and in 1855 he was sent by him on a secret mission to the East, which was destined to prove the last incident in his career. He died at Constantinople on the 27th of November, 1855. His remains were removed to France, where they were interred in the cemetery of Montmartre, and a subscription was opened directly after at Paris and London for the benefit of his children.

One of the most remarkable editions of Mickiewicz's works was published at Paris in 1828 and 1829, in three volumes, at the expense of the Countess Ostrowska, a Lithuanian lady, who presented the money received from its sale to the author, then a captive in Russia. It is generally stated to be the first book printed in France in the Polish language, but it had two predecessors, as its editor, Leonard Chodźko, points out in the preface—one in 1668 and another in 1814. Its successors may be counted by hundreds, many of the best works in Polish being now originally printed at Paris. The best edition of Mickiewicz's works is that in four volumes, issued at that city in 1844, revised by the poet himself, and edited by Alexander Chodźko. A translation of all his works into French, by Christian Ostrowski, was published at Paris in 1841, and again in 1845, with two very different prefaces, the first all enthusiasm for Mickiewicz and his genius, the second full of the disappointment and estrangement his devotion to Towianski had inspired. The English language possesses one only of his larger poems in two translations—the 'Wallenrod,' in prose by Leon Jablonski, Edinburgh, 1841, and in verse by Cattley, London, 1842. An article of some length on Mickiewicz appeared in the London 'Metropolitan,' at the outset of his career, and another in the 'Athenæum' for 1856, on the occasion of his death.

The name of 'the Polish Byron,' which has been generally assigned to Mickiewicz, conveys as correct a notion of the nature and the extent of his genius as any single epithet could possibly do. The most striking point of dissimilarity between the two is the vehement patriotism of the Pole, and the indifference to his country which was professed by the Englishman, but a great deal of this was probably owing to the different position of the two countries, one at the foot of a foreign sovereign, and the other in the most prosperous period of its history. It may be remarked that in 'Pan Tadeusz,' where Mickiewicz has occasion to delineate the character of his countrymen, he depicts them, not consciously perhaps on his own part, as arrogant, ignorant, prejudiced, spiteful, and headstrong, with scarcely any good qualities to balance. There is an obtuseness in Mickiewicz's own moral perceptions which it is often painful to observe. His poem of 'Wallenrod' is devoted, from the first line to the last, to the inculcation of a spirit of systematic treachery, and in one remarkable passage he delineates his young hero in the palace of his foe as descending to the meanest spite—

> "I remember how oft in the castle
> I secretly sharpened my knife, and with what a rapture of vengeance
> I cut the carpets of Winrych, and ruined his glittering mirrors."

It is said that at the time of the appearance of this passage in 'Wallenrod,' the Poles in the palace of the Grand Duke Constantine at Warsaw carried out the idea. The gross anachronism of the carpets and the mirrors in a story of the 14th century is only one of many which abound in the works of Mickiewicz, and it is unsafe to rely on his authority for facts in literary or other history, where his views and theories were concerned. He tells us, for instance, in one of his Napoleonic lectures that the genius of Byron was undoubtedly kindled by a ray from that of Napoleon, and inquires how such a poet could otherwise have arisen in a literature so decrepit and almost dead as that of England, which had as it were come to a close with Thomson and his followers. This general inaccuracy and untrustworthiness must, in fairness to the Russians, be remembered by the readers of the thrilling delineations of their cruelty which abound in the 'Dziady.' Whatever may be the judgment pronounced on Mickiewicz as a writer, a politician, and an historian, nothing can ever erase from Polish literature the name of the poet of 'Graźyna.'

MICROSCOPE, USES OF THE. There are few instruments that have rendered such important aid in scientific search as the Microscope. The chief advances that have been made in the natural history sciences, embracing physiology, during the latter portion of the first half of the 19th century, have been effected by its agency. The structure of this instrument has been described in the article MICROSCOPE. It has been gradually rendered more perfect as the science of optics advanced; and its nature and arrangement can only be understood by the study of the principles of this science. We purpose here referring to its use as an instrument of natural history and physiological research, and of those general arrangements and applications by which its utility can alone be fully secured. It is not alone sufficient that a man possesses eyes in order to observe accurately, nor is it the possession of a costly microscope that will enable a person to confirm the observations of others or make discoveries of his own. The use of the microscope by uninstructed and incautious observers has given rise to many absurd errors. "The fruit of the mulberry has been mistaken for *Entozoa;* calcareous corpuscles have been regarded by several observers as ova, and the appearance arising from the presence of concentric laminæ has been interpreted to be the coils of an inclosed embryo; similar corpuscles have also been regarded as nucleated cells, and again as blood-corpuscles; minute fossils in chalk have been strung together with portions of vegetable tissue, and (perhaps) the spores of *Algæ*, to constitute different stages of a fungus: minute hairs projecting on the surface of a membrane have been declared to be spiculæ within subjacent cells; and quite recently one writer states, that certain minute bodies which he has examined are either blood-corpuscles or the spores of fungi, but which is doubtful! while another recounts, how, by fortunate accident, he discovered that corpuscles, which he had regarded at first as consisting of fat, were afterwards found accidentally to consist of calcareous salts!

"Again, we read in physiological works of the yolk-cells, and the coloured oil-globules of the yolk; and a beautiful function of assimilation has been attributed to them; but they exist only in the imagination of the authors, who have regarded the one as cells, simply because they are round, and the other as consisting of fat, because they are highly refractive. Since the publication of Schleiden's cell-doctrine, almost everything round has been regarded as a cell; any single body within this, or where there are several, the largest has been regarded as a nucleus, and any spot within the nucleus has been viewed as a neucleolus. Whereas many of the so-called cells are homogeneous spheres, many of the nuclei are vacuoles, and a true nucleolus is very rarely found except in books." ('Micrographic Dictionary.')

Against such errors as these a long-continued and careful use of the microscope can alone preserve the young observer. They are not the result of imperfect or inferior instruments, but the consequences of hasty and imperfect observation. They have been made by persons using the most costly instruments, and their erroneousness has been demonstrated by those who have used the simplest and most economical arrangements.

In microscopic observations two things must be remembered: 1st, That in the microscope, especially with high powers, we see surfaces, not bodies. It frequently happens that in looking upon surfaces, we get a glance into the depths of transparent objects by changing the adjustment, without altering the position of the object; it more often happens however that in looking upon such objects, we are unable to make them out to be bodies until we have changed their position, and ascertained their dimensions in three different directions; this, in many cases, from the nature of the object itself, is a matter of great difficulty. 2nd, That we seldom see the objects under the microscope in their natural condition; that we consequently must take into consideration the changes which we ourselves partly produce, either by the medium in which the object is placed, or by the use of the knife or other influences. Long and thorough practice with the microscope secures the observer from deceptions which arise, not from any fault in the instrument, but from a want of acquaintance with the microscope, and from a forgetfulness of the wide difference between common vision and vision through a microscope. Deceptions also arise from a neglect to distinguish between the natural appearance of the object under observation, and that which it assumes under the microscope.

To these difficulties must be added those originating in the eye itself, through the so-called 'Mouches volantes,' and those also which arise from the observer being unacquainted with the appearance, under the microscope, of the common things which are dispersed throughout the air and water, such as small particles of dust, &c. Lastly, deceptions are also caused by air-bubbles, by molecular motion, and by the currents which arise upon the stage of the microscope from the evaporation of water, or from the intermingling of two fluids. The observer must learn to know and distinguish all these things thoroughly, and then no further deception can arise from these causes.

The proper use of the microscope is always the principal thing to be considered. Hedwig, with the microscope of his time, promoted the advancement of science to a greater extent than many observers with incomparably better instruments have done.

In order to use the microscope properly, the observer must be skilful in handling the instrument and the objects, and above all things, his mode of proceeding must be conducted with accuracy and judgment, and he must be able to give a sufficient reason for every thing that he does. His progress in research will be slow, but sure; he must endeavour to obtain objects from every possible source, and must examine them thoroughly; he must verify his own observations as scrupulously as possible, and so, progressing step by step, he will attain the desired end. Work without method will seldom lead to any result; the finest sections of wood made only in one direction, or in a wrong direction, do not lead to any knowledge of the wood under observation. Single observations (of wood, for instance), irregularly made from time to time, only show the condition of the wood at the time of that particular observation, and throw no light on its condition at an earlier or later period; whilst sections made in a proper manner, and well-preserved specimens of the successive conditions of the wood, furnish irrefragable proofs, the one of the construction, and the other of the development in the growth of the wood under observation. (Schacht 'On the Microscope.')

Before speaking of the methods of examining and preserving bodies for microscopic observation, it will be better to draw attention to the natural objects, to the examination of which it has been applied with so much success. In both the inorganic and organic worlds the microscope is made subservient to observation. To speak first of inorganic substances and materials not under the influence of vital action:—It has been found of great use in determining the forms of minute crystals. In this way it aids the analytical chemist. In the examination of the saline contents of water, if a small quantity of the water is allowed to evaporate upon an ordinary glass slide, its contents may be judged of by the forms which the crystalline matters assume. In fluids obtained from organic bodies this plan of examination has been recently applied with the most interesting results. A series of the most beautiful illustrations of the microscopic characters exhibited by crystals obtained by the evaporation of the blood and other fluids, will be found in Dr. Otto Funke's 'Atlas of Physiological Chemistry,' and also in the 'Micrographic Dictionary,' by Dr. Griffiths and Mr. Henfrey.

Not only are the natural crystalline constituents dissolved up in liquids thus obtained, but new combinations obtained by the addition of re-agents. This mode of inquiry is equally applicable to the excretions of the human body, and is rapidly becoming one of the most important means of diagnosis in the hands of the physician.

Although dealing with the disposition of large masses of matter, of which the earth's surface is composed, important knowledge is obtained by the geologist by examining minute portions of them with the aid of the microscope. It is by the aid of this instrument alone that the question of the manner in which an extensive series of rocks has been deposited can be determined. Many rocks which present a homogeneous surface, when sections are made of them and placed under the microscope, are found to consist of the remains of the minutest forms of organic beings. [Diatomaceæ, *S.* 2; Infusoria.] Whilst, on the other hand, rocks which, like the Oolites, present to the naked eye the appearance of being composed of various forms of organic beings, on close examination with the microscope are found to present appearances due to purely physical causes. Each of the little egg-like bodies seen in these rocks is found to contain a particle of sand surrounded by carbonate of lime. [Oolite, *S.* 2.] It frequently happens that the fossilised parts of the higher animals which are left in the solid rock are too small or shapeless to indicate the characters of the family to which they belonged; but by the aid of the microscope this question can be determined in multitudes of instances. It has been found by the recent researches of Dr. Carpenter and others, that the microscopic characters afforded by the structure of shells are frequently so distinct as to afford the means of distinguishing between allied species of *Mollusca*. This is a subject of the highest interest to the geologist; for of all the remains of animal life those of the *Mollusca*, from the hard nature of their shells, are those which are furnished to him in greatest abundance for distinguishing the character of different strata, and determining their relative age. Amongst the vetebrate animals, next to the teeth, the bones are the parts which are most frequently left in rocks. When the form of the bone is no guide, its microscopic structure will determine the family to which it belongs. The forms presented by the lacunæ, or bone-cells, which are only visible by the aid of the microscope, are found to differ so much in fish, reptiles, birds, and mammals, as to afford the means of distinguishing each class. The teeth are only modified bone, and although they present most frequently a very definite external form, and are usually better preserved than any other part of an animal body, they afford still more definite characters by the modifications of the internal portions of their structure. It is thus that the internal structure of the tooth presents a better character than any other part of its structure in the gigantic extinct frog, the *Labyrinthodon*.

Among the earlier fishes which inhabited the seas of the earth were principally those which have a cartilaginous skeleton; but with this perishable skeleton they were endowed with hard scales, which have resisted all decomposing agencies, and these scales, frequently scattered, are the only record of their existence. From microscopic examination of the structure of these scales, Professor Williamson has shown that the species of those fishes can be detected.

Numerous are the forms of *Zoophyta*, *Polyzoa*, and *Echinodermata* that have left remains in the strata of the earth which the naked eye can by no means distinguish, but whose differences are immediately revealed when sections of their fossilised remains are placed under the microscope. Examples of these will be found in the second volume of Professor Quekett's 'Lectures on Histology.'

We pass from this glance at the use of the microscope to the chemist and geologist, to point out its value in researches connected with living organised beings. We begin with plants. It is in the vegetable structure that the ultimate cells, of which all organised beings are composed, are most easily discerned. The earliest microscopic observers were aware of this. It was left however for Schleiden to perceive the full significance of this fact in 1838, when he drew attention to the cytoblast as the source of the growth and life of the cell. [Cells, *S.* 2.] He was followed by Schwann, who pointed out that the cell was of equal importance in the animal as the vegetable kingdom. The ultimate cell of the plant or animal is only visible by the aid of the microscope; hence whatever importance is attached to the discovery of cells and the formation of tissues by their agency is due to the use of the microscope.

The unceasing labours of microscopic observers during the last quarter of a century have developed a new branch of science called histology [Histology, *S.* 2], which embraces a knowledge of the ultimate structure of the tissues of which all parts of plants and animals are composed.

One of the most interesting facts connected with the history of the microscope is the discovery of the existence of minute animals and plants, inhabiting more especially water, and which are perfectly invisible to the naked eye. The earliest observations on these minute beings were made by Leeuwenhoek in the middle of the 17th century; but it was left for Ehrenberg, during the present century, to make known to its full extent the immense variety of forms assumed by these microscopic beings. [Diatomaceæ, *S.* 2; Desmidieæ, *S.* 2; Infusoria.] Since the publication of the 'Infusionsthierchen,' these minute organisms have been a source of increasing interest to microscopic observers. Representing the entire animal or plant in its simplest form, the observations of their growth, structure, and functions have thrown light on some of the most complicated problems of animal and vegetable physiology. Small as they are, they make up for want of size by the prodigious numbers in which they occur, and the important functions they seem to perform in the universe. The unveiling of this world of life is entirely due to the agency of the microscope.

It is not however alone in revealing the minute structure of plants and animals, as the existence of organic beings of minute size, that the naturalist and physiologist are indebted to the microscope. By its aid they have been enabled to investigate the functions performed by cells. If the tissues of plants and animals are built up of cells it was a natural inference that these cells performed an important part in the functions of these tissues. It was soon found that the animal and plant increased in size by the multiplication of these cells; that the tissues were renewed by their agency; that the function of secretion was performed by them; in short, that it was by the aggregate of their functions that plants and animals lived. Hence the cell theory, or cell doctrine, has been to the explanation of the phenomena of living beings what the law of gravitation was to the phenomena of the physical universe. Till the application of the microscope the mysterious function by which new beings in plants and animals were produced was only imperfectly apprehended; but since its extended employment the laws which regulate this process have become perfectly obvious, and but little remains to complete our knowledge of the subject. [Reproduction in Plants and Animals, *S.* 2.]

Having pointed out the objects of the use of the microscope, we now proceed to give some general directions for examining them. In giving these directions we shall follow Dr. Schacht, whose work on the microscope has been translated into English by Mr. Currey.

One of the principal requisites for microscopical investigation, besides a good instrument, is a proper supply of light. When the position and nature of the apartment can be selected at pleasure, a room should be chosen having windows facing the west or the north, or, what is better, a room with windows towards both those quarters of the heavens. The windows must be as high as possible, since the light received from the horizon is the most favourable; light reflected from a white wall, or the light of white clouds, is often very advantageous. The light of scudding clouds fatigues the eye by the rapid change in the intensity of light, besides rendering necessary a continual change in the position of the mirror. No ordinary observation is possible in direct sunlight; the light is, in the first place, far too dazzling for the eye to bear; and, in the second place, it causes appearances which give rise to the grossest deceptions. In working with the microscope in the forenoon and in the middle of the day, a room lying to the east or to the south must therefore be avoided: by means of white blinds, or curtains, the inconvenience may, to a certain extent, be avoided.

Many objects are seen very beautifully by lamp-light, but this light is far more glaring than daylight. When the light is made to pass through blue glass before reaching the mirror, it bears a greater resemblance to daylight, and is pleasanter to the eye. A piece of white ground-glass, fastened in a wooden frame, and placed before the lamp, will have the same effect. By regulating the light of the lamp in this manner, objects already prepared may be shown very well by night, but it is hardly possible to make fine preparations with such an illumination; for exact observation, therefore, the daytime only must be selected. In order to intercept the light of the horizon by means of the mirror, the latter is placed at least three feet from the window, the microscope is turned with the mirror towards the light, and the whole instrument, but especially the mirror, is placed in different positions whilst the observer looks through the eye-glass; the light is, in fact, sought after: when the field of view appears clearest and brightest, the object which is to be observed is pushed under the microscope.

When it is wished to examine opaque objects with incident or reflected light, the microscope may often be advantageously brought nearer to the window. Since for this kind of illumination a much larger quantity of light is necessary, direct sunlight is sometimes desirable; in the absence of this, the condensing lens is used, by means of which the greatest possible quantity of light is concentrated upon the object. In this kind of illumination, the access of light from below, which would interfere with the observation, is prevented by closing the diaphragm. For objects which are altogether opaque, a background which is white, but not glittering, is often advantageous.

The table at which microscopical observations are undertaken must be sufficiently large, and very firm; it must be so arranged that all the apparatus which is ever wanted shall be at hand. Much time is spared by attention to this, and in microscopical investigations time passes only too quickly; moreover, in a very confined space, it is impossible to make effectual preparations with the simple microscope. Every object intended for investigation should be examined in the first instance with a low magnifying power, since by that means a far larger portion of the object is seen, and thus a better impression with regard to the whole is obtained. Should the light be too strong, the plane mirror may be used instead of the concave one. When the observer has gained as much information as he can with the low-magnifying power, for instance, one of 50 diameters, or, in some cases, even a less magnifying power, the object-glass is changed for a more powerful one. When the most powerful object-glass has been used, and a still stronger magnifying power is found desirable, then a stronger eye-glass is taken. As a general rule, the eye-glass of lowest power should be used, and, if necessary, the magnifying power should be increased by passing from the object-glasses of lower power to those of higher power; but, nevertheless, for seeing with convenience, and especially for drawing, the use of a powerful eye-glass is often not without advantage. As long as the magnifying power can be increased by means of an object-glass, recourse should never be had to the eye-glass, since both the light and the sharpness of outline of the image are necessarily diminished by the use of a powerful eye-glass, which is not the case in using a more powerful object-glass.

In some cases, it is a good plan to shade with the left hand, the eye which looks into the microscope. When an object is thin enough to be seen with transmitted light, it is first illuminated with light transmitted directly, and is examined with different, and gradually increasing, magnifying powers; should any details of the image remain undefined, obliquely transmitted light is used, which is insinuated into all the different corners of the object. In some microscopes this is attained by turning the stage round its axis; where this arrangement is wanting, the position of the object must be changed by moving it with the hand. Lines always stand out most clearly when oblique light falls upon them at a right angle: where, therefore, a line is suspected to exist, or is only dimly seen, particular attention must be paid to this circumstance. In submitting objects to incident light, the same rule generally holds good, and particular care must be taken, by turning either the stage or the object itself, to concentrate the light in all possible directions upon the object. Object-glasses of very high power cannot be used with incident light, inasmuch as the shortness of their focal length prevents the light from falling on the object; in this case recourse must be had to less powerful object-glasses, and more powerful eye-glasses. As a general rule, low-magnifying powers are sufficient when incident light is used.

Objects are frequently examined by polarised light. In order to effect this an instrument called a polariscope is employed. That most frequently used is the arrangement proposed by Mr. Nichol. It consists of two prisms of Iceland spar, one of which is fitted beneath the stage, the other is attached to the eye-piece. Tourmaline is also used for the same purpose. Large crystals of iodide of quinine have also been shown by Dr. Herapath to be applicable in polarising light for the microscope. ('Quarterly Journal of Microscopical Science,' vol. ii.) By the use of polarised light objects frequently exhibit their structure in a more perfect manner. Various objects, especially crystals of a spherical or oval form, exhibit a beautiful variety of colour in this way. In some cases it may be made the means of testing the nature of an object.

In most instances, objects are examined under water: it is but seldom, as, for instance, in examining pollen or spores, that it is necessary to observe them in different media, and also when dry. In the case of incident light, water often operates injuriously, especially when the object is not quite covered by it: it is therefore advisable, for certain particular objects, as, for instance, the embryoes of grasses, to observe them first without water, and afterwards under water; by placing them under a cover, and adding water with a camel's-hair brush, the object is generally sufficiently and fully immersed. When low-magnifying powers are used, it is not necessary that the objects should be placed under a glass cover, in fact, in many cases where it is wished to have the power of turning the object round, or when it is thought that the object may be improved by any additional cutting or preparation, it is very advantageous not to cover it; when object-glasses of very high power are used, the focal distance is so short, that in order to prevent striking the lens against the object, or dipping it in the fluid upon the object plate, it is necessary to make use of glass covers. When these are used, the fluid in which the object lies frequently becomes lessened by evaporation during the observation, in which case a fresh drop is added at the edge of the glass cover by means of a glass rod, or a clean camel's-hair brush, which may be used when it is wished to add a solution of iodine, or of chloride of zinc and iodine, to objects which are already immersed in water.

When any chemical re-agents are used, whether iodine, caustic potash, or an acid, the object should always be covered with a thin plate of glass; in using volatile acids, such as nitric acid and hydrochloric acid, too much care cannot be taken. The vapour of sulphuretted hydrogen has a very injurious effect upon flint glass, which is used by some opticians for the under side of the object-glass.

When the microscope is in daily use, it is a good plan to keep it under a high bell-glass, or an ornament shade.

The greatest cleanliness and accuracy are indispensable for microscopical investigations: it must be laid down as a rule always to use the cleanest water, in the cleanest vessels, for moistening the slides. Even with this precaution it is impossible entirely to protect the object from becoming soiled with particles of dust. Extraneous things of this kind will not easily deceive a practised observer; a beginner however may be easily misled by them. Water which has been left standing should never be used, since it too frequently contains the inferior sorts of animals and plants; and when different objects are examined one after another, fresh water should be taken for every new object, in order that no particles of the objects which have been previously examined may be mixed with the water upon the slide. Many errors may be traced to a neglect of small precautions of this sort.

In order to be able to recognise extraneous objects as such, it is advisable to gain an acquaintance with those things which, notwithstanding all precautions, cannot always be avoided. To this class of things belong: 1st, Air-bubbles, which, with transmitted light, generally appear in the form of circles of larger or smaller diameter, with a dark, black-looking rim: with incident light, on the contrary, their rim appears of a white colour. When the object is under a glass cover and in contact with it, the large air-bubbles frequently assume a very irregular shape; the above-mentioned optical fact is generally however by far the best proof of the presence of air, and by it the presence of air may be detected both in and between the cells of plants. 2nd, Colourless or coloured fibres of paper, or of linen, woollen, or silk-textures, left behind upon the object-glasses, from the cloths with which they have been cleaned, and also the hairs which have been detached from the brush. 3rd, Granular particles of dust of irregular shape, which are frequently coloured, and are probably produced by the decay of organised bodies. If it is wished to examine plants, or parts of plants, which grow either in or upon the earth, or in water, great attention must be paid to the many organised bodies which are likely to be met with: pains must be taken by careful observation to become acquainted with the lower forms of animals and plants: it is necessary, for instance, to be able to distinguish the common forms of *Infusoria*, both those that are provided with siliceous coatings, and those that are not; also with the yeast plant, the different forms of mould, the *Oscillatoria*, and such like things, in order to be able to separate them from the particular object under consideration.

The epithelial cells of the mucous membrane of the mouth are also objects which may deceive the observer. They occur when the brush is drawn through the mouth previously to bringing an object upon the object-plate. It is advisable never to pass the brush through the mouth. When in cutting small objects, the latter are held between the thumb and forefinger, or upon the forefinger alone, it often happens that small fragments of the skin of the finger are cut off at the same time. The observer must learn to distinguish these fragments, as well as the small pieces of cork which he will meet with in sections made between that substance.

Appearances of motion, either usual or accidental, may also give rise to mistakes, and these must therefore be learnt. Molecular motion is peculiar to all very small bodies, contained in a thin fluid medium; it consists of a somewhat trembling motion of these small bodies; it is frequently seen in the interior of pollen grains; it may be observed still better in certain fluids, for instance milk, when a small quantity is mixed with water, and placed under the microscope, with a magnifying power of from 200 to 400 diameters. When acquaintance is once made with this phenomenon no further deception can be caused by it. The same result follows from accidental currents upon the object-plate, which may take place either by evaporation or by the mingling of two fluids of unequal specific gravity, or by the dissolving of any salt existing in the fluid.

Observations are made less frequently with reflected than with transmitted light, but since the latter can only be used for very thin objects, the principal point to be attended to in dealing with opaque objects, is to make such an arrangement of them, as to enable the observer clearly to make out their details. The manner in which the object is divided must be regulated and altered according to the nature of the object itself, and the information which it is wished, by the help of the microscope, to obtain respecting it. Firm homogeneous textures, such as wood, must be treated quite differently from delicate objects composed of different organs, such as buds and blossoms; in the case of wood it is sufficient to take as thin a slice as possible, cut in a certain fixed direction; in the case of buds and blossoms, attention must be paid not only to the direction, but also, particularly, to the point at which the section is made; it is necessary to exhibit an accurate longitudinal section through the middle of the whole bud or blossom, and an equally accurate transverse section made at different heights, in order to ascertain the arrangement of the organs with respect to one another; moreover, the different parts of the organs must be separated and examined by themselves; in cases like this, and especially in inquiries connected with the development of plants, a dissecting microscope is necessary. The same remarks apply to hard and soft animal tissues.

Succulent or spongy tissues have generally large cells; it is not necessary therefore to have thin sections of such tissues, which are always difficult to make. Delicate animal tissues may advantageously be placed in spirit or pyroligneous acid for some days, provided it is not necessary that the tissues should be examined whilst fresh; but there is little advantage to be derived from treating botanical objects in that manner. It is a good plan however, in many cases, to saturate delicate portions of animals and vegetables with thick gum-mucilage, and to let them dry slowly in the air.

In dissecting, different methods must be adopted, according to the magnitude of the different objects; objects of large size may be held with the left hand, or with the thumb and forefinger of that hand; very small or very thin objects, such as the stems of mosses, thin twigs and roots, leaves, small seeds, and such-like things, may be placed between two pieces of cork, and thin slices of the object cut by means of a sharp knife or razor.

Observations are sometimes disagreeably impeded by the presence of air, which becomes accumulated in the hairy parts of plants, in the intercellular canals, in the vessels, and in wood; it is best removed by placing the object for a few minutes in a small watch-glass filled with alcohol; when taken out of the alcohol it must be put into water, and then transferred to the slide. When it is wished to examine the cell contents, in which the changes are generally produced by the operation of alcohol, the removal of the air may be advantageously effected by the use of the compressorium, which is permitted to operate continuously upon the object, whilst the observer looks into the microscope. In the absence of a compressorium, the fingers may be lightly pressed against the glass cover.

For transferring objects from one fluid into another a very fine camel's-hair brush should be employed; needles and other sharp instruments should never be used for this purpose, since the object may be easily injured by them. When the object is very small it will be more easily found if the watch-glass is placed upon a dark back-ground.

The microscope only affords a view of one surface of an object; when, therefore, bodies are subjected to examination, it is not sufficient for a correct understanding of them to examine one side only; a transverse section and a longitudinal section, and, in fact, frequently many longitudinal sections in different determinate directions, must be carefully examined and compared with one another before the observer can be satisfied that he has made out the construction of the body under observation. That which in objects of large size is attained by the help of the knife, is effected, in the case of very small opaque objects, by examining them on different sides. In examining small bodies which are very transparent, as, for instance, the ovules of *Orchideæ*, or grains of pollen or starch, the adjustment of the microscope is varied from time to time, by which means the upper side of the object is first brought into the focus, then the middle (which may be called an optical section, transverse or longitudinal, as the case may be), and, lastly, the under-side. The more perfect the object-glass the more exact is the focal plane, and the more sensitive is the instrument to any small alteration of the focus, on which account the observer should always keep his hand upon the fine-adjusted screw whilst he is employed upon observations requiring much accuracy. The sensitiveness above mentioned increases, in good instruments, in proportion to the magnifying power, and also with the angle of the aperture of the glass.

The accurate adjustment of an object is judged of by the sharpness of delineation of the image. The adjustment is more accurate in proportion to the delicacy and sharpness of the lines seen upon small objects, and also in proportion to the fineness and clearness of the outline, which should be soft, but well-defined. The scales of the *Hipparchia Janira*, a common brown butterfly, are well adapted for enabling a person to judge of the accuracy of an adjustment; the smallest change of focus causes transverse striæ to disappear.

In examining small round bodies, such as pollen-grains, the position of the objects should be changed, by gently pushing the glass-cover so as to cause the bodies to roll about; by this means different sides of the objects are seen, and from the different images presented to the eye their true form is made out.

Small objects should never be compressed between two glass sides, that being too rough a method of proceeding. If however it is supposed that anything is to be gained by compression, then it is advisable to use the compressorium, which is an instrument consisting of a mechanical arrangement by which the thin glass covering an object may be compressed at will. When the compressorium is cautiously used, the observer, by carefully watching what takes place, can gain a knowledge of the changes produced by pressure during the time the compressorium is permitted to work. In certain cases, where, for instance, the question is whether a particular object is a delicate cell or a drop of some fluid, the compressorium may be of service; since, if a cellular membrane be present, it will burst and discharge its contents as the pressure is increased, whereas the drop, whether it be oil, liquid resin, or any other chemical substance upon the slide, will only change its form.

In examining any object, whether animal or vegetable, it is not sufficient to observe the nature, form, and arrangement of the cells; it is necessary also to pay attention to their contents, which, in the case of plants, are different according to the functions assigned to them by nature. It is necessary, therefore, to distinguish—1st, Whether a cell is empty, that is to say, whether it contains air, as is the case, for instance, with perfect vessels and wood-cells; 2ndly, Whether its contents are fluid with a solid substance contained in the fluid. Another question which arises is as to the nature of the fluid contents, that is, whether they consist of a homogeneous fluid, or of fluids of different consistencies, apparently not intermingling with one another; the manner in which these fluids are affected by chemical re-agents has also to be considered. Lastly, the solid ingredients of the cell-contents, and their physical and chemical nature, must also be attended to. There are some substances dissolved in the juices of the cell, such as sugar, for example, for which no certain chemical re-agents are known. Gum and dextrine are coagulated by alcohol; the presence of nitrogenous substances is proved by the use of sugar and sulphuric acid, which produce a red colour, or by a solution of iodine, or of chloride of zinc and iodine, and also by nitric acid, with ammonia subsequently added to it; in these three cases an intense yellow colour, almost brown, is produced. When the presence of oil or resin is suspected, the object should be placed in ether or pure alcohol for some hours, which will dissolve both oil and resin. When the juices of the cell hold any salt in solution, some re-agent must be used which operates upon the salt. Starch is detected by being coloured blue by iodine.

The following is a list of re-agents which it will be found convenient to have close at hand in the examination of either animal or vegetable substances:—

1. Alcohol, which is used principally for removing air from sections of wood and other preparations, and as a means of dissolving certain colouring matters, &c. It coagulates the albuminous textures of animals.

2. Ether, which is principally used for dissolving resins, fatty essential matters, and other oils, &c. This is also useful for removing air.

3. A solution of caustic potash, which is used for the purpose of dissolving fat, is also useful in certain cases from its effects upon the contents of cells, and upon the thickening layers. It dissolves up substances of an albuminous nature. This solution often works better after warming.

4. A solution of iodine (one grain of iodine, three grains of iodide of potassium, one ounce of distilled water) for colouring the cell-membrane, and the contents of the cell.

5. Concentrated sulphuric acid. This is principally used for examining pollen and spores. In the examination of hairs it renders the cells very distinct.

6. Diluted sulphuric acid (three parts of sulphuric acid and one part water), for colouring the cells of plants which have been previously moistened with the solution of iodine. The object is moistened with the solution of iodine, which is then removed with a fine camel's-hair brush, and by means of a glass rod a drop of sulphuric acid is added, and the object is then immediately covered with a covering-glass. The effect of the sulphuric acid and iodine, as well as that of the iodised solution of chloride of zinc, is not always the same over the whole surface of an object. At the points where the mixture is more concentrated, the colouring is more intense; frequently places remain without any colour. The colour changes after some time; in twenty-four hours the blue is often changed into red.

The iodised solution of chloride of zinc produces generally the same blue colour in cellulose as iodine and sulphuric acid: the former is preferable in many cases, inasmuch as its effect is not so rapid, and it is not injurious to the cells. Both re-agents should in many cases be employed, and their effects compared with one another. Besides maceration, it is advisable, in examining woods, to adopt the plan of boiling thin sections for about a minute with a solution of caustic potash; after this boiling, the wood-cells, which were not previously turned blue by iodine and sulphuric acid, become of a violet or blue colour upon the application of the iodised solution of chloride of zinc.

7. A solution of chloride of zinc, iodine, and iodide of potassium. A drop of this solution applied to an object placed in a little water, produces the same colour as iodine and sulphuric acid. This solution was first recommended by Professor Schultz, of Rostock; it is more convenient to use than iodine and sulphuric acid, and produces almost the same results; it is, moreover, not so destructive as sulphuric acid. The exact prescription for this solution is as follows:—Zinc is dissolved in hydrochloric acid; the solution is permitted to evaporate, under contact with metallic zinc, until it attains the thickness of a syrup; and the syrup is then saturated with iodide of potassium. The iodine is then added, and the solution, when it is necessary, is diluted with water.

8. Nitric acid, or, what is better, chlorate of potash and nitric acid. This is used for separating cells. The method of maceration discovered by Professor Schultz, and which is much to be recommended, is as follows:—The object (wood, for instance), is reduced in size to the thickness of a lucifer-match; it is then thrown into a long and tolerably-wide boiling-tube; to this is added, in a little while, an equal volume of chlorate of potash, and as much nitric acid as is at least sufficient to cover the wood and the potash; the tube is then warmed over a spirit-lamp; a brisk development of gas quickly appears; the boiling-tube is withdrawn from the flame, the oxydising mixture is permitted to work for about a minute and a half or three minutes, and the whole is thrown into a saucer with water: the small pieces which adhere slightly to one another are then collected, placed in the boiling-tube, and boiled repeatedly with alcohol, until the latter appears colourless; they are then boiled once more, for the last time, with water. By the help of the simple microscope the cells are now separated from one another with a needle, and selected. The boiling with nitric acid and chlorate of potash should never be carried on in the room where the microscope is kept, because its glasses might be injured by the evaporation which is developed. Thin sections of plants, for instance, of woods or leaves, are warmed for half a minute, or a minute, in a watch-glass; the boiling is unnecessary in this case; the section is taken out with a little rod, and thrown into a small watch-glass with water. Nitric acid is one of the best agents for removing animal or vegetable tissues from silica, as in the case of the *Diatomaceæ*.

9. Oil of lemons, or any other essential oil, for examining pollen and spores.

10. A tolerably strong solution of muriate of lime (one part of dry muriate of lime, and three parts of distilled water) for preserving microscopic objects. This is useful for most things, even for delicate objects, unless they contain starch. If it is wished to preserve an object for a few days without mounting it immediately, it is a very good plan to put a drop of this solution upon the object, and to place it under a bell-glass for protection against dust.

11. Glycerine. This is also well adapted for preserving microscopic objects, and especially for cells which contain starch, which latter substance continues unchanged by it. In granules which exhibit lamination, for instance in the potato starch, the lamination is apt to continue invisible for the first few hours; after 24 hours, however, it appears more clearly.

12. Copal varnish, or Canada balsam, also for the preparation of microscopic objects; these are only to be recommended for a few thin sections of wood, such as fossil woods. They both make the object more transparent than the solution of muriate of lime.

13. A tolerably strong solution of carbonate of soda for digesting peat-wood, as well as hydrochloric acid for digesting fossil woods which have been converted into carbonate of lime. It is also recommended for examining the sweat-ducts in the skin.

14. Acetic acid. This is very useful in examining animal tissues. It has the power of making the cell-wall clearer, whilst the nucleus becomes darker and more distinct. It also distinguishes phosphate or carbonate of lime from oxalate of lime, by dissolving the two former, whilst it has no action on the latter.

15. Very dilute chromic acid. It is used for the purposes of hardening tissues. It is especially useful in examining the structure of the retina.

16. Ammonia will be found useful in the same cases where caustic potash and soda are employed.

17. Nitrate of baryta is used as a test for sulphuric and phosphoric acids. Sulphate of baryta is insoluble in acids and alkalies, while phosphate of baryta is readily soluble in acids, but insoluble in ammonia.

18. Nitrate of silver in solution is used as a test for chlorides and phosphates. The white chloride of silver is soluble in ammonia, but insoluble in nitric acid. The yellow phosphate of silver is soluble in excess of ammonia and nitric acid.

19. Oxalate of ammonia is employed as a test for lime, an insoluble oxalate being formed wherever lime is present.

This list of re-agents might be increased, as there is scarcely an operation performed in the laboratory that may not be repeated on a small scale under the microscope. The above list, however, comprises those which will be found most useful.

In addition to the ordinary optical arrangements of the microscope, certain forms of accessory apparatus will be found very useful. Some of these have been already alluded to, and the following will also be found convenient.

1. A spirit lamp, which may be made of brass, tin, or

glass, fitted with a ground glass cap. It may be fitted with a stand, and will be found useful for submitting objects to heat. The objection to the employment of candles, or lamps, is the black smoke they produce.

2. A small warm bath. This will be found of use for drying objects previous to being mounted in Canada balsam.

3. Watch-glasses are useful for examining substances in fluids with low powers, as by this means a considerable depth of fluid is obtained for observation.

4. Plate glass slides, 3 inches long and 1 inch broad, are useful for mounting and examining all kinds of bodies.

5. Thin glass, called cylinder-glass, of different degrees of thickness, is indispensable for placing over objects, especially those which are soft or fluid when placed upon a slide.

6. Needles of various sizes are used for making minute dissections. Small handles may be attached to them, rendering them more easy to work. Needles or pins may be employed for fastening down minute organic bodies which are about to be submitted to dissection.

7. Scissors of various sizes will be found serviceable. These may be obtained of the surgeon's instrument makers.

8. Knives, scalpels, and razors, for cutting soft or hard objects, should be kept at hand.

9. A pair of thin brass forceps will be found convenient for placing thin glass on the slides, as well as for placing or removing objects from the slides.

10. A glass-cutter's diamond is useful for cutting slips of glass, in the making of cells, and in writing the names of preserved objects on the glass slides.

Cements of various kinds are necessary to the microscopic observer who wishes to preserve the objects he examines. They are used for making glass cells to contain objects, on the glass slide, and for fixing the cover after the preparation has been placed in the cell, and for other purposes. The principal cements used are gold-size, sealing-wax varnish, solution of shell-lac, gum, a French cement composed of lime and India-rubber, Brunswick-black, marine-glue, and Canada balsam. These cements are most of them sold at the optician's, and directions for making them are found in some books on chemistry and the microscope.

In order to preserve preparations for a length of time, it is necessary to place them in an air-tight vessel. These vessels are called cells, and are best made of glass. They are also sold where microscopes are procured. With a little practice, however, the microscopist may make his own cells.

Thin cells may be made of various substances. Even paper answers exceedingly well in some cases, and is well adapted for dry preparations. A thin layer of white lead, which has been allowed to dry, has also been employed for the same purpose. White lead, made into a thick liquid with linseed oil and turpentine, has been recommended by some observers. Various varnishes have likewise been used; but where it is required to keep the specimen in some preservative solution, glass is the substance which in all cases forms the best material for making cells.

Sometimes preparations are of such extreme tenuity that it is only necessary to place them on the slide with a drop of some preservative solution, and then to cover them with a square of thin glass, the edges of which have been anointed with gold size or other appropriate cement. The superfluous fluid is next absorbed with bibulous paper, and the slide allowed to dry for a few minutes. A layer of gold-size or other cement is then applied round the edges of the thin glass in order to fix it to the slide. In this way an excessively thin cell may be formed; but preparations mounted in cells made in this manner can seldom be kept for any length of time without the entrance of air-bubbles. This arises from the outer layers of the gold-size drying more rapidly than the more internal layers. By the contraction thus produced the edges of the cement are drawn off from the glass, to which however it does not adhere with great tenacity in consequence of the surface being highly polished. It is therefore always better to make very thin cells of glass or other material, which can be cemented to the glass slides with marine glue or other cement; or else to make the cell by painting the slide with a ring of varnish, marine glue, or Brunswick black, and allowing this to dry thoroughly before the preparation is placed in it. In this manner the thinnest cells which can be required are readily made.

Perhaps Brunswick black is, for the purpose just mentioned, the best. It is painted upon a glass slide with a fine camel's-hair brush, and allowed to dry perfectly, when, if the cell is not sufficiently thick, another layer may be applied. If the cell be required immediately, it is better to warm the slide slightly before applying the varnish. If too great a degree of heat however be employed, the varnish becomes brittle and the cell unfit for use.

Very thin cells may be made of tin-foil. This may be easily accomplished by cutting with a pair of scissors a piece of thin tin-foil the size of the cell which it is desired to make. A hole is cut in the centre of the tin-foil sufficiently large to hold the preparation which is to be preserved, and the tin-foil is then attached to the glass slide with marine glue. When cold the cell may be filed perfectly flat with a very fine file, or rubbed with a little emery upon a piece of plate glass, and the marine glue should be afterwards removed from the centre with a little solution of potash. The cover may be fixed on with gold-size or varnish, as in other cases. Thin cells have also been made of gutta percha, but there is great difficulty in fixing the cell firmly upon the glass slide. This however has been effected by some observers; but in consequence of the difficulty it is a method not generally employed. Preparations however mounted in cells composed entirely of gutta percha keep very well for a length of time.

Cells composed of very thin glass are perhaps the most convenient, and will be found useful for preserving many preparations. They may be obtained of different degrees of thickness, and are made usually by perforating the thin cylinder glass which is used for covering the cells, or by grinding sections of a thick glass bottle to the required tenuity. Round cells of thin glass are made as follows:—A great number of squares of thin glass are cemented firmly together with marine glue, and when cold a hole of the required size is drilled through them all. They are next separated from each other by heat, and, after being cleaned with potash, may be fixed on the glass slides with marine glue in the usual way, and kept ready for use. It is a good plan to roughen the surface of these cells, which renders the subsequent entry of air less likely, as the gold-size adheres much more firmly to a ground than to a polished surface. This is readily effected by rubbing the cell, after it has been fixed upon the glass slide, up and down a narrow hone or strip of plate glass on which some moistened emery powder has been placed. In this way also the thickness of the cell may be reduced if required. (Beale.)

Cells of any thickness or depth may be made for larger objects, but those described will be found most convenient.

If it is only required to examine the character of a specimen in a dry state, it may simply be laid upon a glass slide and placed in the field of the microscope; if however the substance be of a very delicate structure, or in a minute state of division, it is better to place a piece of thin glass over it in the usual manner in order to protect it.

Dry objects may be mounted in a thin glass cell, or in a paper cell, or if of extreme tenuity they may simply be placed on a glass slide and covered with thin glass, which should be fixed to the former by a small piece of gummed paper (rather larger than the glass cover) in the centre of which a hole has been cut of sufficient size to permit the entire object being seen. The paper may of course be of any colour, or ornamented according to the taste of the operator.

When objects are to be examined by reflected light they may be placed in little glass or card-board cells, or in pill-boxes, or they may be put up in glass cells. The preparation should be placed upon a dark ground, which may be effected either by cutting a piece of dark blue or black glazed paper of the exact size of the cell and placing it within; or the black paper may be fixed on the posterior surface of the slide; or this surface may be covered with black paint or black varnish.

There are various methods by which preparations may be subjected to examination, and preserved as permanent objects in a moist state, and the different value of the various preservative solutions which are in use entirely depends upon the nature of the substance to be mounted. Distilled water forms a very good fluid for some objects, while for the preservation of most it is necessary to immerse them in water impregnated with some antiseptic agent, which is not volatile at ordinary temperatures. Many again are best preserved in spirit, or in a solution of some salt. It is very difficult to lay down rules which will enable the observer to choose a preservative fluid for any particular specimen. A little experience however will soon enable him to judge which solution is best adapted for the purpose.

We take the following account of several preservative solutions from Dr. Beale's valuable work on 'The Microscope':—

Spirit and Water.—Mixtures of spirit and water of various strengths are required for preserving different preparations. In diluting spirit distilled water only should be employed; for if common water be treated with spirit, a precipitation of some of the salts dissolved in it not unfrequently takes place, rendering the mixture turbid and unfit for use. Proof spirit will be strong enough for all general purposes, except for hardening portions of the brain or nervous system, when stronger spirit must be used. Two parts of rectified spirit, about specific gravity ·837, mixed with one part of pure water, makes a mixture of sp. gr. ·915-·920, which contains about 49 per cent. of real alcohol, and will therefore be about the strength of proof spirit. One part of alcohol, 60 over-proof, to five parts of water, forms a mixture of a sufficient strength for the preservation of many substances.

Glycerine.—A solution of glycerine adapted for preserving many structures is prepared by mixing equal parts of glycerine with camphor water. The latter prevents the tendency to mildew. It may be used as other preservative solutions.

Glycerine is obtained by boiling oil with litharge. The oleate of lead remains as an insoluble plaster, while the glycerine is dissolved. It may be rendered free from lead by passing a current of sulphuretted hydrogen through it; and the clear solution, after filtration, may then be evaporated to the consistence of a syrup.

Thwaites's Fluid.—This fluid has been much employed by Mr. Thwaites for preserving specimens of *Desmidieæ;* but it is also applicable to the preservation of animal substances.

Water	16 ounces.
Spirits of Wine	1 ounce

Creasote sufficient to saturate the spirit.
Chalk, as much as may be necessary.

Mix the creasote and spirit, stir in the chalk with the aid of a pestle and mortar, and let the water be added gradually. Next add an equal quantity of water saturated with camphor. Allow the mixture to stand for a few days, and filter. In attempting to preserve large preparations in this fluid, I found it always became turbid, and therefore tried several modifications of it. The solution next to be described was found to answer very satisfactorily. Water may also be impregnated with creasote by distillation. It should be remarked that M. Straus-Dürckheim has succeeded in preserving preparations in camphor-water only.

Solution of Naphtha and Creasote.—

Creasote	3 drachms.
Wood Naphtha	6 ounces.
Distilled Water	64 ounces.

Chalk, as much as may be necessary.

Mix first the naphtha and creasote, then add as much prepared chalk as may be sufficient to form a smooth thick paste; afterwards add, very gradually, a small quantity of the water, which must be well mixed in a mortar. Add two or three small lumps of camphor, and allow the mixture to stand in a lightly-covered vessel for a fortnight or three weeks, with occasional stirring. Pour off the almost-clear supernatant fluid, and filter it if necessary. Preserve it in well-corked or stoppered bottles.

I have some large preparations which have been preserved in upwards of a pint of this fluid, for more than five years, and the fluid is now perfectly clear and colourless. Some dissections of the nervous systems of insects have kept excellently—the nerves keeping their colour well, and not becoming at all brittle. Two or three morbid specimens are also in an excellent state of preservation; the colour being to a great extent preserved, and the soft character of the texture remaining. I have one preparation mounted in a large gutta percha cell, containing nearly a gallon of this fluid.

Solution of Chromic Acid.—A solution of chromic acid will be found well adapted for preserving many microscopical specimens. It is particularly useful for hardening portions of the nervous system previous to cutting thin sections. The solution is prepared by dissolving sufficient of the crystallised acid in distilled water, to render the liquid of a pale straw colour.

The crystallised acid may be prepared by decomposing 100 measures of a saturated solution of bichromate of potassa, by the addition of 120 to 150 measures of pure concentrated sulphuric acid. As the mixture becomes cool, crystals of chromic acid are deposited, which should be dried and well pressed on a porous tile, by which means the greater part of the sulphuric acid is removed, and the crystals obtained nearly pure.

Preservative Gelatine.—

Gelatine	1 ounce.
Honey	4 ounces.
Spirits of Wine	½ ounce.
Creasote	6 drops.

Soak the gelatine in water until soft, and to it add the honey, which has been previously raised to the boiling-point in another vessel. Next let the mixture be boiled, and after it has cooled somewhat the creasote dissolved in the spirits of wine is to be added. Lastly, filter through thick flannel to clarify it. When required for use, the bottle containing the mixture must be slightly warmed, and a drop placed on the preparation upon the glass slide, which should also be warmed slightly. Next, the glass cover, after having been breathed upon, is to be laid on with the usual precautions, and the edges covered with a coating of the Brunswick black varnish. Care must be taken that the surface of the drop does not become dry before the application of the glass cover; and the inclusion of air-bubbles must be carefully avoided.

Goadby's Solution.—

Bay salt	4 ounces.
Alum	2 ounces.
Corrosive Sublimate . . .	4 grains.
Boiling Water	4 pints.

Mix and filter. This solution may for most purposes be diluted with an equal bulk of water. For preserving delicate preparations it should be even still more dilute.

Burnett's Solution.—This fluid has been patented. Its preservative properties appear to depend upon the chloride of zinc. A strong solution of chloride of zinc forms a very powerful antiseptic, and also possesses the property of absorbing noxious odours, &c.

Other saline solutions.—Many other saline solutions have been employed by different observers. Of these, a saturated aqueous solution of chloride of calcium, free from iron, has been much recommended for preserving specimens of bone, hair, teeth, and other hard structures, as well as many vegetable tissues (Schacht). A solution of alum in the proportion of 1 part of alum to 16 parts of water has been found to answer pretty well for some substances. Gannal's solution, which consists of 1 part of acetate of alumina dissolved in 10 parts of water; solutions of common salt (1 part to 5 parts of water, with a little camphor), corrosive sublimate, persulphate of iron, arsenious acid, sulphate of zinc, and solutions of several other salts, have been recommended as preservative solutions, but their employment has not been always attended with the most satisfactory results.

Arseniurretted hydrogen gas has also been recommended for the preservation of animal substances, but it is not adapted for microscopical preparations.

Canada Balsam forms a most useful agent for mounting various substances; and the structure of many can only be clearly made out when they are examined in this menstruum.

In this method of mounting objects no cells whatever are requisite. The balsam should be pale and old. The glass slides must be warmed before the balsam is put on, and for this purpose the glasses may be held in a pair of wooden forceps, or in a pair of common forceps, the legs of which are covered with cork, and heated over a spirit-lamp or upon a brass-plate. The latter plan is the most convenient when several preparations are to be mounted at the same time, because they may be arranged in a row along the plate, and the balsam placed upon each slide as it becomes hot.

The Canada balsam may be heated after it is placed upon the slide, in order to allow the air-bubbles entangled in it to rise to the surface before it is applied.

The slide being warm, and the small quantity of Canada balsam sufficient to contain the preparation having been placed upon it, it must be gently moved about while the balsam is hot and quite fluid, until all the air-bubbles have floated to the surface and collected together towards one spot. A pointed wire or needle should then be taken, and all the bubbles either drawn out upon the end of it, which may be readily effected, or broken by the wire after it has been heated. In those cases in which the preparation is not detached from the glass slide upon which it has been allowed to dry, it is only necessary to place the drop of balsam upon it and gently warm it, following the usual precautions; afterwards the thin glass cover may be applied. When the preparation has been dried separately over the water-bath and cleaned, it may be taken in a fine pair of forceps, gently warmed, and carefully placed in the hot and perfectly fluid balsam. After it has been thoroughly wetted by the balsam, and all adhering air-bubbles removed, it may be placed in the position it is intended to occupy. The thin glass cover, adapted to the size of the preparation having been previously cleaned and warmed, may then be taken in a pair of forceps, and, after being held over the warm balsam for a minute, allowed to fall gradually upon the preparation (beginning at one side), until it becomes perfectly wetted with the balsam. The glass may now be slightly pressed in order to force out the superfluous balsam, and the preparation allowed to cool.

We now proceed to give a few directions for the examination of particular objects, more especially animal tissues, as these of all others are the most difficult to manage. In the examination of tissues containing blood-vessels, ducts, or other tubular organs, it is frequently most desirable that injections should be made before they are submitted to the microscope. This operation requires great delicacy. A very small syringe, or small syringes according to the delicacy of the structure, must be employed. The fluid injected consists of size or gelatine, coloured with various substances, as vermilion, sulphuret, and iodide of mercury, chromate of lead, indigo, Prussian blue, white lead, &c., according to the colour wished for.

The following general rules for injection are given by Dr. Beale:—Great attention should be paid to the cleanliness of all the instruments to be used in injecting. The syringe should always be kept scrupulously clean and in good order, and the injecting-cans should be carefully covered, to prevent the ingress of dust. Before commencing the operation, plenty of warm water should be at hand; and the subject should be allowed to soak for some time in a basin of hot water, before it is attempted to inject it, in order that it may be thoroughly warmed through. The temperature of the water must vary according to the degree to which the injection is required to be heated: if size and vermilion be used, the water need only be warm; but if melted wax be employed, the water must be so hot that the hand can scarcely be borne on it. The length of time which the preparation is allowed to soak must depend upon its bulk; and the water should be changed as soon as it becomes at all cool. With respect to the length of time after death that is more favourable for this operation, no absolute rules can be given. Generally, it may be remarked that we should not attempt to inject while the *rigor mortis* lasts. Many days may in some cases with advantage be allowed to elapse, particularly if the weather is cold, while in warm weather we are compelled to inject soon after death. As a general rule, the more delicate the tissue, and the thinner the vessels, the sooner should the injection be performed. Many of the lower animals, annelids, mollusca, &c., and fishes, should be injected soon after death. In making minute injections of the brain, only a short time should be allowed to elapse after the death of the animal, before the injection is commenced. Injections of the alimentary canal of the higher animals should be performed early—not more than a day or two after death.

When the preparation is warmed through, the injection properly strained, and the pipe fixed in the vessel, we may proceed carefully to inject, taking care that the injection is kept at a proper temperature, by allowing it to remain in the warm water-bath during the operation.

The air should be first withdrawn from the upper part of the vessel by means of the syringe, after which the stop-cock is turned off and left attached to the pipe. The syringe is then disconnected, and after being washed out once or twice with warm water, is nearly filled with injection, which must be well stirred up immediately before it is taken. The syringe should not be quite filled, in order that the air in the pipe may be made to rise into the syringe through the injection, by the ascent of the piston, before any of the latter is forced into the vessel. The end of the syringe is then to be pressed firmly into the upper part of the stop-cock, with a slightly screwing movement.

The piston is now very gently forced down by the thumb until the syringe has been nearly emptied, when the stop-cock must be turned off, and the syringe refilled with warm injection as before.

Care must always be taken to keep the syringe in an inclined position, so that any air which may be in it may remain in the upper part; and, for the same reason, all the injection should not be forced out, for fear of the inclosed air entering the vessels, in which case all chance of obtaining a successful injection would be destroyed.

After a certain quantity of fluid has been injected, it will be necessary to use a greater amount of force, which, however, must be increased very gradually, and should only be sufficient to depress the piston very slowly. If too great force be employed, extravasation will be produced before the capillaries are half filled. Gentle and very gradually increased pressure, kept up for a considerable time, will cause the minute vessels to become slowly distended without giving way to any great extent. At the same time it must be borne in mind that extravasation frequently occurs at various points in a successful injection; but the longer this event can be kept off, the more likely are we to succeed.

In order to examine the structure of many tissues, it is necessary to obtain a section sufficiently thin to permit the transmission of the light readily, and so evenly cut, that the minute structure of the tissue may be submitted to examination in every part of the section. The difficulty of making thin sections of many textures is often very great, and, to effect this object satisfactorily, a knowledge of certain mechanical operations becomes necessary. Sometimes we require to cut a thin section of a soft pulpy texture, which can scarcely be touched without injuring its delicate structure, and altering the position of its constituents; while, in other instances, we must obtain a very thin transparent section of a substance so hard that steel tools will scarcely scratch it, such as the enamel of teeth, fossil teeth, &c.

Previous to the examination of a tissue, boiling is frequently of service.

For instance, the fibres of which the crystalline lens is composed are best shown after boiling the lens in water. The branched muscular fibres in the tongue of the frog, and in other situations may be made out very readily by boiling the organ in water for a few moments, and then tearing up small portions with fine needles. Beautiful sections of muscular fibre can often be obtained after the texture has been boiled in water. Various glands and other textures often require to be boiled some time in water, in order to harden them sufficiently to enable us to cut thin sections; but in all cases the microscopical characters of the recent texture should be examined, as well as that which has been hardened by boiling. Small portions of tissue can be readily boiled in a test-tube over the spirit-lamp.

Not unfrequently we wish to get rid of the soft and more pulpy part of a tissue, in order to subject the more dense and fibrous portion to examination. This object is usually effected by soaking the tissue in water for some little time, and then placing it under a running stream of water, by which means the softer portions are gradually washed away. Soaking in water frequently enables us to tear up a tissue very readily with the aid of needles, and thus to demonstrate its structure. Occasionally it is found necessary to press the tissue, and rub parts of it together, before the soft pulpy portions can be got rid of. In this way we may demonstrate the supporting or trabecular tissue of the spleen, and the areolar and vascular tissue of the liver, &c. Thin sections of kidney, liver, and other glandular organs, may be thus treated when the matrix is to be subjected to examination separately.

Thin sections of various tissues can frequently be obtained only by first drying the substance thoroughly, and then cutting off a thin shaving with a sharp knife. In this way specimens of skin, mucous membrane, and many other tissues, are often most advantageously prepared. The tissue is stretched on a board with pins and then allowed to dry, when a very thin section can be cut off and examined in Canada balsam; or it may be placed in water for a short time, in which case, when subject to examination, it will often be found to have regained its first appearance. Portions of muscular fibre, the tongue, skin, and many other tissues, may be allowed to dry in this manner, and then we may with a sharp knife readily obtain exceedingly thin sections, which could not be procured in any other manner. The drying may be effected in a warm room, or in a current of air. A high degree of artificial heat should be avoided.

When the inorganic portion of a tissue which we wish to examine is not altered by exposure to a red-heat, recourse may be had to ignition, in order to get rid of the animal matter. In this way crystals of carbonate and phosphate of lime, and granules of siliceous matter, may be separated from the organic material with which they were combined. The beautiful siliceous shells of the *Diatomaceæ* may be separated from organic matter by a similar process. The ignition should be performed in a small platinum capsule, or upon a small piece of platinum foil. The carbonaceous residue must be exposed to the dull red-heat of a spirit-lamp for some time, until only a pure white ash remains, which will be found to contain the objects of our search in a very perfect state. If the siliceous matter only is wanted, the ash should be treated with strong nitric acid, which will dissolve any carbonate or phosphate. The insoluble residue may then be washed and dried, and subjected to microscopic examination whilst immersed in turpentine or Canada balsam. In many cases this method is superior to that of boiling in nitric acid in order to remove the organic matter. Both processes may however be employed where only the siliceous residue is wanted, but if we require the salts of lime, ignition at a dull red-heat is alone applicable.

In order to subject a portion of tissue or other substance to examination by transmitted light, the following plan is adopted:—One of the glass slides is carefully cleaned, and the thin section of tissue which has been removed by the aid of forceps and scissors, or a scalpel, placed in the centre; a drop of clean water is then added, and the whole covered with a square of thin glass, also perfectly clean. If the under surface of the thin glass be gently breathed upon, it becomes wetted more easily. The substance may be unravelled with needles, or, if necessary, any other operation performed before covering it with the thin glass. If the substance be covered with too much soft pulpy matter, it may be slightly washed in water before being placed upon the slide, or a jet of water from the wash-bottle may be forced upon it. Thin sections will require to be laid flat upon the slide, with the assistance of needles and forceps.

Hard tissues require a different treatment. Here the great object is to make sections thin enough for the object to be seen by transmitted light.

Many hard substances, such as nail, horn, and dried animal textures, may be cut with a strong sharp knife, or with a razor; an operation which is easily performed by placing the substance upon a piece of soft deal board, and, after cutting a smooth edge, removing a thin shaving, which may be examined dry or in fluid, or may be placed in Canada balsam, as occasion may require.

Such substances as bone, ivory, and fossilised rocks, should be first cut into very thin sections with the aid of a sharp saw. These sections should then be pared down to the necessary fineness upon a hone or smooth stone. This may be effected in the following manner:—The section, after having been cut off with the saw, requires to be ground thin before it can be subjected to examination. It may perhaps be as much as the tenth of an inch in thickness when the grinding is commenced, but by rubbing it for a short time upon a smooth stone it may be reduced to the proper degree of tenuity. Stones which are well adapted for this purpose are the 'Charley Forest' stones, the Turkey stones, or the Water of Ayr stones, about an inch or more in width, and six inches in length. Each of the four sides should be perfectly smooth. Other stones, or even a piece of slate, answer also very well, and may be procured at much less cost. The stone is wetted with a little water, and the section rubbed up and down with the finger, or with a piece of cork or leather.

A very good plan also is to imbed the section slightly in a piece of warm gutta percha, which should extend only a very short distance beyond the edges. This is to be rubbed up and down on the wet hone, water being added as required, till the surface is perfectly smooth, when the section is to be taken off, turned round, and ground down on the opposite side until it is sufficiently thin. The section may also be ground down expeditiously by rubbing it between two hones. If very thick, it will be better to reduce it somewhat with the aid of a flat file before commencing the grinding. After being ground to what is considered the proper thinness, the section may be placed in the microscope, when numerous dark lines will be found all over the surfaces; these must be removed by polishing. The deepest of the scratches may be obliterated by rubbing the specimen upon a very smooth part of the hone quite dry.

Teeth require a little more attention than other hard substances. They should be first ground down upon a lapidary's wheel, or upon a dentist's emery wheel. Sections can also be readily cut with a diamond saw (an iron wheel, the edge of which is covered with diamond dust).

The thin section is now to be soaked for a short time in ether to remove the fatty matter, and then allowed to dry.

It is to be subjected to examination in the dry way, moistened with water, turpentine, or Canada balsam, and the different appearances in each case should be carefully observed.

The cartilaginous basis is to be examined also in thin sections, which may be cut either before macerating in acid, or subsequently. A whole tooth placed in moderately strong acid will become soft in four or five days, when thin sections of different parts may readily be cut with a sharp knife.

The dentinal tubes may be isolated from each other by longer maceration in acid, and afterwards by soaking for a few hours in dilute caustic soda or potash. It is better in this investigation to cut the thin section before maceration in acid, or to macerate the tooth until moderately soft, and then remove a thin section, which is to be further exposed to the action of the strong acid. A mixture of sulphuric and hydrochloric acids has also been recommended.

The examination of fluids does not require so much art as that of solid matters. Where it is wished to examine the whole of the contents of a fluid, all that is necessary is to place a drop upon a glass slide and to cover it with a piece of thin glass. It frequently happens however that it is the matter suspended in a fluid that it is desirable to examine. Under these circumstances the fluid should be placed in an ordinary test-tube, and after allowing the deposit to settle, the supernatant liquor should be poured off, and a drop of the deposit conveyed to the glass slide. In other cases a pipette may be made use of to draw up the deposit from the bottom of the test-tube or other vessel in which it may be held. In examining water for living animalcules a small muslin-bag or net may be employed, through which the water may be poured, and the contents of the bag placed on the slide. In this way the *Desmidieæ* and some of the larger forms of *Infusoria* are best procured for examination.

When the quantity of deposit is very small, the following plan will be found of practical utility. After allowing the lower part of the fluid which has been standing to flow into the pipette as above described, and removing it in the usual manner, the finger is applied to the orifice, in order to prevent the escape of fluid when the upper orifice is opened by the removal of the finger. The upper opening is then carefully closed with a piece of cork. Upon now removing the finger from the lower orifice, the fluid will not run out. A glass slide is placed under the pipette, which is allowed to rest upon it for a short time. It may be suspended with a piece of string, or supported by a small retort-stand. Any traces of deposit will subside to the lower part of the fluid, and must of necessity be collected in a small drop upon the glass slide, which may be removed and examined in the usual way.

Another plan is to place the fluid with the deposit removed by the pipette in a narrow tube, closed at one end, the bore of which is rather less than a quarter of an inch in diameter. This may be inverted on a glass slide, and kept in this position with a broad elastic India-rubber band. The deposit, with a drop or two of fluid, will fall upon the slide, but the escape of a further quantity is prevented by the nature of the arrangement.

Amongst the fluids of the human body which may with advantage be submitted to examination with the microscope, there is none of more importance than the urine. This fluid being the great means which nature employs to rid the system of the used-up and effete matter of the body, becomes an index by which the completeness, redundancy, or inefficiency of this function may be examined. The following hints for the examination of this fluid will be found useful.

The urine which is to be examined should be collected in sufficient quantity, in order to obtain sufficient of the deposit for examination.

In all cases the urine should, if possible, be examined within a few hours after its secretion, and, in many instances, it is important to institute a second examination after it has been allowed to stand for 24 hours. Some specimens of urine pass into decomposition within a very short time after they have escaped from the bladder; or the urine may even be drawn from the bladder actually decomposed.

In other instances, the urine does not appear to undergo decomposition for a considerable period, and may be found clear, and without any deposit a day or two, or even longer, after it has been passed.

In those cases in which lithic acid or oxalate of lime are present, we shall find that the deposit increases in quantity after the urine has stood some time. The latter salt is frequently not discoverable in urine immediately after it is passed, but makes its appearance in the course of a few hours; depending upon a kind of acid fermentation, which has been the subject of some beautiful investigations by Scherer.

In order to obtain sufficient of the deposit from a specimen of urine for microscopical examination, we must place a certain quantity of the fluid in a conical glass, in which it must be permitted to remain for a sufficient time to allow the deposit to subside into the lower part.

Urinary deposits often require to be examined with different magnifying powers, those which are most frequently used being the inch and the quarter of an inch. Large crystals of lithic acid are often readily distinguished by the former, but crystals of this substance are sometimes so minute that it is absolutely necessary to use high powers. Octohedra of oxalate of lime are frequently found so small that they cannot be seen with any power lower than a quarter; and, in order to bring out the form of the crystals, higher magnifying powers than this are sometimes necessary. *Spermatozoa* may be seen with a quarter, but they then appear very minute. In these cases, an eighth of an inch object-glass will be of advantage. The casts of the tubes, epithelium, and the great majority of urinary deposits can, however, be very satisfactorily demonstrated with a quarter of an inch object-glass.

In the investigation of those deposits which are prone to assume very various and widely-different forms, such as lithic acid, it will sometimes be found necessary to apply some simple chemical tests, before the nature of the substance under examination can be positively ascertained.

The urine is very liable to the introduction of foreign substances. A paper on this subject by Dr. Beale will be found in the first volume of the 'Quarterly Journal of Microscopical Science.' The following is a list of these substances occasionally found by Dr. Beale:—Fragments of human hair; cat's hair; hair from blankets; portions of feathers; fibres of worsted of various colours; fibres of cotton of various colours; fibres of flax; potato starch; rice starch; wheat starch, bread-crumbs; fragments of tea-leaves, or separated spiral vessels and cellular tissue; fibres of coniferous or other wood swept off the floor; particles of sand; oily matter—in distinct globules arising from the use of an oiled catheter, or from the accidental presence of milk or butter.

Besides the above, there are many other substances, met with less frequently, as, for instance, fragments of silk, mustard, flower, cheese, small fragments of the skin of potato, or of different kinds of fruit, and many others which will occur to the mind of every one. With the microscopical characters of these bodies the student should be perfectly familiar as soon as possible; and, as they may be obtained without the slightest difficulty, this is easily effected.

For the nature of the deposits found in the urine, see the article URINE.

The examination of the other fluids of the animal body presents little difficulty. Next to the urine the blood is of most importance. In order to examine the blood, a small drop is placed upon a glass slide, and covered with thin glass, which is to be pressed down until a very thin, transparent, and almost colourless stratum only remains. If in this manner the individual globules cannot be seen distinctly, a little syrup or serum must be added; but it is better to avoid the addition of any fluid, if possible. Upon carefully focussing, the red globules will appear to present a dark centre and light circumference, or the reverse, according as the focus is altered, and here and there a white corpuscle may be observed.

If a little strong syrup be added to a drop of blood, the corpuscles will be found to have become flatter from exosmosis of a part of their contents; while, on the other hand, if placed in water, they become spherical from endosmosis, and ultimately burst. It is not difficult to make a solution of similar density to that in the interior of the corpuscle; and in this manner, as Dr. Rees expresses it, we may take the specific gravity of a blood-corpuscle, if we ascertain the specific gravity of the solution which has been added to the blood.

Acetic acid causes the membrane of the corpuscle to become more transparent and clear, and to swell up from endosmosis. After the application of this re-agent the blood-corpuscle may be scarcely visible, but the membrane is not dissolved by it. Strong hydrochloric and nitric acids do not dissolve the globules; with the latter re-agent the outline is often rendered darker and thicker, while the entire globule becomes smaller. The corpuscles are entirely soluble in ammonia and alkalies. They are rendered darker, and the walls corrugated, by the acid of the gastric juice, and after remaining in acid urine for oome time a similar change occurs; hence the black colour of blood which has been effused into the stomach, and the dark smoky hue of acid urine containing blood.

We have before spoken of the crystals to be obtained from the blood. These crystals are very readily obtained by diluting blood with water. A drop of blood may be placed upon a glass slide, and after the addition of a drop of water, alcohol, or ether, the whole should be lightly covered with thin glass. A hair, or a small piece of thin paper or wood, may be placed between the glasses, in order that a stratum of fluid of sufficient thickness may be retained. Whenever it is possible, it is preferable to use defibrinated blood. Often the corpuscles and a little serum may be removed from the clot by firm pressure, and from this very perfect crystals may frequently be obtained. The blood-corpuscles become ruptured by endosmosis, their contents escape, and crystallise as the solution gradually becomes concentrated. The time which elapses before crystallisation takes place varies from an hour to several hours or days in different specimens of blood. Crystals may also be obtained in a similar manner from the coagulum of blood.

The form of the crystal often varies slightly in the same specimen, but the blood of different animals yields crystals of very different forms. The prismatic form is that most commonly obtained from the blood of man, the *Carnivora*, and fishes. Tetrahedral crystals appear most common in some of the *Rodentia*, as the guinea-pig, while six-sided tables are formed in the blood of the squirrel, mouse, and some others. Teichmann has succeeded in obtaining crystals from frog's blood by the addition of a very large quantity of water at a very low temperature.

The crystals form more readily in daylight than in the dark, but most rapidly when the slide is exposed in the light of the sun.

Guinea-pig's blood crystallises in the course of half an hour, or even sooner if it be diluted with a little water or alcohol. Dog's blood also crystallises in the course of a short time upon the addition of a little alcohol. Human blood crystallises after the addition of water, slowly if only just removed from the body, but more quickly if the blood has been drawn a few hours.

It is obvious from what has been said above that the microscope is one of the most important instruments of research that has been placed in the hands of man. Its practical value has not however been yet fully recognised. It is employed by the medical man in the diagnosis of diseases, but in medico-legal investigations, in the detection of adulterations in food, in ascertaining the value of fibrous materials in the arts, and in many departments of industry, it has yet to find its way. Dr. Beale gives the following instances of its utility as a means of diagnosis:—

"Diseases of the Kidney.—There is no class of diseases in which its powers have been more advantageously brought to bear by the practical physician than in those of the kidney. By a microscopical examination of the urine we are frequently enabled to ascertain the nature of certain morbid changes which are going on in the kidney, and even to distinguish during life the existence of certain well-defined pathological conditions of that organ. The laborious researches of Dr. Johnson have shown us how, by the peculiar character of the casts of the uriniferous tubes, which are found in the urine, we can ascertain whether the epithelium be desquamating, or, on the other hand, whether it presents no such tendency, but remains firmly attached to the basement membrane of the tube. If the epithelium be undergoing that peculiar change termed fatty degeneration, we shall often be able to ascertain the fact by examining a specimen of the deposit from the urine by the microscope. So again, by the presence of certain other deposits, and a knowledge of the symptoms usually associated with them, the physician is enabled to direct his attention, as the case may be, to the existence of local changes affecting some part of the genito-urinary mucous membrane, or to more general disturbance in the changes which take place in primary and secondary assimilation.

"Fatty Degeneration.—Of late years the remarkable changes which take place, and which have been described under the name of Fatty Degeneration, in some of the highly complex textures of the body, in consequence of which their properties become changed, and their functions impaired, or altogether destroyed, have been undergoing careful investigation by a vast number of highly-talented investigators.

"The recent discovery of a state of fatty degeneration affecting the arteries of the brain, in the majority of cases of apoplexy, by which the strength of their coats becomes deteriorated, and their elasticity entirely destroyed, would tend to lead us to infer that this disease is dependent rather upon complicated changes affecting nutrition, than upon the presence of a condition of plethora or hyperæmia, as was formerly supposed and acted upon.

"The connection between fatty degeneration of the margin of the cornea (arcus senilis), and similar changes taking place in the muscular tissue of the heart (a subject which has been carefully investigated by Mr. Canton), or in the cerebral vessels, must be regarded with great interest by every practitioner.

"The microscopical examination of the matters vomited in certain cases has proved to us that the presence of minute fungi, originally discovered by Professor Goodsir, and named by him *Sarcina Ventriculi*, occurs in connexion with certain morbid conditions of the stomach. These remarkable cases are much more frequently met with than was formerly supposed, and form an exceedingly interesting class of diseases. [Entophyta, *S.* 2.]

"Tumours and Morbid Growths.—The microscope has many times afforded important aid in the diagnosis of tumours, although it has certainly failed in many instances; which circumstance has been brought forward by some, as an argument against its employment altogether. After careful microscopical examination, the best observers have failed in deciding as to the nature of a particular tumour submitted to examination; and they have been unable to pronounce as to its malignant or non-malignant character.

"On the other hand, not unfrequently this question has been positively and correctly answered in the affirmative or negative, and therefore it would surely not be right altogether to discard the use of an instrument which, although eminently useful in many instances, is not infallible; for it would appear to be the opinion of some, that the use of the microscope ought to be altogether abandoned in the diagnosis of tumours."

"For the discovery of Imposition the microscope is invaluable, as it almost necessarily follows that, in consequence of the frequency with which urine is subjected to minute investigation, patients often resort to various expedients to deceive the practitioner. Perhaps flour, starch, sand, and milk are more frequently employed for this purpose than any other substances. The microscope will obviously enable any one to detect the first three. If milk be added to urine, the mixture may very readily be mistaken for a specimen of the so-called chylous urine. Although a considerable quantity of fatty matter is present, in either case this fatty matter exists in a very different state. In milk we find the oil-globules, so characteristic of this fluid, while in true chylous urine not a single oil-globule can be found, although the specimen may contain a large quantity of fatty matter in a molecular state.

"Larvæ of the Blow-Fly in Urine.—A specimen of urine containing several bodies of about half an inch in length, and of a rounded form, was once sent to Dr. Todd for examination. The bodies in question looked not unlike the larvæ of some large fly, but, as it was confidently affirmed that they were passed by the urethra of a gentleman, the accuracy of this view of their nature was doubtful.

"Upon placing a portion of one of them under the microscope, tracheæ—(the air-vessels characteristic of the class of insects) were observed in considerable numbers; and this circumstance alone enabled me to say positively that they were not *Entozoa*, and that they could not have been passed in the manner stated. They were afterwards proved to be the larvæ of a fly.

"The claws of *Echinococci* and portions of hydatid cysts have on several occasions been discovered in the urine, sputa, &c., upon submitting portions of these fluids to microscopical examination, proving beyond a doubt the existence of hydatids. [Entozoa.]

"Substances passed by the Bowels.—If the practitioner have a good knowledge of the use of the microscope, he can often ascertain the nature of substances passed from the alimentary canal; and by the aid of this instrument he can often at once decide as to the nature and origin of substances, which, to the unaided eye, only present most doubtful characters. Considerable perplexity has arisen from the presence of bodies in the stools of patients, which afterwards proved to be portions of almonds, gooseberry-skins, portions of potato, the testa of the tamarind, husks of wheat, &c.; not many years ago the uredo of wheat was mistaken for, and described as, a peculiar fungus, to which it was supposed the phenomena observed in cases of cholera were due.

"Portions of vessels which, unlike the other constituents of the food, have resisted the process of digestion, have been met with in the fæces, and mistaken for small intestinal worms, which they much resemble when examined by the unaided eye. Upon being subjected to microscopical examination their true nature was readily discovered.

"In Medico-Legal Inquiries the microscope has often afforded valuable aid. The distinction between blood-spots and red stains produced by fluids resembling blood in colour —between human hair and that of animals—and the detection of spermatozoa in cases of rape, need only be adduced as examples of the importance of the microscope in such investigations.

"For Detecting Impurities in Food and Drugs the microscope has afforded important aid, and there are several other purposes to which it may be applied."

In preparing this article we have been greatly indebted to Dr. Beale's most useful work on 'The Microscope, and its Application to Clinical Medicine,' also to the translation of Dr. Schacht's work on 'The Microscope in its Special Application to Vegetable Anatomy and Physiology,' translated by Mr. Currey, and to Professor Quekett's admirable 'Treatise on the Microscope.' For those who would wish to refer to the subject further, we give a list of the principal works devoted to this instrument:—Robert Hooke, 'Micrographia,' 1667. Leeuwenhoek, 'Papers in Philosophical Transactions,' from 1673. Baker, 'Employment for the Microscope,' 1744. Adams, 'Micrographia Illustrated; or, the Knowledge of the Microscope Explained,' 1746. Adams, jun. 'Microscopical Essays,' 1787. Pritchard, 'Microscopic Cabinet.' Chevalier, 'Des Microscopes et de leur Usage.' Sir David Brewster, 'Treatise on the Microscope.' Joseph Jackson Lister, 'Philosophical Transactions,' 1829. Ross, article 'Microscope,' in 'Penny Cyclopædia,' 1839. Carpenter, article 'Microscope,' in 'Cyclopædia of Anatomy and Physiology.' Mandl, 'Traité Pratique du Microscope,' 1839. Schleiden, 'Principles of Scientific Botany,' translated by Dr. Lankester, appendix 'On the Use of the Microscope,' 1849. Robin, 'Du Microscope et des Injections.' Hannover, 'On the Microscope,' translated by Professor Goodsir, 1853. Bennet, 'An Introduction to Clinical Medicine,' 1853. Hogg, 'The Microscope, its History, Construction, and Application,' 1854. 'The Microscopical Journal.' 'Quarterly Journal of Microscopical Sciences.' Griffith and Henfrey, 'The Micrographical Dictionary,' 1854-55.

MIDDLEHAM. [Yorkshire.]

MIDDLESBOROUGH. [Yorkshire.]

MIDDLETON. [Durham; Lancashire.]

MIDDLETONITE. [Mineralogy, *S.* 1.]

MIDDLETOWN. [Connecticut.]

MIDHURST. [Sussex.]

MIDLETON, county of Cork, Ireland, a post- and market-town, and the seat of a Poor-Law Union, is situated near the head of the north-eastern branch of Cork Harbour, in 51° 55′ N. lat., 8° 10′ W. long., 13½ miles E. from Cork by road, and 173¼ miles S.W. by S. from Dublin. The population in 1851 was 3676, besides 2334 inmates of the workhouse. Midleton Poor-Law Union comprises 19 electoral divisions, with an area of 109,266 acres, and a population in 1851 of 44,049.

Midleton consists mainly of a spacious and well-built street between the Avanachora and Roxborough rivers, terminating at each end in a bridge. In the town are a neat parish church, a Roman Catholic chapel and nunnery, a Free school, or college, founded in 1696, which had 30 scholars in 1852, two National schools, a court-house, a market-house, a bridewell, a fever hospital, and a district dispensary. There are also distilleries, breweries, com-stores, and flour-mills. Vessels of 300 tons ascend to Baillick, within half a mile of Midleton; and at the port of Ballincurra, about a mile below the town, large shipments are made of corn and other provisions. Quarter and petty sessions are held in Midleton. Fairs are held on May 14th, July 5th, October 10th, and November 22nd. The town and neighbourhood are the property of Viscount Midleton.

MILBORNE. [SOMERSETSHIRE.]

MILDENHALL. [SUFFOLK.]

MILITARY AND NAVAL FORCES. Under 'Great Britain,' in Penny Cyclopædia, vol. xi., p. 420, the state of the army and navy of the United Kingdom, in 1838, was given. Since that period, partly in consequence of the deficiencies made apparent during the war against Russia, several important regulations have been introduced into the army. To the branches of the Artillery and the corps of Engineers, commissions were thrown open to competitive examination, with a marked success. After a certain time, not yet fixed (April, 1858), the first entrance to these corps is to be made at Sandhurst Military College, but it would appear that, with very slight restrictions, these corps, as well as staff appointments, will still be open to public competition. The competitors must not be less than 16, nor more than 18, years of age, they must have testimonials of respectability, and they will have to be nominated by the Commander-in-chief, before they can be received for examination.

To the main body of the army facilities have been afforded for rewarding extraordinary merit by promotion from the ranks. The use of the Minié and Enfield rifles have been generally adopted throughout the army, and prizes have been instituted for the encouragement of skill in their use. Some alterations also have been made in the clothing and equipment of the soldier, which as far as they have gone have been improvements, but which might be judiciously extended. A permanent camp was also formed at Aldershott, near Bagshot, in 1855, where field operations could be effectively performed; and another in Ireland. Also, in consequence of a medical report showing the fearful mortality in the army arising from sickness, an investigation was ordered, which resulted in showing that the main cause of a mortality which considerably more than doubled the average rate, and greatly exceeded even that of the most deleterious and dangerous trades, was the ill-constructed and crowded state of the barracks. In March, 1858, General Peel, the Secretary for War, announced that surveyors had been appointed to examine the barracks, and that prompt means would be taken to remedy these evils.

The number of officers, non-commissioned officers, and rank and file, voted for the effective service of the United Kingdom for the year ending March 31, 1857, the close of the Russian war, was 244,716, exclusive of the troops in the East Indies, who amounted to 26,363; the number of the non-effective service was 2,000; the estimated charge was 34,998,504*l.*; an increase of 30,378 men, and of 6,328,007*l.* of charge, over the preceding year. The revised estimate was subsequently reduced to £20,249,084.

For the year ending March 31, 1858, there were voted 126,756 men, with 11,786 horses, a decrease of 119,920 men from the preceding year. The troops in the East Indies had been increased to 30,197, with 2,812 horses.

For the year ending March 31, 1859, the estimate was as follows:—

	1858-9.				
	Officers.	Non-Com. Officers.	Rank and File.	Total Men.	Horses.
Life Guards and Horse Guards 3 regs.	99	162	1053	1314	825
Royal Horse Artillery	44	90	1426	1560	1200
Cavalry of the Line	476	687	8078	9241	5993
Royal Artillery	658	1272	15,203	17,133	2006
Royal Engineers	367	301	3,000	3668	120
Military Train	112	184	1196	1492	1000
Foot Guards	261	439	5600	6300	—
Infantry of the Line	3331	5913	69,350	78,594	—
Medical Staff Corps	2	70	928	1000	—
West India Regiments	180	239	3000	3419	—
Colonial Corps	243	395	5140	5778	900
General Staff	122	—	—	122	—
Commissariat Staff	179	—	—	179	—
Medical Staff	335	—	—	335	—
	6409	9752	113,974	130,135	12,644

There are three regiments of Life Guards and Horse Guards, one battalion of Horse Artillery, 7 regiments of Dragoon Guards, and 16 regiments of Dragoons according to the Army List (1 to 17, the 5th having been disembodied), but the estimates provide for 18 regiments, the 5th being restored; one regiment of Royal Artillery, one of Royal Engineers, a Military Train, a Medical Staff, and a Commissariat Staff. The Infantry of the Line consist of three regiments of Guards, 99 foot regiments, and a Rifle Brigade. There are three West India Regiments, and seven Colonial Corps. In Jan. 1858, according to the Army List, there were 4 Field-Marshals, 67 Generals, 89 Lieutenant-Generals, and 220 Major-Generals.

At the beginning of 1857 the army of the East India Company, independent of the Queen's troops, amounted to about 320,000 men, of which 34,630 were cavalry, and 7420 artillery, horse and foot, with 516 pieces of cannon. The European officers of this force numbered 6215.

This was, of course, before the breaking out of the Indian mutiny. The Bengal army mutinied almost to a man, and what remains of that force is now (April, 1858) in arms against us. Some disaffection has also probably decreased the numbers of the Madras and Bombay armies. On the other hand, the number of royal troops has been greatly increased; but so many are still on their passage, or under orders to proceed thither, that it is not possible to state the precise numbers. On the whole an addition, from home and from some of our colonies, of more than 50,000 has been forwarded to India, though incessant fatigue, the climate, and frequent fighting, has no doubt materially thinned their ranks. The Queen's troops in India for 1858-9 are estimated as follows:—

	Officers.	Non.-Com. Officers.	Rank and File.	Total.	Horses.
Royal Horse Artillery	26	56	728	810	680
Cavalry of the Line	440	649	7128	8217	7315
Royal Artillery	153	323	4230	4706	1768
Royal Engineers	19	32	448	499	—
Military Train	16	32	230	278	—
Infantry of the Line	2434	4514	58,000	64,948	—
Medical Staff Corps	—	6	30	36	—
Depôts of regiments in India — stationed in the United Kingdom	382	955	11,906	13,245	418
	3470	6567	82,702	92,739	10,181

The amount voted for the year ending March 31, 1857-8, was 11,443,235*l.*; for 1858-9 it was 11,750,000*l.* Of this in the first year 4,388,017*l.*, and in the last 4,361,027*l.* were expended on regimental and staff payments and allowances, but 680,000*l.* in the last year was to be paid by the East India Company on account of the excess of number of men sent to India.

The amount voted for the Embodied Militia for the year ending March 31, 1859, was 650,000*l.*, and for Volunteer Corps, 80,000*l.*; for 1858 the amount had been 50,282*l.*

The sum expended on the effective service of the army in 1857-8 was 9,221,360*l.*; the estimate for 1858-9 was 9,298,319*l.*; on the non-effective (pensions, rewards, and allowances,) 2,221,875*l.* and 2,240,068*l.*

In the *Navy* much attention has been given to instructing the seamen in the working of great guns. This has been eminently successful, and the precision and rapidity with which they can now be directed and discharged has added materially to their efficiency for destructive purposes.

In 1857 the total navy consisted of 260 sailing vessels, carrying 8722 guns, and 202 steam vessels carrying 5050 guns, besides 160 gun-boats. These were manned by 40,776 men, including officers, and there were in addition 15,000 marines.

In Jan. 1858 there were in commission 548 vessels of various sizes, sailing and steam-propelled vessels, mounting 15,716 guns, and 136 steam gun-boats. Of the ships of war, 5 mounted 131 guns each, and 22 others mounted from 101 to 120 guns each. The arming of vessels has however undergone considerable modification, the chief objects aimed at now are facility of motion in the ships, and weight of metal and length of range in the guns.

The flag officers in active service in January 1858 numbered 21 admirals, 27 vice-admirals, 51 rear-admirals, 356 captains, 517 commanders, 1106 lieutenants, 345 masters, 159 mates, 105 second masters, 127 engineers, 327 surgeons, 255 assistant-surgeons.

Of the Royal Marines there are 104 companies, of which the total strength is estimated at 15,000. They are commanded by 3 generals, 3 lieutenant-generals, 5 major-generals, 4 colonels commandant, 5 colonels and second commandants, 19 lieutenant-colonels, 120 captains, 176 lieutenants, and 88 second lieutenants. There are also 14 companies of Royal Marine Artillery, with 1 colonel and second commandant, 2 lieutenant-colonels, 14 captains, 37 first lieutenants, and 9 second lieutenants.

The total expenditure on the navy for the year ending March 31, 1857, was 14,664,514*l.*, an amount less by 1,904,100*l.* than that of the estimate of the gross sum. The vote for 1858-9 was for 44,380 seamen, including coast-guards, &c., and 15,000 marines; the estimate of the expenditure was 9,860,000*l.*, including the effective and non-effective services.

The military and naval forces of the principal foreign countries for 1857 (where not stated to the contrary), are given as follows in the 'Gotha Almanac' for 1858.

Austria had 64 regiments of infantry of the line, numbering, on the war footing, 425,878 men; 14 frontier regiments, with 55,200 men: 25 battalions of light infantry, numbering 32,534 men; with a division or depôt of light infantry, numbering 6,684 men. The cavalry consisted of 8 regiments of cuirassiers, 8 of dragoons, 12 of hussars, and 12 of uhlans, amounting in the whole to 70,376 men, with 60,784 horses. The artillery numbered 58,614 men, with 1,344 pieces of cannon; the engineers and staff corps amounted to 11,116 men; there were 5 battalions of pioneers, numbering 9,217 men, with 3,880 horses; and 20,000 gendarmerie (these are the armed police), in 12 regiments. There are also many other military establishments, such as the military schools, with 7,640 students, sanitary corps consisting of 3,457 men, 21 depôts, with garrison and frontier battalions, &c. The Austrian navy numbered 101 vessels, including 52 gun-boats, and 9 transports, the whole carrying 950 guns. It contains one vessel of 100 guns, 5 frigates, carrying together 165 guns, 3 screw-steamer frigates, carrying 129 guns; the remainder are corvettes, brigs, and smaller craft. The population, at the end of 1854, was 39,411,309, exclusive of the military.

Bavaria had 134,626 infantry; 22,879 cavalry; 24,700 artillery, with 112 pieces of cannon; 2,554 engineers; together with a landwehr, active on the east of the Rhine, of 54,000 infantry and 2,500 cavalry. The population was 4,541,556.

Belgium possessed an army of 16 regiments of infantry, numbering 56,550 men; 7 regiments of cavalry and gendarmerie, numbering 8,202 men, with 7,585 horses; 4 regiments of artillery, numbering 6,700 men, with 152 pieces of cannon; one regiment of engineers, numbering 1,690 men; and a corps of pontoneers, numbering 576 men. This is the peace establishment, and forms in effect a total force of 100,000 men when on a war footing. The population was 4,530,228.

For Denmark the number of men is not stated, but in time of peace it has a general staff, a corps of engineers, 2 regiments of artillery, with 96 pieces of cannon, 25 squadrons of cavalry, and 23 battalions of infantry. There is besides a corps of reserve, composed of cavalry, infantry, and artillery. The navy numbered 119 vessels, mounting 913 guns, of which 4 are ships of the line, and 11 are steam-vessels, carrying 153 guns; of the remainder, 67 are gun-boats, 17 transports, and other small vessels. In 1856 the total population of Denmark, together with Schleswig Holstein, and other dependencies, was 2,600,000.

In France, the infantry of various sorts numbered 220,268 men, the cavalry 62,988, the artillery 34,282, the gendarmerie 22,712, the engineers 9068, the staff 4345, the military train 4971, the veterans 1135, military intendants 6295, the foreign legion (Algeria) 6110; riflemen and indigenous cavalry (Algeria) 6737; a total of 378,911 men. In 1856 the total number had amounted to 577,536 men, of whom there were in France 310,347, in Africa 64,235, engaged in the war in the East 197,597, and in Italy 5357. The navy in 1857 consisted of 353 vessels, of which 10 were of 120 guns each, 10 of 100, 15 of 90, 5 of 80; there were 50 frigates of from 60 to 40 guns each; the rest were smaller vessels, corvettes, brigs, and a few steam-propelled vessels of war. The population was 36,039,364.

Hanover had a total land force of 26,938 men, of which 20,464 were infantry, 3078 cavalry, 257 engineers, 2666 artillery, 441 gendarmerie, and 32 staff officers. The population was 1,819,777.

Naples in 1855 possessed an army amounting in the whole to 143,586 men. Of these 74,814 were infantry, 6736 were cavalry, with 6000 horses; 6322 were artillery, with 1347 horses; 2880 were engineers. These formed the active army, and there were in reserve 48,000 infantry, and 3000 cavalry. The navy contained 98 vessels, mounting altogether 832 guns; there were 2 ships of the line, 5 sailing and 14 steam frigates; there were 50 mortar and gun-boats, and other small vessels. The total population of the Two Sicilies was 9,117,050 in 1856.

The army of the Netherlands amounted to 58,495 men, of whom the infantry, including the staff, number 43,858 men; the cavalry 4490; the engineers 695; the artillery 8867; a corps of pontoniers, numbering 213; and 2 companies of gendarmerie. The navy comprises 82 sail; of which 5 are of the line; 16 frigates, some of them screw-steamers; 16 smaller war steamers; 58 gun-boats; the remainder are smaller craft. The whole carried 1934 guns. The population of the Netherlands, exclusive of the colonies, was 3,487,617.

In Portugal the military force comprised 15,984 infantry; 2,410 cavalry, with 1,362 horses; 1,524 artillery, with 199 horses, and 240 pieces of cannon; and 290 engineers; these, with the staff, sanitary corps, &c,, make a total of 20,520 men in active service; and there are also municipal guards, veterans in retreat, and others, with a reserve of 4,996, making a total of 31,845 men. These were independent of 17,353 men, forming the armed force of its foreign possessions. The navy consisted of 39 vessels, of which 5 were disarmed, and 2 being built; the whole carried 362 guns, and were manned by 2181 men. One vessel carried 80 guns, there was one frigate of 50 guns, 6 steam-vessels carried each 26 guns; the rest were small. The continental population of Portugal in 1854 was 3,499,121.

Prussia had an army on the peace establishment amounting to 161,000 men. It comprised 98 regiments or battalions of infantry of the line, 80 regiments of cavalry, 9 regiments of artillery, with 864 pieces of cannon; a corps of pioneers, &c. The navy consisted of 55 vessels, carrying 265 guns, and 3,500 men. There were 2 sailing frigates carrying 86 guns, 2 steam-frigates carrying 21 guns, 36 gun-boats with two guns each; the rest small vessels, some of which were steamers. The population in 1855 was 17,202,831, in which year the military force was 211,731.

The military force of Russia comprises 96 regiments of infantry; 40 regiments of cavalry, with 12 in reserve; and 33 brigades of artillery, with 2,988 pieces of cannon, and 12 regiments of engineers. The total of the active force consists of 655,000 men, with 141,691 horses, and 1,584 pieces of cannon; the local corps amount to 294,741 men, with 33,325 horses, and 422 pieces of cannon; and a reserve estimated at 70,000 men, with 10,000 horses. The irregular army, consisting chiefly of Cossaks, and forming a principal part of the light cavalry, numbered 127,200 men. The navy was divided into four divisions: the Baltic fleet, the White Sea fleet, the Black Sea fleet, and the fleet of the Pacific Ocean. The first consisted of 6 sail of the line, 3 frigates, and 2 corvettes, mounting in the whole 740 guns, with 3 steam-frigates, of which the number of guns is not stated; the second division consisted of 6 sail of the line, mounting 496 guns, and 8 frigates, of which the armament is not given; the third division consisted of 9 sail, but of these the force is not given; and the fourth division consisted of 8 sail of the line, mounting 660 guns, 5 frigates, and 2 steam-vessels. There were also a considerable number of gun-boats, both rowing-boats and steam-boats. The total population of the empire of Russia in 1851 was 65,237,437.

In Sardinia the infantry formed 20 regiments, numbering 26,410 men; 10 battalions of riflemen (Bersaglieri), with 3627 men; 9 regiments of cavalry, with 5175 men, and 4352 horses; 3 regiments of artillery, with 4300 men, and 1279 horses; 2 corps of engineers, with 1505 men and 252 horses; and 3901 men of the gendarmerie. There are other military bodies, such as guards of the palace, invalids, &c., bringing up the total to 48,273 men. The marine force consisted of 4 sailing and 4 steam frigates, 4 corvettes, 3 brigantines, 1 brig, 10 steam-boats, &c., in all 40 vessels of war, with 900 guns. The population, including the continental possessions, with Sardinia and Caprea, was, in 1848, 4,916,084.

Saxony had 15,748 men of infantry of the line; 4005 of light infantry; 3208 cavalry, and 2420 in the artillery, a total of 25,396 men, not including the reserve. The population in 1855 was 2,039,075.

Spain had 75,317 infantry troops; 12,894 cavalry, with 7998 horses; 10,585 artillerymen, with 1670 horses; 2786 engineers; 10,717 gendarmerie, with 2000 horses; and

303 provincial guards in the Canaries; a total of 112,602 men, with 11,980 horses. There is also a corps of carabineers consisting of 75 companies, of which 11 are cavalry, which form the frontier guard. There are likewise a considerable number of forces in Cuba, and other foreign possessions. The navy consists of 51 sailing ships, and 42 steam-vessels; there were 3 ships of the line, 10 frigates, ranging from 42 guns to 2 guns; 5 corvettes, 11 brigantines, &c., the whole mounting 1100 guns. There are also a large number of gun-boats, &c. The total number of men on board the whole was 15,177. The population of Spain in 1856-7 was nearly 17,000,000.

In Sweden the military force is somewhat peculiar. A part consists of enrolled troops enlisted for six years; another part (called Indelta) are cantoned in different places, and are paid by the owners of estates, and partly by the crown; having also a house and some ground furnished to each man; during war they are paid wholly by the crown, and in peace they are assembled once a year for four weeks to be exercised and reviewed; a third part consists of the militia of Gothland, who are only available for home service; and the fourth part consists of the troops raised by conscription, to which every Swede between 20 and 25 years of age is liable. The total force thus composed amounts to 144,013 men. The enrolled troops form 3 regiments of infantry, 2 of cavalry, and 3 of artillery, and number altogether 7692 men, exclusive of officers; the cantoned troops number 33,405 men; the Gothland militia numbers 7621 men; and the troops raised by conscription number 95,295 men. Norway had a military force of 11,924 infantry, 1070 cavalry, 1330 artillery, with 9160 of the landwehr. The navy possessed 897 vessels of various sizes; it had 10 vessels of the line, 6 frigates, 3 corvettes; but its greatest strength consisted of a swarm of gun-boats and vessels of a similar character, there being 594 row-boats, besides 77 shallops, and 122 yawls carrying guns. The navy of Norway consisted of 142 vessels, mounting 450 cannon; of these 3 were frigates, 4 corvettes, 125 gun-boats, &c. The maritime conscription amounted to 46,000 men. The united population of Sweden and Norway in 1855 was 5,076,088.

Of Switzerland the army consisted of 108,000 men, of whom 76,000 formed the regular army, and 32,000 the reserve. The regular army comprised 74 battalions of infantry, 45 companies of riflemen, 29 companies of cavalry, 40 companies of artillery, and 9 companies of engineers. The population of Switzerland in 1850 was 1,417,754.

Turkey had an army comprising 100,800 infantry, 17,280 cavalry, 7800 artillery, with 5200 additional in fortresses, 1600 engineers, 16,000 detached troops in Candia, Tripoli, and Tunis, and 30,000 gendarmerie; a total of 178,680 men, with a reserve of 125,880 men. The navy in 1853 comprised 70 vessels, manned with 34,000 seamen, and 4000 marines. The population of Turkey in 1844 (the latest taken) was 36,600,000.

Würtemberg had on the peace establishment, 6149 infantry troops, 1972 cavalry, and 1562 artillery, [engineers, &c., making a total of 9683 men; on a war establishment these can be raised to 22,016. The population of Wurtemberg in 1855 was 1,669,729.

The United States of America possessed an army composed of 1 corps of engineers, 5 regiments of cavalry, 4 regiments of artillery, and 10 regiments of infantry. The whole effective force was 15,562 men; but in addition, the militia numbered 51,067 officers, and 1,885,662 men. The navy consisted of 74 vessels, mounting 2244 guns. There were 10 sail of the line ranging from 120 to 84 guns; 13 frigates ranging from 56 to 50 guns, most of the guns of large calibre, and many of the vessels propelled by steam of most excellent construction. The population of the United States in 1856 was 27,601,708.

MILITARY PUNISHMENTS. The policy which has been pursued of late years in modifying the punishments prescribed by law for offences which are cognisable in criminal courts, has been extended to those which may be inflicted by courts martial for military offences. One material alteration consists in the limiting of corporal punishments; the utmost extent to which flogging can now be carried being fifty lashes. See Annual Mutiny Acts.

MILITIA. The qualifications of the officers of this constitutional force are now regulated by the Statute 15 & 16 Vict. c. 50. There have been of late years several statutes, modifying in other details the law relating to the militia, which, it would appear, cannot serve out of the kingdom except with the consent of Parliament (18 & 19 Vict. c. 1).

MILLER, HUGH, an eminent geologist. He was born at Cromarty, in the north of Scotland, on the 12th of October, 1802. He was descended from a humble family, who had been long known in the parish of Cromarty as sailors. His father became eventually possessed of a small vessel of his own, in which he was lost, whilst Hugh Miller was yet a child. In a work entitled 'My Schools and Schoolmasters, or the Story of my Education,' he has given not only an interesting account of his own life, but that of his father, and many of the members of his family. He received his first education at the parish school, where he was early distinguished for his fondness for poetry and poetical composition. At this time he was a large reader, and placed under contribution the libraries of the parish. In this way he laid the foundation of an extended knowledge of literature, which availed him in after life. But the most important part of his education consisted in the natural history instruction he received from an uncle who had acquired a taste for the observation of natural phenomena. Whatever might have been his aspirations, he was obliged to content himself with learning the trade of a mason. This occupation however unexpectedly fostered the taste he had acquired for the study of natural history; and whilst hewing blocks of stone in the quarry, he was diligently studying the traces they exhibited of their past history. It was in this way that he prepared himself to become the historian of the Old Red-Sandstone, amongst the rocks of which he principally worked. His first literary efforts were not however directed to geology. He was early devoted to the muses, and was induced, by the refusal of a newspaper to print one of his poetical effusions, to publish a book of poetry. This work, though it failed to give him a position as a poet, drew towards him the attention of friends, which resulted in his giving up his mason's employment and becoming accountant in a bank in his native town. This appointment gave him more leisure for literature. He became a frequent contributor to newspapers, more especially the 'Inverness Courier;' but his first distinct prose publication was entitled 'Scenes and Legends of the North of Scotland.' Although the subject of this work was only of local interest, the purity of its style and the thought and feeling thrown into the subject discussed, made it a popular work, and several editions have been printed.

With naturally strong feelings, and a power of writing rapidly and impressively, it might be expected that a man in Mr. Miller's position would enter into the great discussion which terminated in a rupture of the Scotch church. His first publication on the subject was entitled 'Letter from one of the Scotch people to the Right Hon. Lord Brougham and Vaux, on the opinions expressed by his lordship in the Auchterarder case.' This letter, which was referred to by Mr. Gladstone in his 'Church Principles,' as the "elegant and masculine production of Hugh Miller," drew at once upon the author the attention of the Free Church party. They had long felt the need of an organ, and the man had at length appeared who was capable of undertaking its conduct. The 'Witness' newspaper was started, and Mr. Miller was invited to accept its editorship. This paper was published twice a week, and conducted with great ability by Mr. Miller to the day of his death. Although never failing in the polemical and political departments, he found time to arrange his geological experience, which he first published in a series of papers in the 'Witness.' These papers excited the surprise and admiration of the geologists who assembled at the first meeting of the British Association in Glasgow in 1840. Sir Charles Lyell, Sir Roderick Murchison, and Dr. Buckland, were amongst the first to express their astonishment at the amount of new matter which was thus for the first time brought before them. Professor Agassiz, who was also present at this meeting, named one of the fishes which had been described by Mr. Miller *Ptericthys Milleri*, after its discoverer. These papers were afterwards published in a volume, 'The Old Red Sandstone, or New Walks in an Old Field.' This work is written in a style remarkably pleasing, and treats of the great facts of geology in a peculiarly attractive manner. It has had a very large sale, and still remains one of the most popular works on geology in the English language. Its scientific merit consists in the description of a number of new fossil forms of animals belonging to a formation which had, up to the time of its publication, been regarded as almost destitute of the remains of animal life.

Hitherto Mr. Miller had never visited England. He now made a journey to London, and with pen in hand made notes of what he saw and felt. These notes he published on his return under the title of 'First Impressions of England and its People.' This work has also had a very considerable circulation. An anonymous work entitled, 'Vestiges of the Natural History of Creation,' was published in 1844, which excited much attention, and not least in the religious world. The discovery of a fish and a plant in the old red sandstone furnished Mr. Miller with arguments against the views of the author of the 'Vestiges.' These he embodied in a work entitled 'Footprints of the Creator, or the Asterolepis of Stromness.' It embraced a general view of the natural history of creation, and is regarded as an able exposition of the views of geologists on the interesting points to which it is devoted. Like the author's other works it has had a large circulation.

Mr. Miller also published other works and papers on geology. In 1848 he published 'The Geology of the Bass.' At the meeting of the British Association at Edinburgh in 1850 he read a paper on 'certain peculiarities of structure in some ancient Ganoids' (Fishes). At the meeting of the Association at Glasgow in 1855 he gave an elaborate account of the Fossil Flora of Scotland. He also lectured in Edinburgh and London on geological subjects. Mr. Miller's death was sudden and very startling. On the morning of the 24th of December, 1856, he was found dead in his room, shot through the body, and under circumstances which left no doubt that he died by his own hand. He had been latterly engaged, in addition to his editorial labours, at a work called 'The Testimony of the Rocks,' and his brain, already diseased, had become strongly excited. An old habit, that of sleep-walking, had returned upon him. He had, through fear of robbers, kept a loaded pistol in his room; and with this pistol, in a paroxysm of his disease, he put an end to his life. The work which he had thus completed on the day preceding his death, was shortly afterwards published, and had a large sale.

His death caused a most painful excitement. Few men have occupied a higher position in the estimation of his countrymen. He was a noble example of what self-education can do for a man, and whether regarded as the fearless and independent writer, or the man of literature and science, his character must claim the respect and admiration of posterity.

MILLER'S THUMB. [Cottus.]

MILLTHORPE, OR MILNTHORPE. [Westmoreland.]

MILNE, JOSHUA, an eminent actuary, was born in 1776. He received a good education, became particularly skilful in mathematics, and acquired an extensive knowledge of languages. When about forty years of age he was appointed actuary of the Sun Life Assurance Office, a situation which he held for upwards of thirty years. His 'Treatise on Annuities,' published in 1815 in 2 vols. 8vo, is one of the the universally-acknowledged authorities on the subject of life assurance, for the calculations of which he invented and described a new system of notation. Mr. Milne had also paid some attention to botany, and was said to have possessed one of the best botanical libraries in London. His uniform courtesy gained him general esteem, and his information and assistance were readily given wherever they might serve a useful purpose. He died Jan. 4, 1851, having unfortunately become mentally incapacitated for fulfilling his official duties a few years earlier.

MILTON ABBAS. [Dorsetshire.]

MILVERTON. [Somersetshire.]

MIMOSA, a genus of Plants belonging to the natural order *Leguminosæ*. It has polygamous flowers; petals 4 or 5, connected together into a 4-or-5-cleft funnel-shaped corolla; stamens inserted in the base of the corolla, or in the stipe of the ovary, equal in number to the lobes of the corolla, or double or triple that number; legumecompressed, flat, 1- or many-jointed; joints one-seeded; ribs permanent; stipules petiolar; leaves bipinnate, with one or more pairs of pinnæ, each pinna bearing two or many pairs of leaflets; flowers rose-coloured or white, disposed in heads. The leaves are frequently sensible to touch, as in the Sensitive Plant. The species are very numerous.

M. sensitiva, the Sensitive Plant, has prickly stems and petioles; leaflets ovate-acute, dotted, with adpressed pili beneath, but glabrous above. It is a native of Brazil. The flowers are rose-coloured and tetrandrous. The leaflets are sensitive to touch, but not so much so as the following species.

M. pudica has a prickly herbaceous stem, with the petioles and peduncles more or less beset with stiff hairs or bristles; leaves somewhat digitately pinnate, with 4 pinnæ, each pinna bearing many pairs of linear leaflets. It is a native of Brazil, and is commonly grown in our gardens under the name of Sensitive Plant, the leaves falling on the slightest touch. The roots of this plant and its allies emit a most offensive smell, resembling the odour of a sewer at the time of impending rain. The legumes of *M. saponaria*, according to Royle, form a considerable article of commerce in India on account of their saponaceous qualities. [Sensitive Plants.]

MIMOTAMIC ACID. [Chemistry, *S.* 2.]

MIMULUS, a genus of Plants belonging to the natural order *Scorphulariaceæ*. It has a tubular calyx, 5-angled and 5-toothed; corolla ringent, upper lip 2-lobed, lower one trifid, usually bigibbous at the base, segments all flat; stamens 4, didynamous, inclosed; cells of anthers diverging or divaricate, at length subconfluent; stigma bilamellate; capsule hardly furrowed, 2-valved, valves entire with flat margins, dissepiment at length free; placentas adnate. The species are erect or procumbent, glabrous, rarely villous herbs, with usually tetragonal stems; leaves opposite, usually toothed, rarely quite entire; flowers axillary, solitary, pedicellate, superior ones sometimes racemose.

M. luteus, Yellow-Flowered Monkey Flower, has leaves closely toothed, lower ones on long petioles, ovate or somewhat lyrate, superior ones rounded cordately, stem clasping; calyx ovate, but campanulate in the fructiferous state, with ovate-acute teeth, the upper tooth larger. It is a native of Chili. Babington says it has become naturalised in Great Britain. The corolla is yellow, with a dark mark in the mouth.

M. moschatus, Musk-Scented Monkey-Flower, has diffuse stems clothed with woolly villi; leaves petiolate, ovate, or ovate-lanceolate, a little toothed, rounded at the base, rather pilose, and somewhat clammy; calyx tubular, but oblong in the fruit-bearing state, with lanceolate unequal teeth. It is a native about the Columbia River, on the north-west coast of America. The plant exhales a strong scent of musk. The flowers are small and yellow. The plant is diffuse, rooting at the base.

MIMUS. [Mocking Bird.]

MIMUSOPS, a genus of Plants belonging to the natural order *Sapotaceæ*. It has a calyx 6- to 8-parted; segments disposed in a twin order; corolla with a double row of segments, the outer row containing from 6 to 16 in number, which are either entire or divided, the inner row containing 6 or 8 entire segments; antheriferous stamens 6 or 8, opposite the inner segments of the corolla, alternating with as many sterile ones; ovarium 6-8-celled; berry 1- or few-seeded from abortion. The species are trees with alternate quite-entire glabrous coriaceous leaves, and axillary fascicles of 1-flowered pedicels. The flowers are small and white; the fruit edible.

M. Elengi has oval-lanceolate or oblong leaves, acuminated, glabrous; pedicels many together, shorter than the petioles, which are glabrous. It is a native of the East Indies, where it is much planted on account of its fragrant flowers, which come out chiefly in the hot season. A fragrant water is distilled from the flowers. The seeds yield an abundance of oil in request for painters. The leaves are said to produce an extraordinary noise when burnt.

M. Kaki has obovate leaves, very blunt, silvery or hoary beneath, hardly three times as long as the petioles, crowded at the ends of the branches; flowers fascicled, hexandrous. It is a native of the East Indies and Australia within the tropic. The tree yields a gum, and the fruit has a sweetish taste, and is much eaten by the natives of India.

MINCHINHAMPTON. [Gloucestershire.]

MINEHEAD. [Somersetshire.]

MINERALOGY, according to the definition given by Kirwan, is the art of distinguishing mineral substances from each other. It may be regarded both as a science and an art: as a science, in reference to the knowledge requisite for supplying accurate descriptions of minerals, and forming what may be termed a natural classification; and an art, in reference to the arrangement of the descriptive characters for the purpose of afterwards distinguishing minerals from each other.

Mineralogy then must be considered as including the chemical composition of bodies, and an account of their external or physical properties. Both are requisite, for substances occur which agree in their chemical composition, and exhibit differences in their external characters; while there are other bodies which differ in their chemical constitution, but agree in their external properties.

Various methods of arrangement of minerals have been proposed by different authors. According to Werner, minerals were divided into the four classes of earthy minerals, saline minerals, inflammables, and metals; Karsten classed them under the heads of earths, salts, combustibles, and metals; Haüy divided minerals into acidiferous earthy substances, earthy substances, non-metallic combustible bodies, metallic bodies, substances not sufficiently known to admit of classification, rocks, and volcanic products. In Phillips's 'Elements of Mineralogy,' the classes are earthy minerals, alkaline-earthy minerals, acids, acidiferous earthy minerals, acidiferous alkaline minerals, native metals, metalliferous minerals, and combustible minerals. Berzelius attempted a strictly chemical classification of minerals: he has, however, candidly admitted that considerable difficulties attend this method, owing, in part, at least, to the uncertainty which exists as to what are the essential and what the accidental constituents of a mineral.

The following is the arrangement of Dufrenoy, as given in Professor Ansted's 'Elementary Course of Geology,' &c:—

Class I.—Simple bodies, or Binary Compounds never bases, generally essential ingredients in combinations, and serving as proximate elements.

Group 1. Hydrogen.
2. Carbon.
3. Silicon.
4. Sulphur.
5. Selenium.

Class II.—Alkaline Salts.

Group 1. Salts of Ammonia.
2. Salts of Potash.
3. Salts of Soda.

Class III.—Alkaline Earths, and Earths.

Group 1. Salts of Barytes.
2. Salts of Strontia.
3. Salts of Lime.
4. Salts of Magnesia.
5. Salts of Yttria.
6. Salts of Alumina.

Class IV.—Silicates.

Group 1. Anhydrous Aluminous Silicates.
2. Hydrous Aluminous Silicates.
3. Silicates of Alumina and Lime, or their isomorphs.
4. Aluminous and Alkaline Silicates, and their isomorphs.
5. Hydrous Aluminous Silicates with Alkaline and Lime bases, and their isomorphs.
6. Non-aluminous Silicates.
  a. With Lime as a base.
  b. With Zircon as a base.
  c. With several bases.
7. Silico-Aluminates.
8. Silico-Fluates.
9. Silico-Borates.
10. Silico-Titanates.
11. Silico-Sulphurets.
12. Aluminates.

Class V.—Metals.

Group 1. Cerium.
2. Manganese.
3. Iron.
4. Chromium.
5. Cobalt.
6. Nickel.
7. Zinc.
8. Tellurium.
9. Cadmium.
10. Antimony.
11. Arsenic.
12. Mercury.
13. Titanium.
14. Tantalium.
15. Niobium.
16. Pelopium.
17. Ilmenium.
18. Lead.
19. Tin.
20. Bismuth.
21. Iranium.
22. Tungsten.
23. Molybdeum.
24. Vanadium.
25. Copper.
26. Silica.
27. Gold.
28. Platinum.
29. Iridium.
30. Osmium.
31. Rhodium.
32. Palladium.

Dana, in his useful 'Manual of Mineralogy,' adopts the following classification:—

Class I.—Gases; consisting of or containing Nitrogen or Hydrogen.

Class II.—Water.

Class III.—Carbon, and Compounds of Carbon.

Class IV.—Sulphur.

Class V.—Haloid Minerals: Compounds of the Alkalies and Earths with the Soluble Acids, or of their Metals with Chlorine or Fluorine.

1. Salts of Ammonia.
2. Salts of Potash.
3. Salts of Soda.
4. Salts of Barytes.
5. Salts of Strontia.
6. Salts of Lime.
7. Salts of Magnesia.
8. Salts of Alumina.

Class VI.—Earthy Minerals: Silica and Siliceous or Aluminous Compounds of the Alkalies and Earths.

1. Silica.
2. Lime.
3. Magnesia.
4. Alumina.
5. Glucina.
6. Zirconia.
7. Thoria.

Class VII.—Metals and Metallic Ores.

1. Metals easily oxidisable: Iron, Lead, Copper, Mercury, &c.
2. Noble Metals: Gold, Silver, Platinum.

We have already observed that Mineralogy includes a knowledge of the chemical composition and of the external and physical properties of minerals, and they are all divisible into two great classes of crystallised and uncrystallised. With respect to regularly crystallised minerals, we refer for an account of their forms to what is stated under CRYSTALLOGRAPHY. There are some substances which do not assume regular forms, but have an imperfect crystalline structure; while those bodies which are not either crystallised or crystalline, unless they are pulverulent, are described as massive, and these are subdivided into such as possess particular forms, as botryoidal, mammellated, nodular, stalactitic, reniform, globular, and amorphous, or without any particular form.

The structure of minerals is an important feature. It may be Columnar, Lamellar, or Granular. The following are explanations of the terms used in describing the different kinds of columnar structure:—

Fibrous: when the columns are minute and lie in the same direction, as gypsum and asbestus. Fibrous minerals very commonly have a silky lustre; a fibrous variety of gypsum, and one of calc-spar have this lustre very strongly, and each is often called satin-spar.

Reticulated: when the fibres, or columns, cross in various directions, and produce an appearance having some resemblance to a net.

Stellated: when they radiate from a centre in all directions, and produce a star-like appearance. Stilbite and gypsum are examples.

Radiated divergent: when the crystals radiate from a centre without producing stellar forms. Examples, quartz, gray antimony.

In the Lamellar Structure the laminæ or leaves may be thick, or very thin; they sometimes separate easily, and sometimes with great difficulty. When the laminæ are thin and separate easily, the structure is said to be Foliaceous. Mica is a striking example, and the term Micaceous is often used to describe this structure. When the laminæ are thick, the term Tabular is often applied; quartz and heavy spar afford examples. The laminæ may be elastic, as in mica, flexible, as in talc, or graphite, or brittle, as in diallage. Small laminæ are sometimes arranged in stellar shapes; this occurs in mica.

When the grains in the texture of a mineral are coarse, it is said to be Coarsely Granular, as in granular marble; when fine, Finely Granular, as in granular quartz; and if no grains can be detected with the eye, the structure is described as Impalpable, as in chalcedony. Granular minerals, when easily crumbled by the finger, are said to be Friable.

Massive minerals also take certain imitative shapes, not peculiar to either of these varieties of structure. The following terms are used in describing imitative forms:

Globular: when the shape is spherical or nearly so: the structure may be Columnar and Radiating, or it may be Concentric, consisting of coats like an onion. When they are attached, they are called Implanted Globules.

Reniform: kidney-shaped. In structure, they are like globular shapes.

Botryoidal: when a surface consists of a group of rounded prominences. The prominences or globules usually consist of fibres radiating from the centre.

Mammillary: resembling the botryoidal, but consisting of larger prominences.

Filiform: like a thread.

Acicular: slender like a needle.

Stalactitic: having the form of a cylinder or cone hanging from the roofs of cavities or caves. The term stalactite is usually restricted to the cylinders of carbonate of lime hanging from the roofs of caverns; but other minerals are said to have a stalactitic form when resembling these in their general shape and origin. Chalcedony and brown iron-ore are often stalactitic.

Reticulated: net-like.

Drusy: a surface is said to be drusy when covered with minute crystals.

Amorphous—shapeless: having no regular structure or form, either crystalline or imitative.

Crystals are also called Pseudomorphous. A pseudomorphous crystal is one that has a form which is foreign to the species to which the substance belongs.

Crystals sometimes undergo a change of composition from aqueous or some other agency, without losing their form; for example, octahedrons of spinel change to steatite, still retaining the octahedral form. Cubes of pyrites are changed to red or brown iron-ore.

Again, crystals are sometimes removed entirely, and at the same time and with equal progress, another mineral is substituted; for example, when cubes of fluor-spar are transformed to quartz. The petrifaction of wood is of the same kind.

Again, cavities left empty by a decomposed crystal are refilled by another species by infiltration, and the new mineral takes on the external form of the original mineral, as a fused metal the form of the mould into which it is cast.

Again, crystals are sometimes incrusted over by other minerals, as cubes of fluor by quartz; and when the fluor is afterwards dissolved away, as sometimes happens, hollow cubes of quartz are left.

The first kind of Pseudomorphs are Pseudomorphs by Alteration; the second, Pseudomorphs by Replacement; the third, Pseudomorphs by Infiltration; the fourth, Pseudomorphs by Incrustation.

Pseudomorphous crystals are distinguished by having a different structure and cleavage from that of the mineral imitated in form, and a different hardness, and usually little lustre.

A large number of minerals have been met with as pseudomorphs. The causes of such changes have operated very widely and produced important geological results.

The characters of minerals depending on light are also arranged. They are of five kinds, and arise from the power of minerals to reflect, transmit, or emit light. They are as follows:—1, Lustre; 2, Colour; 3, Diaphaneity; 4, Refraction; 5, Phosphorescence.

The lustre of minerals depends on the nature of their surfaces, which causes more or less light to be reflected. There are different degrees of intensity of lustre, and also different kinds of lustre.

The kinds of lustre are six, and are named from some familiar object or class of objects:—

Metallic: the usual lustre of metals. Imperfect metallic lustre is expressed by the term Sub-Metallic.

Vitreous: the lustre of broken glass. An imperfect vitreous lustre is termed Sub-Vitreous. Both the vitreous and sub-vitreous lustres are common. Quartz possesses the former in an eminent degree; calcareous spar often the latter. This lustre may be exhibited by minerals of any colour.

Resinous: lustre of the yellow resins. Opal and zinc-blende are examples.

Pearly: like pearl. Talc, native magnesia, stilbite, &c., are examples. When united with sub-metallic lustre, the term Metallic-Pearly is applied.

Silky: like silk; it is the result of a fibrous structure. Fibrous carbonate of lime, fibrous gypsum, and many fibrous minerals, more especially those which in other forms have a pearly lustre, are examples.

Adamantine: the lustre of the diamond. When sub-metallic, it is termed Metallic-Adamantine. Varieties of white lead-ore are examples.

The degrees of intensity are denominated as follows:—

Splendent: when the surface reflects light with great brilliancy, and gives well defined images. Elba iron-ore, tin-ore, some specimens of quartz and pyrites are examples.

Shining: when an image is produced, but not a well-defined image. Calcareous spar and celestine are examples.

Glistening: when there is a general reflection from the surface, but no image. Talc and copper-pyrites are examples.

Glimmering: when the reflection is very imperfect, and apparently from points scattered over the surface. Flint and chalcedony are examples.

A mineral is said to be Dull when there is a total absence of lustre, as chalk.

In distinguishing minerals, both the external colour and the colour of a surface that has been rubbed or scratched, are observed. The latter is called the Streak, and the powder abraded, the Streak-Powder.

The colours are either metallic or non-metallic.

The Metallic are named after some familiar metal, as copper-red, bronze-yellow, brass-yellow, gold-yellow, steel-gray, lead-gray, iron-gray.

The Non-Metallic colours used in characterising minerals, are various shades of white, gray, black, blue, green, yellow, red, and brown.

There are thus snow-white, reddish-white, greenish-white, milk-white, yellowish-white; bluish-gray, smoke-gray, greenish-gray, pearl-gray, ash-gray; velvet-black, greenish-black, bluish-black; azure-blue, violet-blue, sky-blue, indigo-blue; emerald-green, olive-green, oil-green, grass-green, apple-green, blackish-green, pistachio-green (yellowish); sulphur-yellow, straw-yellow, wax-yellow, ochre-yellow, honey-yellow, orange-yellow; scarlet-red, blood-red, flesh-red, brick-red, hyacinth-red, rose-red, cherry-red; hair-brown, reddish-brown, chestnut-brown, yellowish-brown, pinchbeck-brown, wood-brown.

The expression a Play of Colours is used when several prismatic colours appear in rapid succession on turning the mineral. The diamond is a striking example; also precious opal.

Change of Colours: when the colours change slowly on turning in different positions, as in labradorite.

Opalescence: when there is a milky or pearly reflection from the interior of a specimen, as in some opals, and in cat's eye.

Iridescence: when prismatic colours are seen within a crystal; it is the effect of fracture, and is common in quartz.

Tarnish: when the surface-colours differ from the interior; it is the result of exposure. The tarnish is described as Irised, when it has the hues of the rainbow.

Polychroism: the property, belonging to some prismatic crystals, of presenting a different colour in different directions. The term Dichroism has been generally used, and implies different colours in two directions, as in the mineral iolite, which has been named dichroite because of the different colours presented by the bases and sides of the prism. Mica is another example of the same. The more general term has been introduced, because a different shade of colour has been observed in more than two different directions.

These different colours are observed only in crystals with unequal axes. The colours are the same in the direction of equal axes, and often unlike in the direction of unequal axes. This is the general principle at the basis of polychroism.

Diaphaneity: the property which many objects possess of transmitting light; or in other words, of permitting more or less light to pass through them. This property is often called transparency, but it is properly one of the degrees of diaphaneity. The following terms are used to express the different degrees of this property:—

Transparent: a mineral is said to be transparent when the outlines of objects, viewed through it, are distinct. Glass and crystals of quartz are examples.

Sub-Transparent, or Semi-Transparent: when objects are seen, but their outlines are indistinct.

Translucent: when light is transmitted, but objects are not seen. Loaf-sugar is a good example; also Carrara marble.

Sub-Translucent: when merely the edges transmit light faintly. When no light is transmitted, the mineral is described as opaque.

Those minerals whose faces emit light exhibit two sets of phenomena, Refraction and Polarisation.

The index of refraction has been obtained for many minerals, of which the following are a few:—

Air . . .	1·000	Calc-Spar . .	1·654
Tabasheer . .	1·211	Spinel . . .	1·764
Ice . . .	1·308	Sapphire . .	1·794
Cryolite . . .	1·349	Garnet . . .	1·815
Water . .	1·335	Zircon . .	1·961
Fluor-Spar . .	1·434	Blende . . .	2·260
Rock-Salt . .	1·557	Diamond . .	2·439
Quartz . . .	1·548	Chromate of Lead	2·974

Many crystals possess the property of refracting light in two directions instead of one, and objects seen through them consequently appear double. This is called Double Refraction. It is most conveniently exhibited with a crystal of calc-spar, and was first noticed in a pellucid variety of this mineral from Iceland, called from the locality Iceland-Spar. On drawing a line on paper and placing the crystal over it, two lines are seen instead of one—one by ordinary refraction, the other by an extraordinary refraction. If the crystal, as it lies over the line, be turned around, when it is in one position the two lines will come together. Instead of a line make a dot on the paper, and place the crystal over the dot: the two dots seen will not come together on revolving the crystal, but will seem to revolve one around the other. The dot will in fact appear double through the crystal in every direction except that of the vertical axis, and this direction is called the Axis of Double Refraction. To view it in this direction the ends must be ground and polished. The divergence increases on passing from a view in the direction of the axis to one at right angles with it, where it is greatest. In some substances the refraction of the extraordinary ray is greater in the latter direction than that of the ordinary ray, and in others it is less. In calc-spar it is less, it diminishing from 1·654 to 1·483. In quartz it is greater, it increasing from 1·5484 to 1·5582. The former is said to have a Negative Axis, the latter a Positive.

This property of double refraction belongs to such of the fundamental forms as have unequal axes; that is, to all except those of the monometric system. Those forms in which the lateral axes are equal (the dimetric and hexagonal systems) have one axis of double refraction; and those in which they are unequal (the trimetric, monoclinate and triclinate systems), have two axes of double refraction.

Both rays in the latter are rays of extraordinary refraction. In nitre the two axes are inclined about 5° to each other; in arragonite 18° 18′; in topaz 65°. The positions of the axes thus vary widely in different minerals.

The extraordinary ray exhibits a peculiar property of light, termed Polarisation. Viewed by means of another doubly-refracting crystal, or crystalline plate (called from this use of it an analysing plate), the ray of light becomes alternately visible and invisible as the latter plate is revolved. If the polarised light be made to pass through a crystal possessed of double refraction, and then be viewed in the manner stated, rings of prismatic colours are developed, and on revolving the analysing plate the coloured rings and intervening dark ring successively change places.

Several minerals give out light either by friction or when gently heated. This property of emitting light is called Phosphorescence.

Two pieces of white sugar struck against one another give a feeble light, which may be seen in a dark place. The same effect is obtained on striking together fragments of quartz, and even the passing of a feather rapidly over some specimens of zinc-blende is sufficient to elicit light.

Fluor-spar is the most convenient mineral for showing Phosphorescence by Heat. On powdering it, and throwing it on a shovel heated nearly to redness, the whole takes on a bright glow. In some varieties the light is emerald-green; in others purple, rose, or orange. A massive fluor from Huntington, Connecticut, shows beautifully the emerald-green phosphorescence.

Some kinds of white marble, treated in the same way, give out a bright yellow light.

After being heated for a while the mineral loses its phosphorescence; but a few electric shocks will in many cases to some degree restore it again.

Many minerals become electrified on being rubbed, so that they will attract cotton and other light substances: and when electrified some exhibit positive and others negative electricity when brought near a delicately suspended magnetic needle. The diamond, whether polished or not, always exhibits positive electricity, while other gems become negatively electric in the rough state, and positive only in the polished state. Friction with a feather is sufficient to excite electricity in some varieties of blende. Some minerals thus electrified retain the power of electric attraction for many hours, as topaz, while others lose it in a few minutes.

Many minerals become electric when heated, and such species are said to be Pyro-Electric.

If a prism of tourmaline, after being heated, be placed on a delicate frame, which turns on a pivot like a magnetic needle, on bringing a magnet near it, one extremity will be attracted, the other repelled, thus indicating the polarity alluded to. Several other minerals exhibit electrical phenomena, especially boracite and topaz, which, like tourmaline, are hemihedral in their modifications.

Magnetism is exhibited more especially in the ores of iron. The loadstone, as the magnetic oxide of iron is called, is common where the ores of iron are found. When mounted like a horse-shoe magnet, a good loadstone will lift a weight of many pounds. This is the only mineral that has decided magnetic attraction; but several ores containing iron are attracted by the magnet, or, when brought near a magnetic needle, will cause it to vibrate; and moreover, the metals nickel, cobalt, manganese, palladium, platinum, and osmium, have been found to be slightly magnetic.

Minerals vary in their specific gravity. This must be ascertained as for any other substance. [SPECIFIC GRAVITY.]

The Hardness of minerals differs much, and is the point first attended to by the mineralogist. In order to ascertain the hardness of a mineral it is only necessary to draw a file across the specimen, or to make trials of scratching one with another. As standards of comparison, the following minerals have been selected, increasing gradually in hardness from talc, which is very soft and easily cut with a knife, to the diamond which nothing will cut; this table is called the Scale of Hardness:

1. Talc, common foliated variety.
2. Rock-Salt.
3. Calc-Spar, transparent variety.
4. Fluor-Spar, crystallised variety.
5. Apatite, transparent crystal.
6. Felspar, cleavable variety.
7. Quartz, transparent variety.
8. Topaz, transparent crystal.
9. Sapphire, cleavable variety.
10. Diamond.

If on drawing a file across a mineral it is impressed as easily as fluor-spar, the hardness is said to be 4; if as easily as felspar, the hardness is said to be 6; if more easily than felspar, but with more difficulty than apatite, its hardness is described as 5½ or 5·5.

The file should be run across the mineral three or four times, and care should be taken to make the trial on angles equally blunt, and on parts of the specimen not altered by exposure. Trials should also be made by scratching the specimen under examination with the minerals in the above scale, as sometimes, owing to a loose aggregation of particles, the file wears down the specimen rapidly, although the particles are very hard.

Minerals differ in their state of aggregation. Solid minerals may be—

Brittle: when parts of the mineral separate in powder on attempting to cut it.

Sectile: when thin pieces may be cut off with a knife, but the mineral pulverises under a hammer.

Malleable: when slices may be cut off, and these slices will flatten out under the hammer, as native gold and silver.

Flexible: when the mineral will bend, and remain bent after the bending force is removed, as talc.

Elastic: when after being bent it will spring back to its original position, as mica.

A liquid is said to be Viscous when on pouring it the drops lengthen and appear ropy, as petroleum.

When a mineral is broken its cut surface presents different aspects. The following are the several kinds of fracture in minerals:—

Conchoidal: when the mineral breaks with a curved or concave and convex surface of fracture. Flint is a good example.

Even: when the surface of fracture is nearly or quite flat.

Uneven: when the surface of fracture is rough with numerous small elevations and depressions.

Hackly: when the elevations are sharp or jagged, as in broken iron.

Soluble minerals may have taste: the kinds are—

Astringent: the taste of vitriol.

Sweetish-astringent: the taste of alum.

Saline: taste of common salt.

Alkaline: taste of soda.

Cooling: taste of saltpetre.

Bitter: taste of Epsom salts.

Sour: taste of sulphuric acid.

Excepting a few gases and soluble minerals, minerals in the dry unchanged state do not give off odour. By friction, moistening with the breath, the action of acids, and the blow-pipe, odours are sometimes obtained, which are thus designated:—

Alliaceous: the odour of garlic. It is the odour of burning arsenic, and is obtained by friction and more distinctly by means of the blow-pipe from several arsenical ores.

Horse-Radish odour: the odour of decaying horse-radish. It is the odour of burning selenium, and is strongly perceived when ores of this metal are heated before the blow-pipe.

Sulphureous: odour of burning sulphur. Friction will elicit this odour from pyrites, and heat from many sulphurets.

Fetid: the odour of rotten eggs or sulphuretted hydrogen. It is elicited by friction from some varieties of quartz and limestone.

Argillaceous, the odour of moistened clay. It is given off by serpentine and some allied minerals when breathed upon. Others, as pyrargillite, afford it when heated.

Without submitting the mineral to a regular analysis, advantage is often taken of the effects of heat by means of the blow-pipe, with or without the aid of certain fluxes, as soda, phosphoric salt, &c.; and the mineral is stated to be either fusible alone, or with the assistance of the different fluxes, and the nature of the resulting compound is described; sometimes it is a colourless glass, at other times coloured, transparent, or opaque, &c. [BLOW-PIPE.]

(Dana, *Manual of Mineralogy:* Dana, *A System of Mineralogy;* Ansted, *Elementary Course of Geology, Mineralogy, &c.;* Phillips, *Introduction to Mineralogy;* Phillips, *Elements of Mineralogy;* Jackson, *Minerals and their Uses;* Sowerby, *Popular Mineralogy.*)

MINNESOTA, a Territory of the United States of North America, lies between 43° 30′ and 49° 22′ N. lat., 90° 0′ and 102° 30′ W. long. It is bounded E. by the State of Wisconsin, N.E. by Lake Superior, N. by British North America, W. by the Territory of Nebraska, and S. by the State of Iowa. The area is 141,839 square miles. The population in 1856 was estimated at 160,000.

The surface of this Territory has generally the character of an immense high 'rolling prairie land,' but there are considerable exceptions. Towards the eastern side it runs into a ridge of lofty hills, which traverses a large portion of it in a north-east and south-west direction. From a short distance above the Falls of St. Anthony, on the Mississippi, there extends southward a vast forest region for 120 miles, with a breadth ranging from 15 to 40 miles. The northern and north-eastern portion of the Territory is sometimes termed the 'region of lakes,' from the great number of lakes of various sizes which here lie along the upper course of the Mississippi and its tributaries; and for some distance below this region the Mississippi traverses a swampy country.

The Territory is in every part abundantly watered. The Mississippi rises within its boundaries, in Lake Itasca; and belongs wholly to it down to the confluence of the St. Croix, after which, to the southern boundary of the territory, it belongs equally to Minnesota and Wisconsin. This part of its course is described under MISSISSIPPI RIVER. The principal tributaries which join it in this territory are the St. Croix, which separates Minnesota from Wisconsin, and the Minnesota, a large and broad stream, which rises near the centre of the Territory, flows through Big Stone Lake, and after a course including its windings of some 500 miles, first south-east, then south, and finally north-east, falls into the Mississippi at Fort Snelling. The Mississippi is navigable in Minnesota by steam-boats during seven months of the year; the other five months it is, with its tributaries, closed by ice. The Missouri, with its tributary, the White Earth River, forms the western boundary of Minnesota: it is navigable by steam-boats throughout Minnesota. It is joined by several small feeders, but by none of any consequence in this Territory. The Red River, which flows northward to Winnipeg Lake in British America, has its source in, and belongs for a very considerable distance to Minnesota, and has numerous tributaries in this part of its course. The Big Sioux and several other rivers have also their upper courses in this Territory. The Mississippi, Missouri, Minnesota, and St. Croix rivers, with Lake Superior, afford great commercial facilities: while the numerous smaller streams and lakes afford like facilities for agricultural and manufacturing operations. The principal lakes are the Itasca, Cass, Red, Leech, Devil, Ottertail, Big Stone, and Pepin lakes, which range from about 5 to 20 miles long.

As regards its geological character, the larger half of the country, including the centre and north-eastern portions, appears to belong to the igneous and metamorphic formations. In the northern and south-eastern districts are extensive tracts of Lower Silurian rocks. Extending from the centre eastward to Lake Superior is a narrow band of New Red-Sandstone, with dykes of copper trap. The Missouri through its whole course in Minnesota appears to flow through cretaceous rocks, which are bordered on the east by tertiary formations. Copper- and lead-ores are said to have been found.

The climate, though severe, is not subject to rapid or extreme variations. The winters are long, but owing to the stillness of the air during winter, the coldest weather is endurable. A great quantity of snow falls in the winter, but generally there is not much moisture. The soil over a country so vast in extent, and having such different lithological features, is of course greatly varied; but in the settled parts it is found to be remarkably fertile, and the mould is of unusual depth. Most of the cereals appear to flourish: maize, oats, and wheat are the crops most cultivated, but rye, barley, and buckwheat are also grown. Potatoes, peas, and beans are raised to some extent. The broad prairies appear well adapted for raising stock. There are at present no manufactures in the Territory. The chief occupation is the cutting and preparing of pine lumber, much of which is retained for home consumption, but the larger portion is sent to St. Louis.

At the census of 1850 Minnesota was divided into nine counties. The political capital is St. Paul, the only place which can as yet fairly take rank as a town; but Pembina, on the right bank of the Red River, at the northern boundary of the territory—Fort Snelling, at the confluence of the Minnesota with the Mississippi—and Stillwater, on the west side of St. Croix Lake, are places of growing local importance.

St. Paul, the capital, occupies a commanding position on the left bank of the Mississippi, 15 miles below the Falls of St. Anthony, in 44° 52′ N. lat., 93° 4′ W. long. The first trading house was built here in 1842, it having previously been merely the station of a Roman Catholic mission. It now contains a state-house 139 feet long, a court-house, jail, nine churches, schools, numerous hotels, stores, an iron-foundry, agricultural implement factories, flour-mills, &c. The streets are traversed by coaches and omnibuses; and, whilst the river is free from ice, steam-vessels arrive and sail daily, although the vicinity of the town is still a wilderness. In 1850 St. Paul had 1135 inhabitants; in the spring of 1853 it is said to have had above 2500.

Minnesota has a legislature, consisting of a Council and House of Representatives. By the constitution, as framed by the territorial legislature, citizenship is not limited to whites, but extended to "all persons of a mixture of white and Indian blood who shall have adopted the habits and customs of civilized men." Minnesota was erected into a Territory by Act of Congress in March 1849; that portion of it west of the Mississipi having previously formed a part of the Territory of Iowa, and that part east of the Mississipi having belonged to the Territory of Wisconsin.

On the 26th of February, 1857, an Act was passed by Congress, authorising Minnesota to form a State government. This Act makes an alteration in the area of Minnesota, and consequently in the population. The Convention for forming the State assembled in November, 1857; but the particulars have not yet (April 1, 1858), reached us.

(*Statistical Gazetteer of the United States; Seventh Census of the United States; American Almanac,* 1854; Owen, *Report of a Geological Survey of Wisconsin, Iowa, and Minnesota;* Marcou, &c.)

MIRAMICHI. [New Brunswick.]

MIRBEL, BRISSEAU- C.F., a French naturalist, more especially distinguished for his knowledge of botany. He was born on the 27th of March 1776. He was appointed professor of botany in Paris in 1801, and one of his earliest published works was the lecture introductory to his course. The subject was the influence of the study of natural history on the civilisation of man. He was associated with others in the production of the volumes on the general and special history of plants, in the series of works in continuation of the natural history of Buffon. In this work, which extended to eighteen volumes, the first, second, fourth, fifth, and sixth, were written by Mirbel. In 1802 he published his treatise 'On Vegetable Physiology.' He was also associated with Lamarck in the publication of a great work on the 'Natural History of Plants,' which was published in 1803. He subsequently, in answer to views put forth by Link, wrote an 'Exposition of the Theory of Vegetable Organization,' and also a defence of this work in 1808. In 1815 he published his 'Elements of Vegetable Physiology and Botany.' This work was published in three volumes, and was an admirable exposition of the state of vegetable physiology at the time it was published, and contained the result of numerous observations on the structure, functions, and development of plants. In 1835 he published a paper on the nature and origin of the bark on dicotyledonous trees, in which he gave an admirable account of the structure of the bark in exogenous plants. After this he published his celebrated paper on the 'Anatomy and Physiology of Marchantia Polymorpha,' in which he not only described the general structure of the plant, but the history of the development of its embryo. In his general theoretical views and numerous exact observations, Mirbel exercised a great influence on the progress of the science of botany during the first half of the 19th century. He died September 12, 1854.

MITCHELL, SIR THOMAS LIVINGSTONE, Knight, was born in 1792, at the residence of his father, John Mitchell, Esq., of Craigend, in Stirlingshire, Scotland. The name of Livingstone was assumed by the family on a marriage with the heiress of J. Livingstone, Esq., of Halning, brother to Lord Viscount Kilsyth, who was attainted in 1716. Thomas Livingstone Mitchell entered the British army in Portugal in 1808, and served on the staff till the termination of the Peninsular War, when he had attained the rank of major. In the course of this service he had distinguished himself so much as to attract the attention of the late Sir George Murray, upon whose recommendation he was sent back to the Peninsula to make surveys of the great battle-fields. The series of military maps which he constructed from these surveys are preserved in the Ordnance-office, and are unsurpassed for accuracy and skilful execution. A model which he formed of the Lower Pyrenees is in the Museum of the United Service, Whitehall. He married in 1818 the daughter of Lieutenant-General Blunt.

In 1827 Major Mitchell published 'Outlines of a System of Surveying for Geographical and Military Purposes,' 8vo, London. In the same year he received the appointment of deputy surveyor-general of New South Wales under Mr. Oxley, whom he succeeded as surveyor-general—an office which he retained till his death. Besides performing the ordinary duties of this important situation, he conducted four expeditions into the interior, and was one of the most successful of the explorers of the Australian continent. Three of these expeditions were performed in the years 1831-32, 1835, and 1836. The first was in search of an imaginary river called the Kindur, which a runaway convict, who had resided among the aborigines, described as having a north-west course, and entering the sea; and the result of the journey was the discovery of the Peel River and the Nammoy. The second expedition was for the purpose of exploring the course of the river Darling, and was continued in the third expedition, when the Darling was traced to its junction with the river Murray. Australia Felix was also discovered, and the Glenelg was explored to its entrance into the sea. These journeys were attended with great danger from the occasional hostility of the native tribes, and required continual vigilance, combined with the steadiness and resolution of an experienced leader. Major Mitchell published in 1838 his account of these journeys, under the title of 'Three Expeditions into the Interior of Eastern Australia, with Descriptions of the recently-explored Region of Australia Felix, and of the present Colony of New South Wales,' 2 vols. 8vo, London, illustrated with lithographic drawings and woodcuts. He had a short time previously published his 'Map of the Colony of New South Wales, compiled from actual Measurements with the Chain and Circumferenter, and according to a Trigonometrical Survey, in Three Sheets.' Major Mitchell came to England for the purpose of superintending these publications, and, before his return, received, in 1839, the honour of knighthood from the queen, and the title of D.C.L. from the University of Oxford. He was also elected a Fellow of the Royal Society and of the Geographical Society.

Sir Thomas Mitchell's fourth and last expedition was commenced in December 1845, and terminated in December 1846. His account of it was published in 1848, under the title of a 'Journal of an Expedition into the Interior of Tropical Australia, in Search of a Route from Sydney to the Gulf of Carpentaria, by Lieut.-Colonel Sir T. L. Mitchell,' 8vo, illustrated with lithographic engravings and maps. This expedition did not reach the Gulf of Carpentaria, having been compelled to return in consequence of the loss of the cattle and horses from drought and want of pasturage; but advanced as far as 21° 30′ S. lat. Sir Thomas Mitchell himself was the first to discover the important river which he named the Victoria, and saw it taking a north-western course, in a direction towards the Gulf of Carpentaria. Mr. Kennedy, however, Sir T. Mitchell's assistant-surveyor, in a subsequent journey in 1847, found that the river makes a great bend to the south-west, and he traced its course in that direction as far as 26° 14′ S. lat. The channels were in many places quite dry, and he was compelled to return from want of water and pasturage for his horses. In 1850 Sir Thomas Mitchell published an admirable manual of geography for the schools of New South Wales, entitled 'Australian Geography, with the Shores of the Pacific and those of the Indian Ocean, designed for the Use of Schools in New South Wales,' 12mo, Sydney. In 1853 he again visited England. Having invented a new propeller for steam-vessels on the principle of the curious instrument used by the natives of Australia, he delivered a lecture on the subject which excited much interest. It was published under the title of 'Origin, History, and Description of the Boomerang Propeller, a Lecture delivered at the United Service Institution,' 8vo, London.

Sir Thomas Mitchell was advanced to the rank of colonel in 1854. He died October 5, 1855, at his residence near Sydney, and his remains received the honour of a public funeral.

MITCHELSTOWN, county of Cork, Ireland, a market- and post-town, and the seat of a Poor-Law Union, is pleasantly situated near the river Funcheon on a small tributary, in 52° 17′ N. lat., 8° 17′ W. long., 30 miles N.N.E. from Cork, 129 miles S.W. by S. from Dublin. The population in 1851 was 3091. Mitchelstown Poor-Law Union comprises 18 electoral divisions, with an area of 86,957 acres, and a population in 1851 of 27,269. The town consists of an extensive square, containing some well-built houses, and of two principal streets with several smaller streets intersecting these at right angles. It contains the parish church—a handsome building, enlarged in 1830, a spacious Roman Catholic chapel, a National school, and a town library. There are also a court-house, fever hospital, dispensary, bridewell, and Union workhouse. Mitchelstown College, a group of neat buildings with a chapel attached, was founded by the Earl of Kingstown for the support of 12 males and 16 females of his decayed Protestant tenantry. Each receives 40*l*. a year, besides a house and garden. On one side of the square is the gateway to the extensive demesne of Mitchelstown, the seat of the Earl of Kingstown, proprietor of the town. The mansion with its towers and battlements forms a striking object. It was erected in 1823, and is the largest and finest of the modern castles in Ireland. Petty sessions are held monthly. Fairs are held January 10, March 25, May 23, July 30, November 12, and December 2.

Mitchelstown and Kingstown caves are two series of beautiful stalactite caverns, under small limestone hills about 8 miles from Mitchelstown on the Dublin road. One series, discovered in 1833, is 870 feet in extreme length by 572 feet in breadth.

MITFORD, MARY RUSSELL, one of the most delightful of our female authors, was born on the 16th of December 1786, at Alresford, Hampshire. Her father was a physician, and a man of very considerable attainments and ability, but of unthrifty and somewhat eccentric habits, and consequently unsuccessful alike in his professional pursuits and in his pecuniary affairs. By his general want of management and injudicious speculations he wasted his wife's property as well as his own, and when a characteristic present made—when his own fortunes were at the lowest ebb—to his daughter on her tenth birthday, of a ticket in the Dublin Lottery, turned up a prize of 20,000*l.*, that too was as thoroughly, though somewhat more slowly, dissipated as his previous wealth had been. Yet he was a man of the kindliest and most cheerful, as well as sanguine temper, and Mary Mitford, his only child, without a murmur dedicated her life to the promotion of his comfort and happiness, and almost before arriving at womanhood devoted herself to literature as a means of ekeing out his diminished income.

At ten years of age she was sent to a boarding-school at Chelsea; and in addition placed under the special guidance of a governess, who, as Miss Mitford mentions in the introduction to her dramatic works, was not only herself addicted to verse-writing, but seemed to have the faculty of making her pupils write verses also; and among her pupils she at different times numbered, besides Miss Mitford, Miss Landon (L. E. L.), Fanny Kemble, and Lady Caroline Lamb. Miss Mitford took the poetic fit strongly; and before she was twenty she had published three volumes of poetry, one of which was a romance in verse after the manner of Sir Walter Scott. They were not of much worth, but they met with rougher treatment at the hands of the 'Quarterly,' than their juvenile demerits justified. But though pained she was not disheartened, and she profited by the somewhat rough lesson. Another volume of verse—'Watlington Hill; a Poem,' was published in 1812. She had by this time deliberately adopted literature as a profession, and was busy in writing short tales and sketches for the magazines. She had acquired facility and confidence by these exercises, when the early celebrity probably of the 'Sketch-Book of Geoffry Crayon,' turned her thoughts to the writing of some descriptive sketches of English rural scenery and rustic life. A pleasant little village on the borders of Berkshire and Hampshire—Three Mile Cross, near Reading—had long been her residence; every lane and field, and almost every nook and corner of it, every house and cottage, and almost every person in them, was familiar to her; and it occurred to her that faithful delineations of the country scenery and country manners as they existed in that small southern village would not be unwelcome to the world of readers.

But she met in the first instance with serious discouragement. Thomas Campbell was then editor of the 'New Monthly Magazine,' and the earlier essays of what ultimately formed 'Our Village' were offered to him, but peremptorily rejected. They were beneath the dignity of his magazine. After other rebuffs they were fain to take shelter in the 'Lady's Magazine.' There their freshness, geniality, and faithfulness were recognised, and Miss Mitford, nothing loth, was called upon to publish them in a collected form. By the general public 'Our Village' was warmly welcomed, and each series has been several times reprinted. They have found many imitators too, but hitherto no rivals. She wrote in the Preface when they were first collected:—"Her descriptions have always been written on the spot and at the moment, and in nearly every instance with the closest and most resolute fidelity to the place and the people. If she be accused of having given a brighter aspect to her villagers than is usually met with in books, she cannot help it, and would not if she could. She has painted, as they appeared to her, their little frailties and their many virtues, under an intense and thankful conviction, that in every condition of life goodness and happiness may be found by those who seek them, and never more surely than in the fresh air, the shade, and the sunshine of nature." This is a fair account of them, and fairly represents, moreover, the genial and hearty spirit of their authoress. 'Our Village' is in all respects a work that more than almost any other represents in literature that phase of English taste and feeling, which is so characteristically exhibited in our best water-colour landscapes and scenes of country life—so redolent of the open air and sunshine. 'Our Village' altogether extended in its original collected form to five volumes, or series, the last of which was published in 1832. Of some of the sketches in the last volume or volumes it must however be admitted that there is a little want of the primal freshness, and in them, and in some of her later essays, there is too much yielding to the besetting sin of those who depict character—the tendency to exaggeration or caricature. 'Belford Regis; or Sketches of a Country Town,' in which the neighbouring town of Reading, instead of the pretty country hamlet, supplied the materials, was her most important subsequent work in a similar style. Her later sketches and essays furnished to various periodicals have not, we believe, been collected. Among her other works may be mentioned her 'Stories of Country Life.' She also for some years edited Finden's 'Tableaux;' and three volumes of 'Stories of American Life by American Authors.'

Whilst at the Chelsea school Miss Mitford's dramatic tastes had been as carefully nurtured as her poetic tastes. The consequence was that in early life her most ardent aspirations as an authoress were directed towards the stage. She wrote altogether a large number of dramatic pieces of various kinds. Four of these were works of considerable importance. The first, 'Julian,' was performed in 1823, with Macready for the hero, and met with decided success. The 'Foscari' appeared with equal good fortune in 1826; and 'Rienzi,' which had a run, in 1828. 'Charles the First' was not so fortunate as its predecessors; Colman, then licenser of plays, having refused to sanction its performance on the ground of the impropriety and danger of permitting the trial of an English king to be represented on the stage. Driven from the legitimate houses, Charles I. was at length brought out at a minor theatre, the Cobourg, and it has not apparently been repeated elsewhere. Besides these an opera, 'Sadak and Kalasrade,' written by her, was produced at the Lyceum, but was unsuccessful. One of Miss Mitford's last literary appearances was in an edition of her 'Dramatic Works' (2 vols. 8vo, 1854), which, besides the pieces above named, included a tragedy—printed for the first time—'Otto of Wittelsbach;' 'Inez di Castro,' another five-act piece, twice rehearsed for performance, and twice withdrawn; a melodrama, 'Gaston de Blondeville;' and several 'Dramatic Scenes.'

In looking at Miss Mitford's works, it should be borne in mind that, though they seem almost invariably the reflex of a mind full of happy images, and surrounded by pleasant circumstances, they were often really written under the pressure of pecuniary discomfort and during much ill-health. As long as her father lived her attention to him was unremitted, and her own health suffered from her filial devotion: shortly after his death it gave way entirely. Yet she lived and laboured on in her pretty Berkshire cottage, beloved by every friend, and cheered often by finding that her books had made her friends innumerable. About three years before her death she was hurt by the accidental overturning of her pony-chaise, and thenceforth she was pretty much confined to her house; but through her prolonged and hopeless suffering, she retained her wonted cheerfulness, and even her old industry was continued. Besides revising the work on which her fame is chiefly founded—'Our Village'—for a new edition, which appeared in 1852, she compiled a sort of literary patch-work, 'Recollections of My Literary Life; or Books, Places, and People,' which is in fact a sort of gossiping commentary on the "books, places, and people" that had, she fancied, most influenced her mental career, with a somewhat large addition of extracts from her favourite authors. She also prepared the collected edition of her 'Dramatic Works,' already noticed—to which works she prefixed various autobiographic introductions; and in 1854 she published 'Atherton; a novel,' in 3 vols. She died at her residence, Swallowfield Cottage, near Reading, on the 10th of January 1855.

MOA. [Dinornis, *S.* 2.]

MOCHA-STONE. [Agate.]

MOIR, DAVID MACBETH, was born at Musselburgh, in the county of Edinburgh, on the 5th of January 1798. He was educated at the grammar-school there, and when only thirteen was apprenticed to Dr. Stewart, a medical practitioner in that town. He was a diligent and attentive student in his profession, but became very early inclined to literary pursuits. In 1812 he produced some poems, which, though neat, had little originality; shortly afterwards he appeared in print with two brief essays in prose, in a small local magazine. During the last year of his apprenticeship, which was for four years, he attended the University of Edinburgh, which he continued to do after his apprenticeship terminated, and obtained his diploma as surgeon in the spring of 1816. It had been his intention to enter the army, but the peace offering few hopes of advancement in that direction, he abandoned his purpose, returned home, and for awhile devoted himself to literature, writing occasionally for the 'Scots Magazine,' and published an anonymous volume, entitled 'The Bombardment of Algiers and other Poems,' which brought him little profit or fame. He was also a member of 'The Musselburgh Forum,' a debating society, in which he favourably distinguished himself. In 1817 he entered into business as a partner, in his native town, with Dr. Brown, who had an extensive but laborious practice. Moir worked hard at his professional duties, but, when the toils of the day were ended, he employed a great part of the night in his literary pursuits. He was at this time a frequent contributor in prose and verse to Constable's 'Edinburgh Magazine.' When 'Blackwood's Magazine' was started, he became a still more constant contributor to its pages. He wrote for it both prose and poetry, both comic and serious. Among his comic effusions were 'The Eve of St. Jerry,' and 'The Auncient Waggonere,' and at the time some of them were supposed to be from the pen of Dr. Maginn. His serious poems were marked as by Δ, a signature which he retained in that magazine until his death. In 1823 he formed a strong friendship with John Galt, who, when he departed for America, left his novel, 'The Last of the Lairds,' unfinished, and Moir wrote the concluding chapters for him. In 1824 he published 'The Legend of Genevieve, with other Tales and Poems,' consisting of selections from his magazine contributions, with some original additions. In the same year he commenced, in 'Blackwood's Magazine,' his novel of 'The Autobiography of Mansie Wauch,' which was continued for nearly three years, and afterwards published separately. It had great success, and the character of its hero is a clever embodiment of some of the peculiarities of Scottish character. During all these literary labours he continued to attend to his professional duties with indefatigable assiduity and extreme kindness. Between 1817 and 1828 he is stated never to have slept a night out of Musselburgh. He was now recommended to remove to Edinburgh, where he might have readily attained a more lucrative practice, but his attachment to his old haunts and his old patients and neighbours caused him to refuse. In 1829 he married. In 1831 he published his 'Outlines of the Ancient History of Medicine, being a View of the Healing Art among the Egyptians, Greeks, Romans, and Arabians.' In 1832, after having exerted himself in a most energetic manner when the cholera was raging in his district, he published as a pamphlet 'Practical Observations on Malignant Cholera,' which had a very extensive circulation; and this was followed by 'Proofs of the Contagion of Malignant Cholera:' both works being allowed to possess great merit, even by those who differed from the author's conclusions. In 1832 Mr. Moir attended the meeting of the British Association for the Advancement of Science at Oxford, and afterwards visited London, where he extended his acquaintance among the literary celebrities. In 1843 he published 'Domestic Verses,' in which, among other things, he records, with much tenderness, the loss of two of his sons, who died young. In 1845 he contributed the account of the civil history and antiquities of the parish of Inveresk, of which Musselburgh is the chief town, to the 'New Statistical Account of Scotland.' In 1846 he met with an accident, being thrown from a carriage, by which he was rendered lame for life. In the spring of 1851 he delivered a series of lectures 'On the Poetical Literature of the Past Century,' at the Edinburgh Philosophical Institution. In the same year, 'Selim,' his last contribution to 'Blackwood's Magazine,' appeared, and on the 6th of July he died. His activity had continued unabated during his whole life. He had, besides paying a sedulous and benevolent attention to his patients, filled various municipal offices, and had been a member of the General Assembly. His contributions to 'Blackwood' alone number 370. His serious poetry, by which he will be chiefly remembered, is sweetly pensive and tender, without any remarkable original poetic power, but it possesses a charm in its natural imagery and its appeals to our feelings that can never fail to please. In 1852 his 'Poetical Works,' which, however, are only a selection, were published, with a memoir of his life, by T. Aird.

MOLÉ, COMTE DE, was born in 1781, and was descended from an illustrious family in France. He was the son of the President Molé, who fell a victim to the violence of the first French Revolution. Enough property however appears to have been saved from the wreck of his family fortunes to enable the father to send his son to the Central School of Public Works, afterwards called the Polytechnique, where he pursued his studies with industry and vigour. In 1806 he published 'Essais de Morale et de Politique,' which attracted the attention of the Emperor Napoleon I., and secured for him the post of auditor of the Council of State. These essays, as may be supposed, were of a highly absolutist cast; and though their author continued to the last a staunch adherent of the Bonaparte dynasty, he remained in office under the Bourbons after their restoration, who created him a peer of France. To the policy and measures of Prince Polignac he offered the most determined opposition. After the revolution of July 1830 he was appointed by Louis Philippe to the portfolio of Foreign Affairs, and shortly afterwards was advanced to the post of Prime Minister of France, which he eventually was obliged to resign by the opposition of M. Guizot and M. Thiers. Upon this he retired into private life, and though he was elected a member of the Legislative Assembly, he took little or no part in its proceedings. The family of Count Molé was of that rank which is known as the 'nobility of the robe,' and his ancestors were of gentle blood as long ago as the days of Henri IV. Talents and administrative capacity seem to have been hereditary in the family, as well as the love of legal order, monarchy, and constitutional government. Count Molé was almost the last remaining link between his countrymen of the old and of the new régime, as combining the high-bred tone and monarchical principles of the former with a proportion of the liberal principles which are the distinctive mark of the latter class. But while Count Molé accepted each successive change in the governing system of France as the result of political necessity, it cannot be said that he ever swerved in principle from the opinions which he had originally professed. At the close of his long career, under various successive changes of government, he renewed his relations with the ancient dynasty, and departed life as he entered upon it, a supporter of the old monarchy. In his theological opinions he inclined to the Ultramontane party, and from his high character, great abilities, and illustrious position, he was one of the strongest supporters of the Roman Catholic Church in France. His memoirs, which naturally include reminiscences of all the great men and notables of France during the first half of the 19th century, were announced as in preparation, but have not yet (April 1858), been published. He died suddenly at his family seat at Champalatrux, November 23rd 1855.

MOLESWORTH, RIGHT HON. SIR WILLIAM, eighth Baronet of that name, was born in 1810. He was the lineal representative of an old Cornish family of large landed possessions, originally of Irish extraction. The first baronet was governor of Jamaica in the reign of Charles II. Sir William's father died in 1823. It is uncertain at what school Sir William Molesworth was first educated, but it is certain that having spent some time at Cambridge, he was sent to Edinburgh, where he was taught classics, mathematics, and metaphysical science, by an Italian refugee, and afterwards passed to a German university. In this latter soil his mind took deep root; he acquired the German language, and followed at will the bent of his own vigorous talents. Having left England with an average acquirement of general and classical knowledge, he concentrated his powers in Germany upon the study of philology and history. His mind however revolted against the mysticism of the German school, and as soon as he was released from collegiate study he made the usual tour of Europe. On his return to England in 1831 he was still in his minority. His first public appearance in this country was at a meeting convened in his native county in that year for the purpose of supporting parliamentary reform, and his maiden speech on that occasion gave considerable promise of future eminence. He was little more than of age when he was returned to parliament unopposed in December 1832, for East Cornwall, by which constituency he was re-elected in December 1834, but withdrew from the contest in July 1837, when he was returned for Leeds. At the dissolution of 1841, being convinced that his chance of success at Leeds was hopeless, he declined a contest, and remained out of parliament for four years. During this interval he read and thought much on politics and social economy, gave himself a sounder political education, and accumulated capital for his future senatorial life. In 1850, however, on the death of Mr. Wood, he offered himself as a candidate for the representation of Southwark, and though strenuously assailed for his support of the grant to Maynooth College, he was successful, and he continued to represent the same constituency to his death. In January 1853 he accepted the office of First Commissioner of Public Works on the formation of Lord Aberdeen's administration, and was re-elected without opposition; and again on his subsequent translation to the Colonial Office.

As a 'Commons' debater' Sir William Molesworth was not of first-rate eminence. His speeches in parliament were few, but always valuable, though of too philosophical a cast to be generally popular. Those on the colonies, delivered in 1838; in 1840 on the state of the nation and the condition of the people; on transportation, in 1837-38; and on many important social and economic questions about the same period, were of great merit and immense practical utility. They were carefully prepared beforehand, and were the results of reading, labour, and reflection. In July 1855 Sir William Molesworth found a sphere far more congenial to his tastes, and a larger scope for his administrative ability, on being appointed to the secretaryship of the colonies, but he held that office only for the brief space of four months, when his career of public usefulness was cut short by death, which occurred on the 22nd of October 1855. The colonial and domestic press were all but unanimous in expressing their satisfaction at his appointment; it was not forgotten that he had taken the deepest interest in the affairs of Canada and Australia, and had studied the problem and mastered the theory of colonisation to a greater extent than perhaps any contemporary. Neither was it forgotten that he was the first person who, in this country, succeeded in calling public attention to the manifold abuses connected with the transportation of criminals, though eighteen years had elapsed since the parliamentary committee, of which he was chairman, brought to light all the horrors of our penal system. In the words of a writer in the 'Times,' "Sir William Molesworth found our colonial empire disorganised and distracted by the mal-administration of the Colonial Office, wedded as it then was to a system of ignorant and impertinent interference. He first aroused the attention of parliament to the importance of our remote dependencies, and explained with incomparable clearness and force the principles of colonial self-government. With untiring diligence and great constructive power he prepared draught constitutions, and investigated the relations between the imperial government and its dependencies. Starting from a small minority, he brought the public and parliament over to his side, till principles once considered as paradoxes came to be regarded as axioms. By such means he fairly won the position of Secretary of State for the Colonies; but he did not live to enjoy the prize which he had grasped. Before we had time to hear of the satisfaction with which his appointment was sure to be hailed by our remote dependencies, the sceptre was snatched from his hand by death, and the post became again vacant. In the full vigour of life and intellect, in the possession of what must have been to him the highest and noblest prize of ambition, in the enjoyment of the confidence of his sovereign and the esteem of his fellow-subjects, he was taken away suddenly and prematurely, yet not so soon as to deprive his friends of the consolation of thinking that he has left behind him durable memorials which will link his name with the destinies of every British community planted on the face of the earth. The best monument that could be raised to him would be a complete collection of his parliamentary speeches; the noblest epitaph that could be inscribed on his tomb would be the title of the 'Liberator and Regenerator of the Colonial Empire of Great Britain.'"

Though he had not avowedly appeared before the public as an author, Sir William Molesworth was favourably known in the world of letters and science. Having purchased the 'Westminster Review,' he for some years conducted it either alone or in conjunction with his friend, Mr. John Stuart Mill, the eminent political economist, and during that time he was a not unfrequent contributor to its pages; he likewise wrote at different times many articles in other periodicals and newspapers. He also edited and published at his own expense a complete edition of the English works of the philosopher Hobbes, in 16 volumes. [HOBBES, THOMAS.] In science Sir William Molesworth had obtained some reputation as a botanist; but his acquirements extended over a large range of subjects. In private life few men have been more highly esteemed.

MOLLUSCA. Referring to the articles CONCHIFERA, GASTEROPODA, CEPHALOPODA, and MALACOLOGY, for information as to the zoological arrangement and subdivision of the various families of the *Mollusca*, we shall in the present article consider the animals which constitute this great group in a purely anatomical and morphological point of view; that is, we shall endeavour to show—firstly, what Common Plan or Archetype is discoverable among the varieties of Molluscan forms; secondly, in what way the Common Plan is more specially modified in the leading sub-typical groups of this great division of the animal kingdom; thirdly, the various modes in which the organs are arranged being thus comprehended—what peculiar characters are presented by these organs themselves; and fourthly, the development of the *Mollusca*, so far as it bears upon the idea of a Common Plan, will be discussed.

1. *The Common Plan or Archetype of the Mollusca.*—By the Common Plan or Archetype of a group of animals we understand nothing more than a diagram, embodying all the organs and parts which are found in the group, in such a relative position as they would have, if none had attained an excessive development. It is, in fact, simply a contrivance for rendering more distinctly comprehensible the most general propositions which can be enunciated with regard to the group, and has the same relation to such propositions as the diagrams of a work on mechanics have to actual machinery, or those of a geometrical work to actual lines and figures. We are particularly desirous to indicate the sense in which such phrases as Archetype and Common Plan are here used; as a very injurious realism—a sort of notion that an Archetype is itself an entity—appears to have made its way into more than one valuable anatomical work. It is for this reason that if the term Archetype had not so high authority for its use, we should prefer the phrase 'Common Plan' as less likely to mislead.

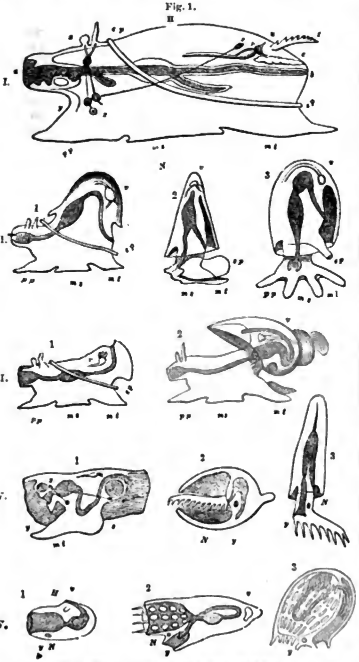
There are two modes in which the Archetype or Common Plan of any group of animals may be set forth. In the first, the community of plan among the members of each group would be demonstrated; and then, the minor plans thus obtained being compared together, the general Common Plan would be deducible. But this analytical method (which has been carried out to a certain extent for the *Mollusca* by the writer in a Memoir in the 'Philosophical Transactions' for 1852), would require more space and more illustration than can here be devoted to it; we must, therefore, take the opposite course, and, assuming a Common Plan, trace out its modifications in the subordinate plans, and explain the laws by whose operation they are affected.

The assumed Common Plan or Archetype of the *Mollusca* may be represented by *fig.* 1, I.:—

This figure is supposed to be bilaterally symmetrical, and the following parts and regions are to be distinguished in it:—(*H*). The Hæmal Region, or that upon which the heart is situated, and which corresponds with what is commonly termed the dorsal region. The word dorsal, however, is vague, being used in different senses in various divisions of the animal kingdom, and should therefore be abandoned in philosophical anatomy. For the same reason, the opposite region (*N*) is termed, not ventral, but Neural, inasmuch as it is the region in which the great centres of the nervous system are placed. The termination (*a*) is the anterior or oral; the end (*b*), the posterior, or anal. Between these extremities the intestine takes a straight course. The neural surface is that upon which the majority of Molluscs move, and by which they are supported; and it is commonly modified to subserve these purposes into a muscular expansion or disc called the Foot. Three regions again, often very distinctly divided from one another, may be distinguished in this foot:—an anterior, the Propodium (*pp*); a middle, the Mesopodium (*ms*); and a posterior, the Metapodium (*mt*). In addition to these, the upper part of the foot or middle portion of the body may be prolonged into a muscular enlargement on each side, just below the junction of the hæmal with the neural region—the Epipodium (*ep*). The mass of the body between the foot proper and the abdomen, or post-abdomen, which bears the Epipodium, and whose limits cannot very well be defined, though it would be very convenient to have a name for it, may be termed the Mesosoma (mid-body); and for what is loosely called the head the name Prosoma might advantageously be adopted. On the upper part of the sides of the head or Prosoma are two pairs of organs of sense: the Eyes (which may be supported on pedicles—Ommatophores), and the Tentacles. In the hæmal region the integument may be peculiarly modified and raised up at its edges into a free fold, either in front of or behind the anus, and when so modified it is called a Mantle (Pallium). In front of the anus again the Branchiæ (*t*) project, as processes of the hæmal region. Among the internal organs we need only point out the position of the Heart (*u*, *v*), which lies in front of the branchiæ in the hæmal region; and the

Nervous Ganglia (x, y, z), of which there are three principal pairs arranged around the alimentary canal, which they encircle by means of their commissures.

Fig. 1.



I. The Ideal Archetype or Common Plan of the *Mollusca*.

II. Its modifications in consequence of the development of an abdomen and consequent neural flexure of the intestine. 1, Hypothetical; 2, Pteropod; 3, Cephalopod.

III. Modifications resulting from the development of a post abdomen and consequent hæmal flexure. 1, Hypothetical; 2, Pectinibranchiate Gasteropod.

IV. Primarily neural flexure modified by subsequent changes. 1, Lamellibranchiate Mollusc; Neural *Molluscoida*. 2, Brachiopod; 3, Polyzoon.

V. Hæmal *Molluscoida* (Ascidians). 1, simple hæmal flexure, as in *Appendicularia*; 2, after hæmal flexure the intestine is bent back, and an atrium is formed; the branchial sac remains comparatively small; 3, the branchial sac comparatively large.

a, oral aperture; *b*, anal aperture, or extremity of the intestines; *c*, renal organ; *pp*, propodium; *ms*, mesopodium; *mt*, metapodium; *ep*, epipodium; *t*, branchiæ; *u*, auricle; *v*, ventricle; *x*, cerebral ganglia; *y*, pedal ganglia; *H*, hæmal region; *N*, neural region.

[The letters have the same signification in these and all the other figures, with the exception of figure 10.]

Such is the Common Plan of which all Molluscs whatsoever may be regarded as modifications; the next question is, to consider the laws according to which the plans of the great sub-classes of the *Mollusca* may be derived from it.

2. *Modifications of the Common Plan.*—The structural peculiarities of all known Molluscs may be very simply accounted for by the excessive or defective relative development of certain regions in the Archetype, more particularly of one or other parts of the Hæmal Region. Of this region the portion which lies in front of the anus may be conveniently termed the Abdomen, while to that which lies behind it the term Post-Abdomen may be applied. Now, if it be supposed that the Abdomen grows out of proportion to the rest of the body, constituting a kind of prominence, and that the intestine passes into the outgrowth so as to form a sort of loop (II.), it is clear that the open angle of this loop will be turned towards the Neural surface; and the intestine may be appropriately said to have a Neural flexure. On the other hand, if it be supposed that the Post-Abdomen grow out in the same way, and draws into itself a loop of the intestine, then the open angle of the loop will be in the opposite direction, that is, it will be directed towards the Hæmal surface; the intestine therefore may in this case be said to have a Hæmal flexure (III.). It will be readily understood that either Abdomen or Post-Abdomen may develop a mantle or not, and that the existence or absence of this mantle has nothing to do with the essence of the change in question, however much it may affect the external appearance of the resulting form.

Again, the extent to which the Abdomen or Post-Abdomen is developed, may have a great influence on the relative position of certain organs of the Mollusc. Thus, in the first place, the position of the anus may become greatly altered. When there is a neural flexure it will acquire a direction towards the neural surface and backwards, the final approximation to the oral end depending on the amount of the development of the abdomen on the one hand, and that of the neural region on the other. Again, if the outgrowth of the abdomen take place, not symmetrically, but more or less on one side of the median line, the final position of the anus will be towards the opposite side and to the right or left, as the case may be.

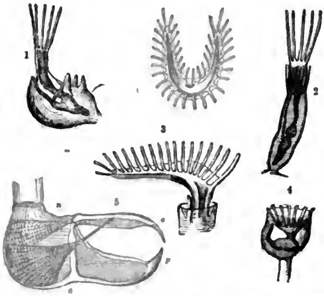
It is even conceivable (this amount of modification indeed actually obtains in nature) that by an exceedingly one-sided development of the abdomen, the anus may be thrust quite round on to the hæmal side. Its final position therefore must not be regarded as certainly indicative of the direction of the flexure by which it obtained this position. Where there is a hæmal flexure again, the direction of the anus will be normally towards the hæmal (that is, dorsal) side, and forwards; its approximation to the head, its asymmetrical position, and the amount to which it may be thrust backwards and towards the neural side, depending upon conditions of the same order.

It is not merely the anus which is affected by these changes however; the branchiæ (and the heart which follows them) undergo similar transpositions, whose nature and origin it is very necessary to understand, in order to appreciate their value as organic characters. M. Milne-Edwards long since pointed out the singular fact that, in certain Molluscs, the branchiæ are in front of the heart, while in others they are behind it. The latter he termed *Opisthobranchiata*, the former, *Prosobranchiata*. It will be seen that our Archetype is Opisthobranchiate. Now, it is easy to understand that if an Abdomen were developed in front of the heart, without involving the cardiac region, the Mollusc would remain opisthobranchiate; if however it were more extensively developed, so as to involve the heart and branchiæ, the heart, from having been in front, would eventually take a position posterior to the branchiæ, and the Mollusc would thus become prosobranchiate. So, with regard to the development of a Post-Abdomen; its effect on the position of the heart and branchiæ would depend wholly on the extent of hæmal surface which it involved. It follows, therefore, that Opisthobranchism may co-exist with either a hæmal or a neural flexure, or with none; while Prosobranchism indicates one or the other, but not which; and that these organic characters, however valuable, are secondary to and therefore of less importance than the neural and hæmal flexures (that is, development of an abdomen or post-abdomen), on which they depend. Dealing with the facts furnished by adult structure alone then, there are two primary modifications of the Molluscan Archetype, which may be shortly termed the Neural and Hæmal Plans. The *Cephalopoda*, *Pulmonata*, *Pteropoda*, *Lamellibranchiata*, *Brachiopoda*, and *Polyzoa*, are the molluscs which present modifications of the Neural Plan. The *Heteropoda*, *Gasteropoda*, *Tectibranchiata*, *Inferobranchiata*, *Cyclobranchiata*, *Tubulibranchiata*, *Nudibranchiata*, and *Ascidioida*, are those which present modifications of the Hæmal Plan.

3. *The Neural Plan and its Principal Modifications.*—Milne-Edwards has proposed a division of the *Mollusca* into the *Mollusca* proper, and the *Molluscoida* (*Molluscoides*), including under the latter class those Polype-like forms, the *Polyzoa* and the *Ascidioida*. Believing that the *Molluscoida* are as truly and wholly Molluscan as any other *Mollusca*, we nevertheless consider the distinction drawn by the eminent French naturalist to be very important, and that it should be retained as a primary subdivision of the great Hæmal and Neural Divisions. In the hæmal division the limits of the *Molluscoida* are the same for us, as for M.

Milne-Edwards; but in the neural we include somewhat more. In fact, if the most fitting definition for this subdivision be those Molluscs which have the neural region comparatively little developed, and the nervous system reduced to a single or at the most a pair of ganglia, while the mouth is usually surrounded by a more or less modified circlet of tentacles, then we shall find that, in the neural division we must include the *Brachiopoda* with the *Polyzoa*. Commencing our study of the morphology of the special groups of the *Mollusca* with the Neural Division; and with the *Molluscoid* sub-division of the neural forms, we have to consider first, the *Polyzoa* and the *Brachiopoda*:—

Fig. 2.



Polyzoa.—1, *Membranipo* . 2, *Bowerbankia*. 3, *Plumatella*. 4, *Pedicellina*. 5, *Avicularium*.

The *Polyzoa*.—Conceive the abdomen of the Archetype to be greatly prolonged, the neural region with its appendages, the organs of sense and the heart remaining undeveloped; so that the anus comes into close apposition with the oral extremity, while the edges of the latter are produced into long ciliated tentacles, and the result will be a Polyzoon, which needs only the power of gemmation to give rise to those composite aggregations which are so characteristic of the group.

The Polyzoic type itself presents five subordinate modifications in the five principal orders of the group:—the *Cyclostomata*, *Ctenostomata*, *Cheilostomata*, *Hippocrepia*, and *Pedicillinida*.

In the first three, the body of the Polyzoon when fully expanded is completely straightened, there being no permanent fold or inversion of the integument. In the last two there is such a permanent inversion.

In the *Cyclostomata* the horny or calcareous deposit in the integument of the abdomen joins the soft parts by an even level edge, and there is nothing which serves as a cover or operculum for the retracted Polyzoon.

In the *Ctenostomata* (*fig.* 2, 2) the margins of that portion of the abdomen which is inverted in the retracted state are produced into a toothed horny sheath, which can be retracted by special muscles, and which serves as an operculum.

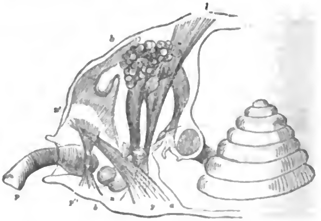
In the *Cheilostomata* (*fig.* 2, 1) the horny or calcareous deposit takes place in such a manner that the hardened integuments of the front portion of the hæmal region constitutes a sort of lid, regularly articulated upon the hinder portion, and provided with proper occlusor (and perhaps levator?) muscles. It should be noted that the anal aperture is directed away from this lid or operculum.

In each of the previous divisions the tentacles are arranged on a circular disc, or lophophore, of whose edges they are prolongations; but in the great majority of the *Hippocrepia* (*fig.* 2, 3), which are all fresh-water forms, the lophophore is so produced into two arms on the anal side as to assume a horse-shoe shape. It is important to consider this in connection with the peculiar features presented by the *Brachiopoda*.

Thirdly, we venture to regard the peculiar genus *Pedicellina* (*fig.* 2, 4) as constituting an order by itself. Essentially a Polyzoon, it is nevertheless distinguished from all other *Polyzoa* by the circumstance that its tentacles are united together by a membrane into a cup, which cup is never protruded far beyond the general boundary of the body.

The *Cheilostomata* are remarkable for possessing two kinds of moveable appendages—*Flabellaria*, whip-like processes, articulated to a bulb containing muscles by which they are moved; and *Avicularia* or bird's-head processes (*fig.* 2, 5). The structure of the latter is of great interest in a morphological point of view, and demands particular attention. They consist of a larger piece, or valve (*p*), shaped like a bird's head, and produced into a longer or shorter process of attachment, to which a smaller valve (*o*), representing the bird's lower jaw, is articulated. Stalked or sessile, these avicularia present during life an incessant snapping action, produced by the alternate contraction of two sets of muscles, which arise from the concavity of the 'skull' of the bird's head by wide fan-shaped origins, and seem to be inserted by narrow tendons into the smaller articulated valve. The one tendon (*e*) is inserted into the smaller valve in front of the line of articulation, and the other (*n*) behind it, and therefore by their alternate action they raise and depress the lesser valve upon the larger.

Fig. 3.



Rhynchonella psittacea.

a, oral aperture; *b*, anal aperture, or extremity of the intestine; *l*, adductor muscles of *Brachiopoda*; *n*, cardinal muscles of *Brachiopoda*; *p*, pedicle; *p′ p″*, pedicle muscles; *y*, pedal ganglion.

The *Brachiopoda*.—Now, if we compare the relative positions and mode of articulation of the operculum and cell of a Cheilostomatous Polyzoon, or of the two valves of an avicularium, with those which obtain in the shells of the typical *Brachiopoda*, such as the *Terebratulidæ* and *Rhynchonellidæ*, the resemblance will be found to be very striking; and still more so, if in addition the arrangement of the muscles be taken into consideration. In such a Brachiopod, in fact (*fig.* 3), the shell is composed of two valves—one large, excavated, and produced into a canal or tube, through which a pedicle of attachment passes; while the other is smaller and more or less flattened. The two valves are articulated together by means of a socket in the smaller valve and a tooth in the larger, on each side, the intermediate space being free, just as the operculum of the Polyzoon is united with its cell, or as the lesser valve of an avicularium is articulated with the larger. So likewise the anal extremity of the Brachiopod is turned from the smaller valve. Then the arms of the Brachiopod are essentially comparable to those of the lophophore of a Hippocrepian Polyzoon, except that their direction is different; the calcified supports to which they are fixed in many *Brachiopoda*, are so variable in form and so extensively absent in others, that their existence can in nowise affect the homology of the parts. Again, if we leave out of consideration the pedicle muscles (which are however, in all probability, as Mr. Hancock has shown, the homologues of the retractors of the *Polyzoa*), the arrangement of the other muscles is precisely what we have seen to obtain in the avicularium: the adductors which pass from the larger valve to be inserted into the smaller, in front of its point of support, corresponding precisely with the occlusor muscles of the avicularium; while the cardinal muscles, which arise from the larger valve, and pass to be inserted into the cardinal process of the smaller, behind the point of support, are identical with the divaricator muscles of the avicularium.

The existence of distinct muscles for the purpose of separating the valves of the shell is characteristic of the *Polyzoa* and *Brachiopoda*, the only approximation to such an arrangement at present known among the *Lamellibranchiata* being presented by the *Pholades*.

Finally, if the great proportional size of the *Brachiopoda*, their pedunculated attachment, their thick and solid shells, and their simple forms, be brought forward as arguments against the view we take of their essentially polyzoic nature, we would remind the objector of the like opposition in such features between *Boltenia* and *Botryllus*, or *Aplidium*, among the Ascidians.

Two principal modifications of the common Brachiopod plan are to be observed. In the *Terebratulidæ* and *Rhynchonellidæ*, and in all probability in their extinct allies the *Spiriferidæ*, *Orthidæ*, and *Productidæ*, the muscles are always arranged in three sets—Adductor, Cardinal, and Peduncular. At the same time the mantle (whose homology with the produced edges of the non-retractile part of the abdomen of a Polyzoon is at once appreciable), though divided into two distinct lobes in front, is continuous and entire behind, that is, towards the peduncle. A still more remarkable feature in their organisation is that, at least in *Waldheimia* and *Rhynchonella*, there is no anal aperture, the intestine terminating in a cœcum, directed towards the middle of the large valve.

In the *Craniadæ*, *Discinidæ*, and *Lingulidæ* the muscles have a very different arrangement, which could only be rendered intelligible by detailed descriptions and illustrations, as the homologies of these muscles with those of the other division are not yet determined. The lobes of the mantle again are completely separated (*Discina*, *Lingula*, *Crania ?*), and the intestine opens upon one side of the body between these lobes. There are no teeth, and the articulation of one valve with the other and the modes of attachment vary remarkably; *Lingula* having a long peduncle; *Crania* being attached by the surface of its lower valve; and *Discina* having an aperture in the corresponding valve through which a portion of the adductor passes, and spreading out at its extremity into a sort of plug, acts as a pedicle.

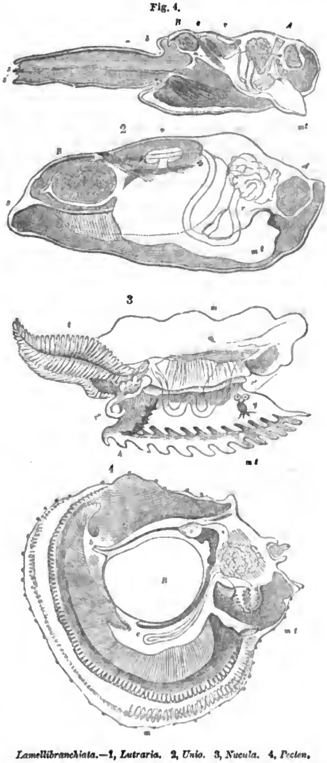
Neural Mollusca.—The *Lamellibranchiata*. In all *Mollusca* proper the neural region is developed to a much greater extent than in the *Molluscoida*, and there are always three pairs of ganglia, two Cerebral, two Pedal, and two Parieto-Splanchnic (or branchial). The especial characters of the *Lamellibranchiata*, as modifications of the Archetype, are the following:—The hæmal region is well developed in its abdominal portion, but forms no prominent sac-like abdomen, into which the viscera enter in the adult condition. Its edges are produced into extensive pallial lobes, which are arranged on each side of a longitudinal plane, and not above and below a horizontal one (or more properly before and behind a transverse one), as in the *Brachiopoda*. The mouth is surrounded by a fringe, representing the tentacles in the *Molluscoida* (as may be well seen in *Pecten*, *fig.* 4, 4) which is produced laterally into elongated 'palps,' but is totally unprovided with any manducatory apparatus. The intestine passing from the stomach either forms a simple loop with a second open angle directed hæmally, or this loop may be much coiled and convoluted: the intestine finally passing over the great posterior adductor and terminating between the lobes of the mantle behind it.

The foot may be more or less largely developed, but never presents any clear distinction into pro- meso- and metapodium, unless indeed, as we are inclined to suspect, the whole free portion of the foot of the *Lamellibranchiata* ought to be regarded as a modified metapodium. Besides the pedal muscles, the Lamellibranchs possess one or two characteristic muscles—the adductors, which approximate the valves of the shell, and whose greater or less development seriously affects the ultimate form of the animal.

The gills deviate but little from their archetypal form and position in some Lamellibranchs, such as *Trigonia* and *Pecten*, being merely thrown downwards by the development of the mantle. In *Nucula* (*fig.* 4, 3), their inner edges are united posteriorly, but they remain comparatively small. In the majority of Lamellibranchs, however, the gills are exceedingly large in proportion to the rest of the body, and consist of two double plates, which are united with the mantle and with one another, in such a manner as to divide the pallial cavity into two chambers, a supra- and infra-branchial, which communicate only by the passage between the anterior edge of the branchiæ and the foot, and by the multitudinous perforations in the branchial plates themselves.

It is in the absence of external organs of sense or of any buccal masticatory apparatus, and in the peculiar arrangement of the gills, that the main difference between the *Lamellibranchiata* and the *Gasteropoda* lies; and hence the great resemblance which the ideal section of a typical Lamellibranch bears to a typical Gasteropod. Compare (*fig.* 4) 4 with 1, 3, and 2.

Fig. 4.



Lamellibranchiata.—1, *Lutraria.* 2, *Unio.* 3, *Nucula.* 4, *Pecten.*

a, oral aperture; *b*, anal aperture, or extremity of the intestine; *c*, renal organ; *m*, mantle; *r*, labial palpi; *s s'*, anal and branchial siphons; *t*, branchiæ; *v*, ventricle; *y*, pedal ganglion; *A*, anterior adductor; *B*, posterior adductor.

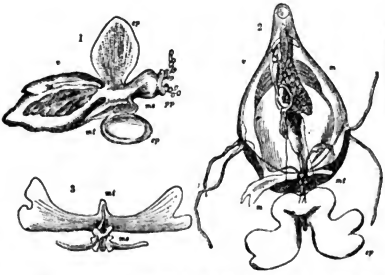
It may seem at first sight inconsistent with our own principles to consider as neural molluscs these Lamellibranchs, which confessedly have the principal loop in the intestine open to the hæmal side. But the position of the largely-developed mantle, completely in front of the anal aperture, and the direction of the aortic end of the heart, unchanged from what is observable in the Archetype, are sufficient, apart from developmental considerations, which will be adduced by and bye, to prove that the second flexure of the intestine in this case is to be considered accidental, the result of the great development of the mesosoma, to serve as a chamber for the viscera, and of the enlargement of the great posterior adductor, thrusting up the rectum which passes over it.

As for the leading varieties of form of the Lamellibranchs, there are none which, in reality, depart very widely from the Common Plan. Perhaps *Teredo* or *Pholas*, on the one hand, and *Ostræa*, on the other, may be regarded as the extreme forms, the former being as much as possible elongated longitudinally, the latter attaining the extreme of concentration about a centre. At the same time there is a reduction of parts to a minimum, as shown in the absence of a second adductor, and of any foot in the adult state. The differences between these forms are, however, decidedly less than those which may be observed between the extreme forms among the *Cephalopoda* or *Gasteropoda.*

The *Pteropoda* and *Pulmonata.*—The Lamellibranchs are, as we have said, curiously exceptional in presenting the general features of the *Mollusca* proper, without that singular buccal apparatus which we meet with in all other members of the subdivision, whether neural or hæmal, and whose peculiar nature is described below. Again, they are exceptional in the vast development and symmetrical longitudinal division of their mantle, and in the corresponding division of their pallial shell into two pieces or valves—characters we shall not meet with again in any modification of the Common Plan.

In the *Pteropoda* and *Pulmonata* the mantle is never developed into such lateral lobes, and the shell to which it gives rise never consists of two pieces, but is constituted by a single mass, which either has the form of a flat plate or presents some modification of a cone. Again, the foot (or some part of it) is always well developed, presenting no obvious distinction into regions in the *Pulmonata;* but in the *Pteropoda* often exhibiting a well-marked meso- and metapodium, and always presenting a characteristically large epipodium—an organ which in these Molluscs constitutes the so-called 'wings,' from which their name is derived.

Fig. 5.



Pteropoda.—1, *Pneumodermon.* 2, *Cleodora.* 3, *Psyche* (foot and head only). Letters as in figure 1.

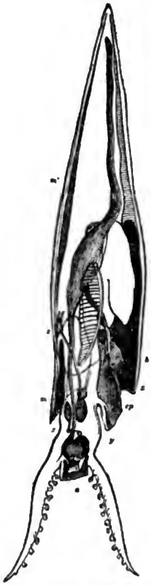
There is usually a well-developed mantle in the *Pteropoda* and *Pulmonata,* and its walls act as a branchial surface without being produced into true gills—(*Hyalœa?*)—the sea-water in the marine *Pteropoda* and the air in the terrestrial and aquatic *Pulmonata* being inspired and expired into its cavity.

In the *Pteropoda* in general, the aperture of the pallial cavity and that of the anus, are situated upon the posterior surface of the body, in accordance with the neural flexure of the intestine. The anal aperture however is usually thrust to one side of this surface, and, in *Limacina* and *Spirialis,* this lateral thrust has taken place to such an extent, that not only the anal aperture, but that of the mantle cavity, is thrown up completely on to the dorsal surface. This laterodorsal, or dorsal position of the anal and respiratory apertures, is as regular in the *Pulmonata* as it is exceptional in the *Pteropoda.*

In the *Pteropoda* and *Pulmonata* some most important modifications of form are produced by the greater or less development of the mesosoma on the one hand and of the mantle on the other. The predominance of the latter is to be observed in such forms as *Criseis, Cleodora, Hyalœa,* and *Helix;* while the former may be seen in *Pneumodermon* and in *Limax.* In the latter the mantle is very small, and in the former it is almost if not entirely absent; what is ordinarily considered as the mantle in this mollusc being in fact nothing more than the mesosoma. The like confounding together of parts so essentially different has taken place, we shall find, in the *Nudibranchiata* and in the *Heteropoda.*

The *Cephalopoda.*—In the Pteropod forms, *Pneumodermon* and *Cliò,* a hood, giving off long processes covered with suckers from its inner surface, surrounds the oral aperture, and there is every reason to believe corresponds with the propodium, whose lateral halves have united over the mouth. If the like process were to take place in a *Criseis,* but to a greater extent, so that the mouth were thrust back between the halves of the mesopodium, and the propodium and mesopodium formed one continuous tentaculigerous sheath around the oral aperture; and if at the same time the two halves of the epipodium united posteriorly into a funnel-shaped tube, the *Criseis,* so far as its external organisation goes, would no longer be a Pteropod, but would have become a Cephalopod. In fact, the Cephalopod may be derived from the Archetype by supposing these modifications. The mantle is always well developed, and its cavity incloses one or two pair of gills. The two halves of the epipodium are united behind into what is called the funnel, a peculiar apparatus, of great importance in the economy of many Cephalopods; and in the majority of the group the sides of the foot, having united in front of, and forming a complete sheath for, the head, are produced into eight or ten processes, the so-called arms, on which are set the acetabula, or suckers.

Fig. 6.



Vertical Section of *Loligo media.*

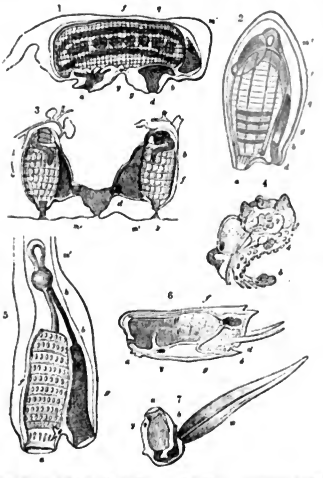
a, oral aperture; *b*, anal aperture, or extremity of the intestine; *m*, mantle; *m'*, shell; *x*, cerebral ganglia; *y*, pedal ganglia; *z*, parieto-splanchnic ganglia; *ep*, funnel.

Beyond this peculiar arrangement and development of the external organs, we are not aware that any characters exist by which the *Cephalopoda,* as a class, can be distinguished from the other *Mollusca.* Among themselves they present a remarkable harmony, differing chiefly in the number of their branchiæ, in the internal or external position of their shell, and in the nature of the appendages into which the edges of the foot are modified—characters which do not attain to ordinal importance in other divisions of the *Mollusca.*

Having thus glanced at all the leading modifications of the Neural Plan, we may next turn to the Hæmal Plan, commencing with its Molluscoid modification constituted by the *Ascidioida* alone.

The *Ascidioida.*—As a Molluscoid group, the Ascidians are characterised, in the first place, by the rudimentary condition of their whole neural region, and by the reduction of their nervous system to a single infra-œsophageal ganglion. Besides these, however, their organisation presents certain characters which appear at first sight very remote from such a Common Plan as has been described, and hardly deducible from it. An Ascidian, in fact, is usually fixed by one extremity of its body, and presents at the other two apertures. One of these leads into a wide cavity, whose entrance is fringed with a circlet of tentacles, and whose walls (except along the middle line anteriorly and posteriorly) are perforated by innumerable ciliated apertures, and often thrown into folds, by which their surface is greatly increased. At the bottom of this cavity—the branchial sac—a second wide aperture leads into the alimentary canal, which invariably presents a hæmal flexure, and then almost always bends backwards neurally to terminate in a second wide cavity. This, the *atrium,* whose more external portion is usually termed the *cloaca,* opens externally by the second or cloacal aperture, and extends along each side of the branchial sac up to its median line of attachment—communicating freely with its cavity by means of the small ciliated apertures which have been mentioned. The single ganglion lies between the oral and cloacal apertures.

Fig. 7.



Ascidioida.—1, *Boltenia.* 2, *Cynthia.* 3, *Botryllus.* 4, Intestine of *Perophora.* 5, *Clavelina.* 6, *Salpa.* 7, *Appendicularia.*

a, oral aperture; *b,* anal aperture, or the extremity of the intestine; *d,* cloacal aperture and atrium; *f,* branchial sac; *g,* hypo-pharyngeal band; *m',* test; *q,* genitalia; *y,* pedal ganglia.

Now, in what manner is this form derivable from the Archetype? It is to be remarked, in the first place, that the pharynx, large in the *Polyzoa,* becomes comparatively enormous in the Ascidians; while the tentacles, which were very large in the *Polyzoa,* are in the Ascidians comparatively small. Next, with the development of a post-abdomen, the intestine acquires a hæmal flexure; but instead of the anal aperture remaining on the hæmal side, it is bent round, by the same process as in *Spirialis* and *Limacina,* but in the inverse direction. Suppose with all this that a mantle has been developed, and that its free margin remaining small and narrow, has followed the anus to the neural side, while its cavity has extended up on each side of the pharynx to the middle line of the hæmal surface of the latter, carrying to a great extent a process of which the outline may be seen in *Cymbulia,* and giving rise to the atrium;—imagine also that the sac thus constituted externally by the inner surface of the mantle (third tunic), and internally by the pharynx, becomes perforated by minute apertures—and the result would be an Ascidian.

Such is the manner in which the Ascidian type is derivable from the Common Plan. Of this type the group presents three subordinate modifications. The first is that presented by the extraordinary and instructive genus *Appendicularia* (*fig.* 7, 7), which in a manner represents permanently the larval state of the more perfect members of the group—swimming by means of a long rapidly-vibrating tail, like that of a tadpole. In *Appendicularia* there is no cloacal aperture or atrium. The mouth opens into a wide pharynx representing the branchial sac of other Ascidians; from this a gullet leads into the stomach. The narrower intestine passes from the stomach, forwards and to the hæmal surface, where it terminates without bending downwards, and without being surrounded by any special cavity. *Appendicularia* therefore might be said to be a form in which the process of modification of the Molluscan Archetype into the Ascidian Type is arrested half way.

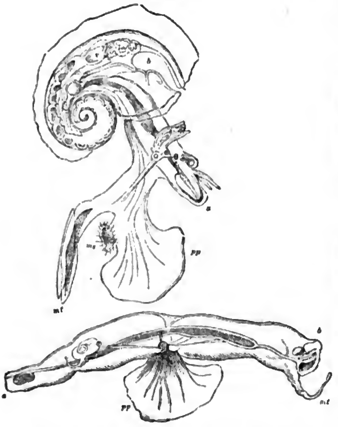
In all other Ascidians this process is complete, and there is a distinct cloacal aperture and atrium; but these forms again may be arranged under two great sub-typical modifications, according to the development of the branchial sac relatively to that of the post-abdomen. In such forms as *Cynthia, Boltenia, Perophora, Botryllus,* the branchial sac attains so great a proportional size as to occupy the whole, or nearly the whole, length of the body, the intestine lying on one side of it: these might therefore be well denominated *Ascidiæ Branchiales,* Branchial Ascidians. On the other hand, in *Clavelina, Aplidium, Polyclinum, Salpa,* the alimentary canal lies completely behind the branchial sac, which is proportionally small, and these might therefore be termed *Ascidiæ Intestinales,* Intestinal Ascidians. A very complete mutual representation will be found to obtain between the members of these two groups.

Hæmal Mollusca.—In passing from the Hæmal *Molluscoida* to the Hæmal *Mollusca,* we find the same new features presenting themselves as in the Neural Division, the transition being even more abrupt, from the absence of any representative of the *Lamellibranchiata.* In all these *Mollusca,* in fact, there is a more or less well developed foot; a distinct head, with its organs of sense and buccal armature; and three pairs of ganglia—cerebral, pedal, and parieto-splanchnic.

The modification of the Common Plan is carried to a less extent in this than in the Neural Division, the chief varieties of its forms depending on the changes in the shape of the shell with which the majority are provided; on the greater or less development of the different regions of the foot; but most of all in the relative proportions of the mesosoma and mantle.

If we divide the Hæmal *Mollusca* into two great groups—the one consisting of the *Heteropoda, Scutibranchiata, Tubulibranchiata, Pectinibranchiata,* and *Cyclobranchiata,* families, which are most intimately allied, and which are connected as a group by the diœcious arrangement of their reproductive organs; and the other of the *Nudibranchiata, Inferobranchiata,* and *Tectibranchiata,* families in like manner united, among other characters, by their common hermaphrodism, then we shall find in each such group two extremes of form—the one resulting from the great development of the pallial region, the other from that of the mesosoma. In the Diœcious Division, *Dentalium, Vermetus, Atlanta,* and the ordinary *Pectinibranchiata* may be regarded as examples of the former case; and in the Monœcious Division the *Inferobranchiata* and *Tectibranchiata;* while the mantle becomes rudimentary or absent altogether in the Diœcious *Firoloides,* in the Monœcious *Phyllirhoë,* and the *Nudibranchiata* in general, where the region from which the so-called branchial processes arise, and which is commonly called the mantle, is not the homologue of the mantle of *Atlanta* for example, but of its mesosoma, which here, as in *Firoloides*, constitutes the main portion of the body.

Fig. 8.

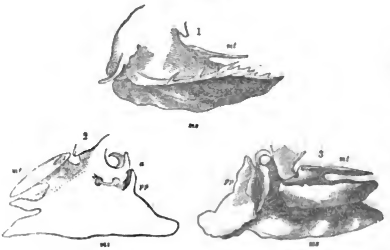


Heteropoda.—8, *Atlanta*; 9, *Firoloides.*

a, oral aperture; *b*, anal aperture, or the extremity of the intestine; *mt*, mantle; *ms*, mesopodium; *pp*, propodium; *v*, ventricle.

The foot in the Monœcious Hæmal *Mollusca* rarely presents any special development of its different regions, except that in certain forms—namely, *Aplysia* and *Gasteropteron*—the epipodium is as well marked as in the *Pteropoda*, and serves the same end in locomotion. This is well known in *Gasteropteron*, and we have seen a tropical *Aplysia* 'fly' through the water in precisely the same way as a Pteropod would do. These epipodial lobes have been frequently called mantle, although the true mantle is a most distinct and obvious structure.

Fig. 9.



Foot of *Pectinibranchiata.*—1, *Trochus*; 2, 3, *Natica.*

a, oral aperture; *mt*, metapodium; *ms*, mesopodium; *pp*, propodium.

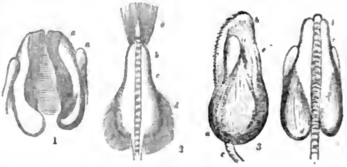
In the Diœcious group the epipodium is never well developed, presenting itself at most under the form of little lobes and processes—at least it would seem probable that the neck-lappets and head-lappets of the *Trochidæ* are rudiments of the epipodium. On the other hand, it is in this group that the propodium, mesopodium, and metapodium attain their most complete and distinct form; as in *Atlanta*, where the propodium constitutes the anterior flattened fin, the mesopodium the rounded sucking disc, and the metapodium extends backwards, as the tail-like lobe which carries the operculum. In *Firoloides* we find that the mesopodium has vanished, and the metapodium has taken the form of a mere filament, while the propodium constitutes the great swimming fin.

In the ordinary *Pectinibranchiata*, on the other hand, the foot may not be differentiated into its subdivisions at all, the metapodium being marked only by the position of the operculum, when this exists, as in *Buccinum*. In other cases, as in *Oliva* and *Sigaretus*, a deep cleft marks off a very distinct propodium from the conjoined mesopodium and metapodium; in others, as in *Pterocera*s, the metapodium is as specialised as in *Atlanta*; while again, in such forms as *Natica*, the three constituent parts are distinguishable—the propodium constituting the hood in front of the head; the mesopodium the creeping disc; and the metapodium the operculigerous lobe. (*Fig.* 9.—2 and 3.)

Having thus passed in review those modes of arrangement of the various organs of the *Mollusca* which constitute the Common Plan of the group and the subordinate plans of its leading subdivisions, we have next to consider the peculiarities presented by these organs themselves, or, in other words, those more striking features in which the organs of the *Mollusca* differ from those of the *Vertebrata*, *Annulosa*, and *Radiata*. The most important organs, in this point of view, are those of—1, the Alimentary; 2, the Circulatory; 3, the Respiratory; 4, the Renal; and 5, the Nervous System.[*]

1. The Alimentary Organs, in certain *Mollusca*, present two kinds of apparatus which are met with in no other division of the Animal Kingdom. The first of these is that peculiar manducatory instrument usually called the 'tongue,' which is possessed by all the *Mollusca* proper, except the *Lamellibranchiata*; and for the first description of whose true structure and mode of action we are, we believe, indebted to Mr. Thompson (see article 'Tongue,' in the 'Cyclopædia of Anatomy and Physiology'), although the organ itself had been more or less an object of attention ever since the time of Cuvier.

Fig. 10



Tongue of *Patella.*

1. *a a*, the cartilaginous plates which constitute the pulley over which the elastic plate 2, *b*, supporting the series of teeth *c*, plays; *d* and *e* are the anterior and posterior insertions of the intrinsic muscles of the tongue. 3 is a side view, and 4 a view from above, of the entire apparatus.

The tongue is essentially composed of a cartilaginous mass, with a pulley-shaped upper and anterior surface, which projects from the bottom of the oral cavity. An elastic plate plays over the pulley, and is attached at each end to muscles which arise from the upper and lower surfaces of the cartilaginous mass. Along the middle line of this elastic plate successive transverse series of strong recurved teeth are set—new ones being continually formed behind as the old are worn away—in a sort of persistent dental sac.

When the tongue is brought into play it is protruded by appropriate muscles from the cavity of the mouth, and its extremity is firmly applied against the body to be rasped. The superior and inferior sets of muscles, which are inserted into the corresponding ends of the elastic plate, now contract alternately, and the resulting action is precisely that of a circular saw. It is by means of this apparatus that the Carnivorous *Mollusca* bore through the shells of the animals upon which they prey; and perforated shells, which have been thus emptied, abound on every coast.

The other appendage of the alimentary canal peculiar, so far as we at present know, to the *Mollusca*, is what is termed the Crystalline Style, a transparent, usually elongated body, which projects by one end into the stomach, and is lodged for the rest of its extent in a sac formed by a diverticulum of

[*] Our limits preclude the consideration of the tegumentary and genital systems, whose peculiarities, however, are less exclusively Molluscan.

that organ. The Crystalline Style is found in a great number of Lamellibranchs (to which group it has erroneously been supposed to be confined), but has hitherto been observed in only a few Pectinibranch *Mollusca*, such as *Pteroceras*, *Strombus*, *Trochus*, and *Murex*. Its function is wholly unknown.

Among the alimentary appendages, the Liver in one group, the Ascidians, departs sufficiently from the ordinary plan to deserve particular notice. In these animals (*fig.* 7, No. 4, *k*) it always consists of a series of narrower or wider anastomosing tubules, commencing in cæca upon the outer surface of the intestine, which they envelop in a close network, and terminating by a narrow duct in the stomach. In the *Botryllidæ* the hepatic tubules are remarkably wide.

2. The nature of the Circulatory System in the *Mollusca* is at present in some respects a vexed question, more especially as regards the important point whether they possess a true closed system of vessels or not. Without entering into any discussion of the various arguments used on both sides of a dispute which is in some respects verbal, we may be permitted shortly to state our own conclusions on the subject.

In the *Polyzoa* there are no special circulating organs, if we except the cilia with which the perivisceral cavity is often lined, and which keep up a continual current in the perivisceral fluid; nor do we imagine that any one will insist that in them the perivisceral cavity is not a sinus, but has a truly venous lining membrane.

In the *Ascidians* there is a heart, but it is a simple muscular sac, open at each end, and possessing the extraordinary power of reversing the direction of its contractions, and thus circulating its blood first in one way and then in the opposite. The blood thus poured out is driven through channels in which assuredly no separate lining membrane is demonstrable. Indeed it is difficult to comprehend how any one with a living Ascidian under his microscope can question that here, at any rate, the circulation takes place through lacunæ, and not through vessels with distinct walls.

In the *Brachiopoda* a very remarkable vascular system has been said to exist, consisting of two hearts (in *Rhynchonella* of four), each composed of an auricle and a ventricle; the former being in free communication with the perivisceral venous sinuses (perivisceral cavity, *nobis*), while the latter ends in an aorta, whose branches undergo a regular distribution. Such is the circulatory system in the *Brachiopoda* according to Professor Owen; but our own inquiries have tended to strengthen very greatly the doubts first raised by Mr. Hancock as to the true nature of this so-called circulatory system. It fact these inquiries lead us to doubt whether the so-called 'hearts' of the *Brachiopoda* have anything at all to do with the circulating system; inasmuch as, in the first place, we are pretty confident that no 'arteries' are given off from the apices of the 'ventricles,' as has been said, and think it more than probable that they open externally. Secondly, there is no evidence at present, either indirectly from structure or directly from observation during life, that the so-called 'hearts' of any Brachiopod are contractile. Thirdly, the multiplication of these hearts to four in *Rhynchonella* seems not a little to militate against their cardiac nature.

We may fairly conclude then that, for the present, the nature of the circulatory system in the *Brachiopoda* must be regarded as an open question.

Mollusca Proper.—The doctrine first advocated by M. Milne-Edwards that in these Molluscs the circulating system is always more or less incomplete, has met with a wide acceptance, but also with no small opposition. So far as the minute transparent Molluscs, which can be submitted to direct microscopical observation during life, are concerned, we do not understand how the truth of M. Milne-Edwards's doctrine can be questioned. If the term 'venous lining' is to have any meaning but a non-natural one, assuredly it cannot be said with truth that anything of the kind exists in the sinuses of *Firoloides*, or of *Atlanta*, or in those of the *Pteropoda*.

In the larger *Mollusca*, on the other hand, much depends on the verbal question—what is the definition of a 'vein,' or 'venous membrane?' If a lamina of connective tissue separable from the surrounding parts be a venous wall, then doubtless the venous blood-channels of many Lamellibranchs and Gasteropods, and perhaps of all Cephalopods, are veins. If on the other hand a greater histological differentiation corresponding to that which exists in the *Vertebrata* be required to constitute a vein, evidence of the existence of anything of the kind in the greater proportion of the venous blood-channels of these creatures is at present wanting.

As regards the grosser structure of the circulatory apparatus in the *Mollusca* proper, it may be observed that, in the *Lamellibranchiata* there is either a single auricle and a single ventricle (*Ostræa*), a single ventricle and a double auricle (most Lamellibranchs), or two auricles and two ventricles (*Arca*). In all other *Mollusca*, except the *Cephalopoda*, there is a single auricle and a single ventricle. In the *Cephalopoda* the heart is essentially similar to that of the Lamellibranchs, inasmuch as it consists (in the *Dibranchiata*) of a single ventricle and of two contractile, so-called 'Branchio-Cardiac Veins,' which represent the two auricles of the Lamellibranchs. The circulation in these creatures is assisted (at least in *Loligo media*, in which we lately had opportunities of convincing ourselves of the fact), not only by the regular contraction of the so-called 'branchial hearts,' which are dilatations of the afferent branchial veins, but by that of the gills themselves.

The nature of the so-called Pericardium in the *Mollusca* has been much misunderstood. It is most important to recollect that in no case is there evidence of its being a closed serous sac, comparable to the pericardium of the higher animals. On the contrary, wherever it has been examined with sufficient care (*Lamellibranchiata*, *Pteropoda*, *Heteropoda*, *Nudibranchiata*, and *Cephalopoda*), it has been found to be a blood-sinus, which in some cases (*Pteropoda*, *Cephalopoda* (?), *Lamellibranchiata* (?), and *Heteropoda*) communicates with the exterior by the mediation of the renal organ.

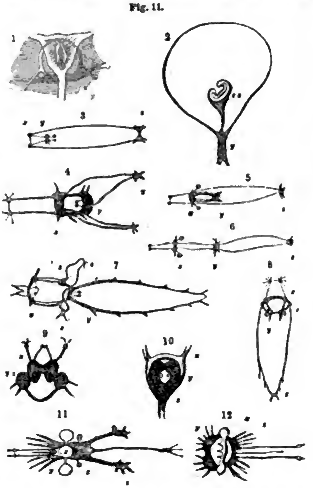
3. The Respiratory Function is performed by modifications of several distinct parts in the *Mollusca*.—1. By the general surface of the pallial cavity, which may be more or less adaptively modified: this kind of respiratory organ is to be found in the *Brachiopoda*, *Pteropoda*, and *Pulmonata*. 2. By specially modified parts of the walls of the pallial cavity into true gills: the whole tendency of the modification of form which these gills undergo is to increase their surface, and this end, generally speaking, is effected in one of three ways:—*a*. By the development of simple processes, as in *Patella* or *Atlanta*. *b*. The simple processes become ramified, so that the gill eventually consists of a stem with lateral branches, and these again may be subdivided into smaller and smaller branchlets—*Pectinibranchiata* and *Cephalopoda*. *c*. In the *Lamellibranchiata* each gill essentially consists of a stem with lateral undivided branches, and in such forms as *Trigonia* and *Nucula* (*fig.* 4, No. 3, *t*); the branchiæ have precisely this structure. In *Nucula* the lateral branches are comparatively short, but in *Trigonia* they are much longer. In *Pecten* they turn up at their free ends upon themselves and form a close loop, so that the free end takes a position near the fixed extremity; at the same time lateral processes are given off from the branches which unite and connect them together by a very loose and open vascular network. Each gill has thus become a flattened pouch, completely open, both laterally and superiorly; the sides of the pouches are very open, and are constituted superficially by the parallel produced and reflected portions of the gill-branches, and more deeply by the very loose network formed by the anastomosing lateral processes. Now, if we suppose that the reflected portion of the outer gill-pouch adheres to the mantle, while the reflected portion of the inner gill-pouch remains free on each side of the foot, but adheres to its fellow behind the foot, thus forming a complete partition across the pallial cavity, the deep vascular network becoming very close, and giving off vertical septa, by which the pouch becomes divided into successive antero-posterior chambers; then the result will be such a gill as we meet with in the Oyster, the *Unio*, and the great majority of *Lamellibranchiata*. The minute structure of these branchiæ strikingly resembles that of the branchial sac of the Ascidians, as has been long since pointed out by Siebold and others, and has given rise to the prevalent idea that the two organs are homologous. Structural resemblance, however, is in itself no true basis for the establishment of homologies, and here there are abundant means of demonstrating the resemblance to be simply analogical. 3. The 'branchiæ' of the *Nudibranchiata* again doubtless subserve respiration, but they are developed from the mesosoma, and contain the gastro-hepatic processes of the alimentary canal—features by which they are essentially distinguished from true gills. 4. The branchial sac of the Ascidians is, as we have shown, a modification of their pharyngial sac, resembling

the gills of fishes (especially *Amphioxus*) more than any structure to be found in other *Invertebrata* (the nearest approximation perhaps is in the cloacal branchiæ of Neuropterous Larvæ and of some Annelids). Like the wall of the gill-pouch of *Lamellibranchiata*, that of the branchial sac of the Ascidians is fundamentally composed of two elements—a superficial strong framework of branchial bars corresponding with the 'gill-branches,' and a deeper vascular network connecting these. The more obvious peculiarities in the structure of the branchial sac of Ascidians are produced by the plaiting of its wall into the so-called branchial folds, which may vary in number from four (*Cynthia*) to a number so great that the wall of the sac appears crimped (*Phallusia*).

4. The Renal Organs.—The existence of a special organ for the urinary secretion has now been demonstrated in all the great divisions of the *Mollusca* except the *Polyzoa* and *Brachiopoda*. The essential feature of the molluscan kidney is the deposition of a quantity of urinary excretion beneath a free surface, which in all aquatic *Mollusca* is, by some means or other, freely bathed with water. In *Phallusia*, for instance, minute rounded sacs, each clothed with a delicate epithelium, and containing one or many concretions, are scattered over the intestine immediately beneath the lining of the atrial cavity. It is probable that the constant current setting through this cavity carries away some portion of the secretion; but the greater part seems to remain, and eventually coats the whole parietal surface of the atrium. Here the secreting part of the apparatus appears to be out of proportion to the excretory. In the *Pteropoda* and *Heteropoda* the reverse relation would appear to obtain. In these animals, in fact, the concretions have not yet been detected; but the excretory apparatus is an elongated sac, which opens at one end by the side of the anus, and at the other communicates with the pericardial blood-sinus. The sac contracts rhythmically and with great rapidity, so that the blood in contact with its delicate walls must be very effectually washed. How far the internal communication with the blood-sinuses is available for the same end, is not at present understood. In the *Lamellibranchiata* (at least in *Unio*) the pericardial sinus is connected anteriorly with the internal cavities of two spongy bodies—the glands of Bojanus—in which a great quantity of concretionary matter may be detected; on the other hand, the outer surfaces of these glands lie in a cavity which admits the water freely by an opening placed anteriorly close to the genital aperture. This cavity clearly corresponds with the contractile sac of the *Pteropoda* and *Heteropoda*, but no evidence of contractility has yet been observed in it, or in the renal organ itself. Keber also denies that any direct communication exists between the interior of the kidneys and pericardial sinus and the outer sac, but it is somewhat difficult to make sure of this. However this may be, the arrangement of the kidney in *Unio* is very interesting, from its close analogy with what obtains in the *Cephalopoda*, where the 'serous cavities,' which open at the base of the gills and contain the peculiar spongy venous appendages attached to one of their walls, correspond exactly with the excretory sacs of the *Lamellibranchiata*, while the spongy appendages themselves are but the glands of Bojanus in another form. Our limits will not permit of the description of the structure of the renal organ in *Nudibranchiata* and *Pectinibranchiata*, but it might readily be shown to resemble in all essential points that of the *Lamellibranchiata* and *Cephalopoda*.

5. The nervous system of the *Mollusca*.—The *Molluscoida* and the *Mollusca* respectively present a remarkable agreement in the general arrangement of their nervous apparatus, which consists in the *Polyzoa* and *Ascidioida* of a single ganglion placed in the midst of the neural region of the body; in the former case between the oral and anal apertures, in the latter between the oral and cloacal apertures. In the *Brachiopoda* the nature of the nervous system is only known with certainty in the *Terebratulidæ*, where it consists of a single elongated ganglion having the same position as in the *Polyzoa*, sending on each side a commissural branch to surround the mouth, and giving off numerous branches to the mantle. In the *Brachiopoda* no distinct organs of sense have yet been observed, but in the Hippocrepian *Polyzoa* a little tongue-shaped organ projecting from the lophophore close to the ganglion, probably represents the 'languet' of the Ascidians, an organ whose function is not known, but which probably performs, in conjunction with the ciliated sac, the part of an organ of sense. The 'ciliated sac' is, as its name implies, essentially a small ciliated pouch placed between the oral end of the hypopharyngeal band and the circlet of tentacles. In the *Cynthiæ*, *Phallusiæ*, &c., it becomes enlarged and twisted upon itself, so that its margin frequently presents a very elegantly convoluted pattern. *fig.* 11, 2, *c s*. In this form it was described by Savigny as the 'Tubercule Antérieure.' In *Appendicularia* and in the *Salpæ* an otolithic sac is also attached to the ganglion.

Fig. 11.



Diagrams of the Central Nervous System.—1, *Waldheimia*; 2, *Phallusia*; 3, *Lamellibranchiata*; 4, *Pteroceras*; 5, *Atlanta*; 6, *Firola*; 7, *Patella*; 8, *Bullæa*; 9, Eolis (after Alder and Hancock); 10, *Criseis*; 11, *Ommastrephes* (Hancock); 12, *Nautilus* (Owen). The circles with central dots represent the auditory vesicles.

cs, ciliated sac; *x*, cerebral ganglia; *y*, pedal ganglia; *z*, parieto-splanchnic ganglia.

In all the *Mollusca* proper the nervous system presents a remarkable uniformity as to its central elements, and remarkable differences in their arrangement. There are essentially three pair of ganglia:—

1. The Cerebral, which supply the eyes and olfactory organ, and give off the nerves to the buccal ganglia where they exist.

2. The Pedal Ganglia, which supply the foot with nerves, and always, save in *Heteropoda* and perhaps some Nudibranchs (where the exception is very possibly only apparent), give off the nerves to the auditory vesicles.

3. The Parieto-Splanchnic Ganglia, which supply the hæmal region of the body and many of the viscera.

There are never more than two pedal and two cerebral ganglia, but the parieto-splanchnic centres would seem to be capable of almost indefinite multiplication. These multiplied centres however may be reduced to two classes—Parietal Ganglia, which give nerves to the sides of the body, and Visceral Ganglia, which supply the heart, branchiæ, &c.

The accompanying diagramatic figures of the nervous systems of Molluscs of all classes, in which the Cerebral Ganglia are marked *x*, the Pedal *y*, and the Parieto-Splanchnic *z*, will render the great changes of position, while the essential parts remain the same, obvious without further description.

For the organs of sense of the *Mollusca* proper we must refer to the articles Conchifera, Gasteropoda, &c.

4. *The Development of the Mollusca.*—Those conceptions which the philosophical anatomist comprehends under the name of Archetypes, or Common Plans of Animal Forms, must always present a certain value and interest to all who regard anatomy as something more than an exercise of the

memory; but the amount of the value of such conceptions, and of their beneficial influence on the forward progress of science, depends entirely on the extent to which they embrace the whole anatomical peculiarities of a group of animals. Now animals, like all living beings, not only are, but become; and their anatomy, in the widest sense of the term, is to be obtained, not merely by the study of their structure (which is their final anatomy), but also by that of their development, which is the anatomy of the successive states through which they pass in attaining their final condition. Now the Archetype or Common Plan professing to be the embodiment of the most general propositions which can be enunciated with regard to the anatomy of the group, its validity will depend upon its embracing both structural and developmental facts. If it neglect either of these, it will be theoretically imperfect, and will run the risk, at any rate, of being practically erroneous. Before the publication of Von Bär's great work, and unfortunately too often since then, the extant notions of archetypes, unity of organization, &c., were open to precisely this objection, their authors having contented themselves with devising hypotheses to fit the facts of adult structure, without concerning themselves whether their hypotheses would or would not also fit the facts of development. Hence the infinite variety of baseless speculations of the 'Nature-philosophie' school; in botany, the unlimited and quite gratuitous demands upon 'abortion and fusion' of parts which Schleiden has so justly ridiculed; in zoology such notions as that a Cephalopod is a vertebrate animal doubled upon itself, that an Insect is a vertebrate animal with free ribs, &c.

It is precisely on this footing however that at present our Common Plan or Archetype of the *Mollusca* stands. We have before us the evidence which might perhaps have satisfied Geoffroy and Oken. Given our plan and certain laws of modification, and all known molluscan forms may be derived from it; but it remains to be seen how far the evidence which would alone have satisfied Von Bär, the evidence of development, justifies the view which has been taken; how far, in fact, our hypothesis is capable of being elevated to the dignity of a theory.

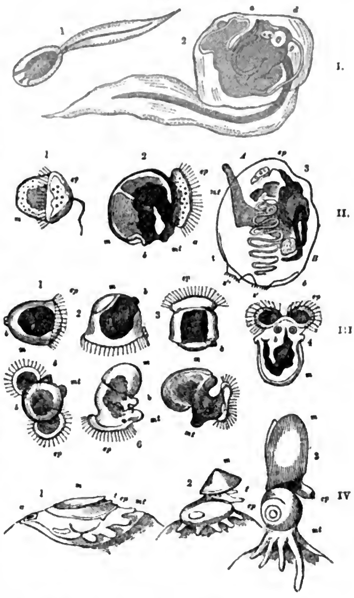
To this end it is by no means requisite to show that every Mollusc has at one time the archetypal form, and is subsequently modified into its persistent condition; to maintain such a proposition it would be necessary greatly to simplify (though not essentially to alter) the archetype, and thus to do away with a great part of its utility in exhibiting the tendencies of every Mollusc. All that appears to be really necessary is to show:—first, that no molluscan form presents features in its development which cannot be reconciled with the archetype; and secondly, that the kind of modifications which have been supposed to take place in the conversion of the archetype into the special types are such as actually occur.

The first stage of development of the *Mollusca* resembles that of other animals. The yelk, at first a homogeneous mass, undergoes the process of division to a greater or less extent, its outermost layers eventually becoming converted into a blastodermic layer, the plastic material out of which the future animal is modelled.

In the *Molluscoida* the rounded or oval embryo thus formed either becomes covered with cilia and swims away as a free form (*Polyzoa Brachiopoda?*), or it gives rise from one portion of its surface to a long fin-like muscular process (*fig.* 12, I. 1.), by whose rapid vibration it is propelled (*Ascidioida*, in great part). With what organ of the *Mollusca* is this 'tail' or 'fin' of the Ascidian larva homologous? This is a very difficult point to ascertain, as the tail arises before the regions of the animal are differentiated. At first sight one might be tempted to consider it as a modification of the velum of the embryos of the *Mollusca* proper; but its relation to the middle of the neural surface, and its insertion close behind the ganglion, which may be readily observed in later stages, appear rather to indicate that it is the homologue of the foot proper, and probably of the metapodium, as this is the portion of the foot which in the *Mollusca* appears first.

In the further development of the *Molluscoida* there can be no question that, as regards the *Polyzoa*, the neural region soon almost ceases to grow, the further increase of the body taking place by the disproportionate development of the hæmal region, which constitutes almost the whole of the body of the adult animal, and presents the surface by which it becomes fixed. Again, simple inspection is sufficient to show that the intestine extends into the great abdomen thus developed; that it acquires herewith a neural flexure; that the tentacles are produced from the margins of its oral aperture; and that the pharynx acquires a large proportionate size.

Fig. 12.



Development of—I. *Clavelina*. II. *Lamellibranch* (Lovèn). III. *Antiopa*. IV. *Sepia* (Kölliker).

a, oral aperture; *b*, anal aperture, or extremity of the intestine; *d*, cloacal aperture and atrium (Ascidians); *ep*, epipodium; *mt*, metapodium; *g*, hypopharyngeal band (Ascidians); *m*, mantle; *s'*, *s"*, anal and branchial siphons (*Lamellibranchiata*); *t*, branchiæ; *A*, anterior adductor (*Lamellibranchiata*); *B*, posterior adductor.

In the *Ascidioida* the neural region remains in a like rudimentary condition, the hæmal region undergoing a similar disproportionate growth; but it is next to impossible to ascertain from the study of development whether this hæmal outgrowth is formed behind the anus or before it, inasmuch as the intestine has acquired its complete hæmal flexure when its parts are first distinguishable.

In the youngest state in which the different organs are distinguishable, the intestine is almost entirely bent up on to the hæmal side of the body; the pharynx is a wide cavity (not wider proportionally however than that of a Polyzoon); the tentacles spring from its margin in exactly the same relative position as in a Polyzoon, and there is no atrial cavity. By degrees the pharyngeal cavity enlarges still more, the tentacles remaining comparatively rudimentary (*fig.* 12, I. 2). Contemporaneously with these changes, the end of the intestine becomes more and more bent down towards the neural surface, and a cavity, which in another Mollusc would be the mantle-cavity, appears around its extremity; a single or two lateral apertures (subsequently uniting into one) are soon formed, and allow this cloacal portion of the atrial cavity to communicate with the exterior. At the same time the atrium extends on each side of the enlarged pharynx, detaching it from the side of the body, and enveloping it just as a serous sac invests the surface of a viscus. Ciliated apertures (at first one or two only on each side) now pierce the wall of the enlarged pharynx, and increase in number until it assumes the structure of the perfect branchial sac. Finally, it depends upon the proportional development of the branchial sac, and of the post-abdomen, whether the adult Ascidian shall belong to the Branchial or to the Intestinal subtype.

We unfortunately know hardly anything of the development of the *Brachiopoda;* but so far as the *Polyzoa* and *Ascidioida* are concerned, it is obvious that the hypothetical modifications of the Archetype do in fact faithfully represent the actual course of development. (See however the remarks, further on, as to the nature of the post-abdominal outgrowth in hæmal *Molluscoida* and *Mollusca.*)

Development of the Neural Mollusca.—The *Lamellibranchiata.*—The first step towards the production of the organs from the blastodermic layer in this group is the development of one portion of its surface into a disc with mixed edges, provided with very long cilia (*fig.* 12, II. 1). Next in the inner substance of the germ the intestine appears as a solid mass, bent upon itself, towards what the eventual development of the foot proves to be the neural surface; its oral portion being placed immediately behind the ciliated disc (2). Finally, the hæmal surface behind the ciliated disc gradually gives rise to the two lobes of the mantle, upon each of which a thin transparent pellicle, the first rudiment of one valve of the shell, eventually appears. As development goes on (3), the neural surface between the primarily approximated oral and anal apertures becomes converted into the large foot and mesosoma of the Lamellibranchs, which serve to lodge the principal mass of the viscera, the abdomen never becoming developed into a great process as in Gasteropods. The great posterior adductor makes its appearance on the neural side of the intestine, and by its development the latter is thrown up so as almost to appear to have a hæmal flexure. The gills next appear as processes of the body within the mantle-cavity, and therefore have not the remotest homology with the pharyngeal branchial sac of Ascidians, any more than the two siphonal apertures which are essentially dependent upon the union of the two lobes of the mantle with the gills and with one another have anything to do with the oral and cloacal apertures of the Ascidians.

Finally, it is said that the ciliated disc becomes metamorphosed into the labial palpi. This is a point well worthy of further investigation; for the arrangement and form of the appendages in *Pecten* leads us strongly to believe, as we have said, that they are the homologues of the tentacles in the *Ascidioida* and *Polyzoa.* On the other hand, there can be no doubt that the ciliated disc of Lamellibranchs is homologous with the ciliated lobes of the Gasteropod embryos; and these, there is every reason to believe, are nothing but the specially modified anterior portion of the epipodium. The tentacles of the *Polyzoa* would thus come to be the homologues of the epipodium; but the validity of the whole chain of reasoning obviously depends upon whether the ciliated disc does or does not become metamorphosed into the palpi—a position which the more requires confirmation as in the *Gasteropoda* the ciliated lobes are now known entirely to disappear. However this may be, what has been stated with regard to the main steps in the development of the *Lamellibranchiata* fully confirms the hypothetical derivation of the type from the Common Plan.

Pteropoda and *Pulmonata.*—In the primary stages of their development no important distinction is to be drawn between the members of this division and those of the last, except that in the *Pteropoda* the ciliated disc is replaced by two ciliated lobes, one on each side; and in the Pulmonate embryos by a contractile expansion—their so-called 'yelk-sac.' The primarily neural flexure of the intestine in the *Pulmonata,* and the development of their mantle in front of the anus (that is, the development of an abdomen), are fully demonstrated by late observations upon their embryogeny. It is important to remark, that in the *Pteropoda* the ciliated lobes of the embryo do not become the lateral alæ of the adult form, but are a production of the anterior part of the epipodium, which usually disappears in the adult.

Cephalopoda.—In this group the embryo attains a much higher development before leaving the egg, and the modifications which its primary form undergoes are extremely instructive. The first organs of the Cephalopod which appear on the germ-disc are (*fig.* 12, IV. 1) the mantle, which is simply a thickening in the middle of the hæmal surface with somewhat raised edges; around this is a surface representing the mesosoma and foot, at one end of which is the mouth, and at the other or anal extremity are placed two little processes, the rudiments of the gills. Again, on each side of the mantle the mesosoma is produced into a longitudinal ridge occupying the precise position of the epipodium. As development goes on, the hæmal surface occupied by the mantle grows out, and becomes a prominent sac, whose free edges detaching themselves more and more for only a short distance anteriorly, but for almost the whole length of the sac posteriorly, give rise to the mantle cavity (IV. 2). The intestine passing into the abdomen thus formed becomes more and more bent upon itself, until at last it makes a complete loop, open towards the neural side. With all this the epipodium, remaining rudimentary in its anterior region, becomes a free process on each side posteriorly (representing for a time the alæ of a Pteropod), but after a while these processes unite, and form a hollow canal, the Funnel. The changes undergone by the margins of the foot are not less remarkable; they are produced from behind forwards into four or five digitations on each side, the anterior pair of which stretch in front of the mouth and unite over it; the digitations elongate more and more, and the mouth is in consequence at last placed in the centre of a sort of inverted cone, formed by the foot and its prolongations—the acetabuliferous arms (IV. 3).

Such may be taken as a very short abstract of Professor Kölliker's most valuable 'Entwickelungs-Geschichte der Cephalopoden,' and it is needless to point out that it is our hypothetical process of modification of the Archetype into the Cephalopod type, in other words.

The Hæmal Mollusca.—It is unnecessary to consider the development of the separate families of these Molluscs, as the process, as far as we know, is the same in all. We will take that of a Nudibranch (*Antiopa cristata*) as a type, having recently had occasion to go over it with especial reference to the points here under consideration.

The end of the process of yelk-division (which, we may remark in passing, results, not in the formation of 'nucleated cells,' but simply in that of smaller and smaller packets of yelk-granules) in this Mollusc, is the formation of a blastodermic layer investing the remainder of the yelk. The whole embryo next becomes more or less bell-shaped, a sort of rim, with very long cilia, appearing at the broader end, while a minute prominence is seen at the opposite extremity (III. 1). A straight line drawn from this prominence to the centre of the surface, surrounded by the rim, would have the body of the creature symmetrically disposed around it. On the one surface is a deep pit, formed by the edges of the blastodermic layer; on the opposite a delicate transparent cup, the rudiment of the future shell, and the indicator of the position of the hæmal surface and mantle appears (III. 3). By degrees the hæmal surface becomes more and more prominent, and the shell larger. With this the prominence above referred to is thrust more and more towards the right side, so that its position becomes quite asymmetrical (II. 3, 5). At the same time the ciliated rim from being circular is produced laterally into a lobe on each side—the ciliated lobes; the metapodium makes its appearance behind these as a small prominence; and a delicate operculum is formed upon the metapodium. The aperture of the mouth may now be observed behind the ciliated lobes and between them and the metapodium; and the internal substance of the germ is seen to present the outlines of an alimentary canal, consisting of a rounded gastro-hepatic mass and a narrower intestine, which turns abruptly forwards and upwards, to end on the right side more or less hæmally in the before-mentioned prominence, whose position has become thus extensively altered. The mantle cavity has begun to appear as a sort of pushing-in of the integument around the anal prominence.

Two things are obvious in this series of developmental changes. In the first place, the primary symmetricality of the embryo; secondly, the gradual asymmetry brought about by the development of that portion of the body which bears the shell, and which is a portion of the hæmal surface.

Now this is perfectly in accordance with our hypothetical derivation of the Hæmal *Mollusca* from the Archetype, and the only point which remains to be proved is, that this over-developed hæmal surface is to be considered as a post-abdomen, that is, as a post-anal portion of the hæmal surface.

This view has been taken in deriving these forms from the Archetype, because it is much the more readily comprehensible, and has many structural facts in its favour; but we are by no means prepared to assert that the post-anal position of the hæmal outgrowth in the Hæmal *Mollusca* may not be a secondary production, the result of a gradual twisting to one side and backwards of a primarily pre-anal outgrowth of the hæmal surface. The facts just detailed with regard to the development of *Antiopa* would favour this view; but, on the other hand, sufficient attention has not been paid to the process of development of other *Gasteropoda* to decide whether it is in these respects identical with that of the Nudibranchs or not. The anatomy of adult Pectinibranchs and Pteropods would lead one to believe that in these forms, at any rate, the hæmal flexure has been direct and primary; and it may be that a careful comparative study of development of the Pectinibranchs and Nudibranchs will lead to the translation of the Nudibranchs to the Neural division, the final hæmal flexure turning out to be a secondary modification. In the absence of sufficiently conclusive studies of this kind, however, we prefer to be guided by structural considerations, and thence to retain the Nudibranchs provisionally among the Molluscs with a hæmal flexure. It will probably be granted that the doctrine of a Common Plan among the *Mollusca*, which has been advanced, will have its value as a guide through the mazes of their varying organisation—even although the details of this first sketch should turn out to be even in many points erroneous.

MOLOSSUS. [Cheiroptera.]

MONASITE, or MONAZITE, a mineral with the following composition:—

Oxide of Cerium	26·00
Oxide of Lanthanum	23·40
Thoria	17·95
Phosphoric Acid	28·50
Oxide of Tin	2·10
Protoxide of Manganese	1·90
Lime	1·70
	101·55

It occurs in modified oblique prisms. It has a perfect and brilliant basal cleavage. It is only found in small imbedded crystals. It has a brown or brownish-red colour; subtransparent, or nearly opaque. The lustre vitreous, inclining to resinous. It is found near Platoust in Russia.

MONK, DR. JAMES HENRY, Bishop of Gloucester and Bristol, was born in 1784, and received his early education at Norwich Grammar School and the Charter House. He subsequently entered at Trinity College, Cambridge, of which he became Fellow and Tutor. In 1808 he was chosen to succeed the celebrated Richard Porson as Regius Professor of Greek in the University. It was mainly owing to his efforts that the present system of classical honours at Cambridge was established, and the Pitt Press founded. As a scholar of Porson's school he is best known for his editions of the 'Alcestis' and 'Hippolytus' of Euripides, and in the literary world for his 'Life of Bentley,' and the 'Adversaria' of Porson. He was appointed Dean of Peterborough in 1824, and consecrated Bishop of Gloucester in 1830; the see of Bristol was added to his charge in 1836. He died June 6, 1856.

MONKEY-FLOWER. [Mimulus, *S.* 2.]

MONRADITE. [Mineralogy, *S.* 1.]

MONSTROSITY, a term applied to those individuals amongst plants and animals which present any irregularity in their general form or the form of the organs of which they are composed.

The term Monstrosity is often applied to those anomalies only which are apparent externally, and which produce more or less deformity; but, in a scientific point of view, it includes every variation, either external or internal, in any organ, from its most general or natural conformation; and it is in the latter sense that we shall here treat of it.

Monsters were formerly regarded as sports or prodigies of nature, and these ignorant notions, with respect to their true character, continued prevalent among all classes of people until the commencement of the last century, and are even now held by the uninformed. By the physiologist however the study of the various anomalies of organisation in plants, animals, and man, are now viewed as a branch of natural science. An accurate anatomical examination of monstrosities and a minute acquaintance with embryology and structure, have shown that the formation of these different imperfect beings is governed by the same laws which preside over the formation of perfect individuals; the only difference being, that the process of development in the former cases has been perverted, or arrested, or increased in its course during the growth of the embryo or germ.

Monstrosities in the animal kingdom are treated of under the head Monster. We shall here treat of monstrous growths in plants. The study of such growths is not a mere matter of curiosity, as their structure tends to throw light on the true laws of development amongst plants. Although direct observations are more easily made on plants than on animals for the purpose of ascertaining the facts of their history during growth, it is nevertheless interesting to obtain a confirmation of these facts from the forms which monsters assume, these forms in the majority of cases being permanent conditions of the stages of growth through which plants pass. In these forms nature presents us with as it were experiments to test the truth of the general laws of morphology.

This subject can perhaps be best illustrated by reference to special instances. To begin with the Leaves. [Leaf.] In the history of the normal development of the leaves, it is found that they are always arranged in an alternate manner, one leaf above the other, but subsequently in many plants, and even whole families, the leaves become opposite or whorled. In the case however of individuals it not unfrequently happens that the leaves of opposite or whorled-leaved families of plants become alternate. Thus an instance is recorded of *Hippuris vulgaris* (Mare's-Tail), which in its normal complete development has whorled leaves, presenting its leaves arranged alternately in a spiral upon the stem. (Lankester in the 'Report of British Association,' 18th meeting, p. 85.)

In the conversion of the leaf-bud into the flower, one of the earliest changes that takes place is the conversion of the leaves into the organs called Bracts. [Bracts.] Instances are very often seen of monstrous forms of plants in which the leaves are not converted into bracts but retain their leaf-like character. This frequently occurs in the species of *Plantago*, giving the inflorescence a singularly different character to that which occurs under normal circumstances.

The leaf-bud is always seated in the axil of the leaf, but in the case of the bracts forming the involucre of the *Compositæ* neither leaf-buds nor flower-buds are seated in their axils; but in the case of the monstrous variety of the common daisy [Bellis], known by the name of Hen and Chickens, flower-buds are developed in the axils of the bracts.

Next after the bracts the Sepals are formed in the flower-bud. [Calyx.] It not unfrequently happens that during the growth of cultivated plants, the sepals are found assuming the appearance of leaves. This is especially the case with the cultivated roses. This tendency to recur to the condition of the leaf is sometimes a normal tendency of plants. Thus, in the case of *Calycophyllum Stanleyanum*, one of the sepals after the corolla drops off begins to grow into a beautifully rose-coloured leaf. Other instances of this kind are seen in the order *Cinchonaceæ*. In plants with inferior fruits [Fruit] the germen seems to contract an adhesion with the lower part of the sepals which thus produces the peculiar character of these fruits, such as the gooseberry, the currant, the apple, and the pear. In these fruits it is not uncommon to find amongst them leaves growing from the surface of the fruit, indicating the tendency of this sepallary part of the fruit to assume the condition of the leaf. The most remarkable example of this tendency of the sepal to assume the condition of the leaf has been observed in the Goat's-Beard (*Tragopogon pratensis*), in which the pappus surrounding the minute flower which represents the calyx has been found to have assumed the character of the leaf.

It frequently happens where one of the parts of a flower have a tendency to relapse to the foliar condition, that the whole of them partake of this character. Thus Mr. Austen has recorded very accurately the changes observed in a monstrous form of the White Clover (*Trifolium repens*). The following changes were observed in his specimens:—

"1. Calyx.—The calyx-teeth often rise into single leaves, but when compound leaves are formed the division seems to be as follows: the two large equal teeth, which are opposite the vexillum, form one serrate leaf, and another leaf is formed from the three remaining teeth.

"2. Corolla.—The part which here most frequently reverts to a leaf is the vexillum, and this is a perfect one. Of these leaflets, the alæ are often seen forming simple leaves, as also the carina; but their perfect union into a ternate leaf is less common.

"3. Stamens.—Whatever changes the flower may exhibit, these organs are always in a state to be recognised, and their reversion to leaves less frequent than in any other part; so that there is more difficulty in determining the number of leaves which go to form this portion. As two ternate leaves form the calyx and corolla, it might be supposed that the stamens were constructed out of the same number. The figures represent cases of a stamen reverting to a leaf with a true stamen attached to its stalk on either side; the single anterior stamen, where it reverts, seems always disposed to form more than a simple leaf; and it is therefore probable that the ten stamens (9 + 1) may be formed out of four sets of ternate leaves.

"4. Pod.—From the well-known character of the pod and pistil in *Leguminosæ*, it might be expected that instances of reversion to leaf would be most frequent in this part of the flower; and a series might easily have been produced which would have represented it in every stage of passage; some of these were given. From these it would appear that the pod is not formed of a whole compound leaf, as either two scales, or two abortive leaves, are constantly to be seen at the base of the imperfect pod on either side; the pod is therefore usually formed out of the middle leaflet. In one flower-head however each division of the pistil-leaf had become a pod, with a distinct stem and the ovules inwards.

"Ovules seem to be produced only when junction of the edges of the pistil-leaf takes place; in other cases leaflets are produced in the place of ovules.

"In cases where every other part of the floral series has been regularly developed, the Pistil occasionally will take the form of a perfect ternate leaf, and then the axis of the plant is continued through the flower." (Austen, 'British Association Report,' 19th meeting.)

Mr. Austen has likewise recorded in the same place an instance in which the staminiferous flowers of the Common Maize (*Zea Mais*) were converted into pistils. In this case we have an instance of the tendency of an organ not to relapse to a lower type, but to assume a higher type of development.

It is very frequently the case that stamens relapse to the condition of petals. This is the case with most of the double flowers of our gardens: and in the case of the rose, the pæony, the bachelor's-buttons, and others, the anthers may often be found tipping the petaloid bodies in the centre of the flower. This is seen as a normal condition in the water-lily.

The recurrence of the pistil to the form of the stamen and corolla is not so frequent, as its assuming the form of the leaf. In the double cherry of our gardens this condition of the pistil is frequently presented. It is this same tendency which is seen in monstrous oranges, in which this fruit is split up into the same number of parts as it possesses carpellary leaves. [FLOWER.]

The most central organ of the plant is the Seed, and its development is the great object of the production of the flower. In the seed is the young plant. The seed is however but a changed bud, and during the process of its development it sometimes recurs to the condition of the leaf-bud, and produces instead of an embryo a branch.

These instances will be sufficient to show how instructive the study of vegetable monstrosities really is. Many such have been recorded, and one of the best resumés of the whole subject will be found in Moquin Tandon's 'Teratologie Vegetale.' [METAMORPHOSIS OF ORGANS.]

MONTACUTA, a genus of Acephalous Lamellibranchiate *Mollusca*, belonging to the family *Kelliadæ*. The shell is small, thin, equivalve, inequilateral, transversely oblong or obliquely oval, surface smooth or concentrically striated, or rarely radiatingly furrowed; beaks inflected; inner margins smooth; hinge-margin with a trigonal incision and cartilage pit, and a pair of diverging laminar teeth in one or both valves; ligament internal; muscular scars suborbicular; pallial impression simple; animal oblong, its mantle freely open in front with simple margins, not furnished with siphonal tubes posteriorly; a single siphonal orifice, or none; foot, very large, strong, and broad, furnished with a byssal groove. Such are the characters of this somewhat unsatisfactory genus as given by Messrs. Forbes and Hanley. They enumerate three species as British—*M. ferruginosa*, *M. bidentata*, *M. substriata*.

MONTAGU, BASIL, Queen's Counsel, was born April 24, 1770, in London. He was a natural son of John Montague, fourth earl of Sandwich, and was brought up in his house. His mother was Miss Ray, who was shot in 1779 in the Piazza of Covent Garden, by the Rev. Mr. Hackman, who had fallen in love with her, and destroyed her in a fit of jealous frenzy. Basil Montagu received his early education at the Charterhouse School, London, of which the Earl of Sandwich was one of the governors. In 1786 he was sent to the University of Cambridge, where he was soon distinguished for his love of literature, and where he remained till after he had taken his degree of M.A. His father died in 1792, leaving him a competent income, of which, however, he was deprived by a suit in the Court of Chancery. Having selected the law as a profession, he entered himself of Gray's Inn, where he was called to the bar in 1798, but some years afterwards he became a member of Lincoln's Inn. After he had settled in London he formed an intimacy with Coleridge and others of that literary connection, and became so zealous a convert to the opinions of Godwin that he had serious thoughts of relinquishing the profession of a lawyer, as 'injurious to society in proportion to the power and attainments of the individual.' Sir James Mackintosh, however, with whom he travelled for some years on the Norfolk circuit, convinced him that the dogma of Godwin was not founded in truth, and he continued in the legal profession. He never rose to eminence as a pleader, but having devoted his attention chiefly to the bankrupt laws, acquired a high reputation and good practice in that department.

His first work was 'A Summary of the Law of Set-Off, with an Appendix of Cases argued and determined in the Courts of Law and Equity upon the Subject,' 8vo, 1801. It had not appeared many weeks before it was noticed with approbation by Sir Vicary Gibbs, who thus extended the practice of the young lawyer, then almost unknown. His most important legal work was 'A Digest of the Bankrupt Laws, with a Collection of the Statutes, and of the Cases argued and determined in the Courts of Law and Equity upon that Subject,' 4 vols. 8vo, London, 1805, 2nd edition, 1811. This 'Digest' became a standard work, and many other editions of it were published. He published also 'Law and Practice in Bankruptcy,' 2 vols. 8vo, with 'Supplement,' 1 vol.; 'The Law of Partnership,' 8vo; and 'The Law and Practice of Parliamentary Elections,' in conjunction with Mr. W. Johnson Neale, 8vo, 1839. His other legal works and compilations, partly in his own name, partly in conjunction with others, are too numerous to be quoted. Lord Erskine, during his brief tenure of the office of lord chancellor (1806-7) made Mr. Montagu a commissioner of bankrupts. While holding this appointment, and deriving a considerable income from it, he became so convinced of the delay and expense to suitors of this mode of administering the law, that he published a yearly detail of these injurious results, which, together with his statements before a Committee of the House of Commons, finally put an end to those commissionerships. A new law was made (1 & 2 Wm. IV. c. 56), under which three judges constituted a Court of Review, and six commissioners exercised functions similar to those previously exercised by the commissioners under the great seal. Mr. Montagu was very much dissatisfied with the new law, but he accepted the office of accountant-general in bankruptcy, which he held during ten years. While in this office he demanded from the governors of the Bank of England interest for the bankruptcy moneys in their possession, which had never previously been paid. His demand was at first resisted, but ultimately he obtained 20,000*l.* for the bankruptcy fund.

The works and compilations by which Mr. Montagu is best known to general readers are the following:—'Selections from the works of Taylor, Hooker, Hall, and Lord Bacon, with an Analysis of the Advancement of Learning,' 12mo, 1805. The analysis is carefully executed, and very useful for those who wish to study Lord Bacon's treatise. 'The Opinions of different Authors on the Punishment of Death,' 3 vols. 8vo, 1809-13. In furtherance of these 'Opinions,' he formed a society for "the diffusion of knowledge upon the punishment of death." His efforts for the abolition of hanging for forgery and other crimes without violence, in conjunction with those of Sir Samuel Romilly, Mr. Wilberforce, and others, were at length rewarded by complete success. 'Inquiries into the Effects of Fermented Liquors, by a Water-Drinker,' 8vo, 1814. 'The Works of Francis Bacon, Lord Chancellor of England,' 16 vols. 8vo, London, 1825-34. This work was commenced while he was at the university by the translation of Bacon's Latin works, in which he was assisted by Archdeacon Wrangham and others.

The 16th volume, in 2 parts, contains Montagu's 'Life of Bacon,' which, though not distinguished by much power of thought or beauty of style, is a useful exhibition of the leading events and labours of Bacon's life, active and contemplative. 'Essays and Selections, by Basil Montagu,' 12mo, 1837. He published altogether about 40 volumes, and is stated to have left about 100 volumes of manuscripts, a Memoir of himself and his contemporaries, and a Diary.

Basil Montagu assisted in the establishment of several mechanics institutes, and frequently gave lectures in them. He seems to have been not only an industrious and useful lawyer, but an honest, liberal-minded, and benevolent man. He died November 27, 1851, at Boulogne, in France. At the age of thirty-five he had been twice a widower, both wives having died in childbirth, leaving him four children. In 1808 he married the widow of Thomas Skipper, Esq., who survives him, and by whom he had four children. Of his eight children only a son and daughter are living. His daughter-in-law, Miss Ann Skipper, is the wife of Mr. Procter (Barry Cornwall).

MONTEREY. [CALIFORNIA, *S.* 2.]

MONTGOMERY, JAMES, was born at Irvine in Ayrshire, where his father was a Moravian preacher, on November 4, 1771. When only four years of age his parents removed to Grace Hill in the county of Antrim, Ireland, where he was first placed at school. In 1778 he was sent to the Moravian settlement at Fulneck near Leeds, in Yorkshire, to complete his education, and in 1783 his father and mother went to the West Indies as missionaries, where they died in 1790. At Fulneck the instruction was excellent, but the seclusion was monastic, and James Montgomery, during his ten years' residence there, distinguished himself for nothing "but indolence and melancholy." He had taken a fancy for poetry, which was utterly forbidden in the school; he had clandestinely read 'Robinson Crusoe,' which had greatly interested him; and he wrote, when only thirteen, some poor imitations of Moravian hymns. Though characterised by his teachers as indolent, he had contrived to procure and read a copy of Cowper's poems, and these he thought he could excel, so he wrote a mock-heroic poem of a thousand lines, and commenced a serious epic, to be called 'The World,' and this before he was fourteen. He also wrote other small poems; but his teachers, who wished him to become a Moravian preacher, were dissatisfied with his inattention to his studies. In the school-diary of July 3, 1787, it is recorded that, as "J. M., notwithstanding repeated admonitions, has not been more attentive, it was resolved to put him to a business, at least for a time." A situation was soon afterwards found for him with a shopkeeper at Mirfield. He was probably not much more attentive there, for it is stated that he continued to write poetry and compose music till June 1789, when he ran away. He had only a trifle of money when he started; but on reaching Wentworth, he presented one of his smaller poems to Earl Fitzwilliam, who gave him a guinea. He then settled for a twelvemonth at Wath-upon-Dearne as assistant in a general shop. The brethren at Fulneck discovered him, and wished him to return; but he refused. He continued in this situation, silent and recluse, but no doubt pondering over thoughts for which as yet he wanted fitting powers of expression.

He continued to write, and at the end of the year having sent a volume of manuscript poetry to Mr. Harrison, the publisher in Paternoster-row, London, followed it himself. Mr. Harrison declined publishing the poems, but engaged him as shopman. In London he led the same solitary and retired life as in the country. His sole amusement was writing, and he is stated to have never entered a theatre, or even the British Museum, to which it might have been thought his habits and disposition would have led him. While in London his first production, a tale in prose, entitled 'The Chimera,' appeared in 'The Bee,' an Edinburgh periodical work, in November 1791. He also wrote a novel, which he offered to Mr. Lane, of Minerva-press celebrity, who declined it, because the characters swore too much. The novel was never published, but the objection greatly hurt the religious feelings of Montgomery, who thought he had only imitated Fielding and Smollett. This disappointment made him resolve to return to his old shopkeeping occupation at Wath. He did go, but not to remain long. Towards the end of 1792 (having replied to an advertisement for a clerk), he entered the service of Mr. Joseph Gales of Sheffield, who was printer, bookseller, auctioneer, and editor, publisher and proprietor of a newspaper, 'The Sheffield Register,' which advocated principles at that time designated as revolutionary. Montgomery formed an attachment to his employer; wrote political articles for the paper; and when Gales, learning that a warrant had been issued to apprehend him for treason, fled to America, he started a new weekly paper, on "peace and reform" principles. The first number of 'The Sheffield Iris,' appeared on July 4, 1794, which he continued to edit till September 27, 1825, and it maintained its existence, with a few changes, till January 1857. The 'Iris' was at first very successful, but it was a singular position for Montgomery to fill, with his recluse habits, his mild and almost timid feelings, his dislike to the practical details of business, and his poetical and refined taste. He evidently felt it to be so. "I hate politics," he said, "and would as soon meet a bear as a ledger." Almost immediately after starting the newspaper, a poor man employed him to print a few quires of a ballad, for which he was charged eighteen-pence. It was 'On the Fall of the Bastille,' as mere doggrel as can be well conceived; but the attorney-general, Sir John Scott (afterwards Lord Eldon), discovered it to be seditious, indicted the printer, and in January 1795 he was tried at Doncaster, found guilty, fined twenty pounds, and sentenced to three months' imprisonment. He gave an account in his newspaper of a riot in Sheffield, to quell which the military had been called in and had fired on the people; for this, in 1796, he was again tried, again found guilty of sedition, fined thirty pounds, and sentenced to six months' imprisonment. During his confinement, which was in York Castle, he wrote a small volume of poems, entitled 'Prison Amusements,' which was published in 1797. After his release from prison his life flowed smoothly to its end. His honest sincerity, his gentle manners, and perhaps his increasing literary celebrity, won him the regard of even his political opponents, and secured him the esteem and love of the rest of his townsmen. He continued to write short poems, several of which are very pleasing; and in 1806 he published 'The Wanderer in Switzerland'—a work of which he thought so little himself, that he occupied three years in printing it at his own press, but which obtained so great a popularity, that a second and third edition were quickly demanded. His own estimate was probably juster than that of the public, and the 'Edinburgh Review,' in noticing the third edition, characterised it as "very weakly, very finical, and very affected." This censure is overcharged; the poem has not much power, but it cannot justly be styled affected, and it is very melodious. In 1809 'The West Indies' was published—a great advance on the former—containing some exquisite descriptive passages, and others of considerable power and pathos. In 1812 appeared 'The World before the Flood,' a work which enjoyed a great and deserved popularity; and in 1810, having by this time rejoined the Moravian community, he wrote 'Greenland,' commemorating their exertions in that desolate establishment, which contained much of beauty and of pathos. In 1827 'The Pelican Island and other Poems' was published, which fully maintained his poetic character. In 1836 a collected edition of his poems was issued in three volumes; another in four volumes in 1849; and another in one volume in 1851. In 1853 'Original Hymns, for Public, Private, and Social Devotion,' concluded the series of his poetical works. Of the smaller poems contained in the collected works, many are of great excellence. His restricted education, and his early habit of writing had given him a dangerous fluency; and the ideas, though frequently original, are generally too much expanded: his imagination seldom soars, nor does his fancy sparkle; but his sympathies with all that is good and holy are ever ardent and sincere; his pathos is touching, and his style melodious, though in his longer poems occasionally too ambitious and magniloquent. Such faults as they have are least likely to occur in his shorter poems; and in some of them, as 'The Common Lot,' and 'The Prayer,' they entirely disappear.

We have pursued Mr. Montgomery's poetical career to the end in order to give a collected view of it. We now return to the few remaining events of his life. His publication of 'The Wanderer in Switzerland' led to an engagement on the 'Eclectic Review.' He had few qualities for an able critic—indeed none but a poetical taste and good principles. His praise or blame depended more upon his feelings than his judgment of the character of the work or its literary attributes; consequently one of his earliest reviews was an onslaught on Moore's early poems, whom he termed in a private letter "a deliberate seducer." This feeling led him later in life to decline being introduced to Moore, who sought his acquaintance. In 1825, as we have said, he resigned the editorship of the 'Iris,' on which occasion a public dinner was given to him by the inhabitants of Sheffield, and funds were subscribed to establish a mission-station in Tobago, where his parents had died, which has been named Montgomery. When released from his constantly required attention to the newspaper, he took a lively interest in municipal affairs, and was a frequent speaker at religious meetings. In the spring of 1830 he delivered a course of lectures at the Royal Institution on the 'History of English literature,' a subject on which he was not well qualified to speak, and which therefore fell somewhat dull and flat. Later in the year he published 'A History of Missionary Enterprise in the South Seas,' for which he was better suited, and which is an interesting and valuable work. In 1835 he discreetly declined the office of Professor of Rhetoric in the University of Edinburgh; and in the same year a pension of 150*l.* was bestowed on him by the Queen, through Sir Robert Peel. In 1836, after having lived forty years in the house occupied by his old employer, Gales, with three of Gales's daughters, who kept the bookseller's shop, on the death of one of them he removed, with the remaining two, to a more convenient residence; and in the same year he delivered a course of lectures 'On the British Poets,' at Newcastle-on-Tyne; and for some years added to his income by delivering similar courses at other places. In 1841 he visited Scotland on a missionary tour. He was received everywhere with great distinction, particularly in his native town of Irvine, where he had a public reception, and was made a burgess. In 1842 he visited Ireland on a similar errand, saw his old abode at Grace Hill, and while occupied in these religious labours often lamented his not having become a Moravian minister. In 1852 he delivered a lecture 'On some Passages of English Poetry but little known,' but was so feeble as greatly to excite the compassion of his audience. On April 30, 1854, he died; and on the day of his burial the shops and manufactories of Sheffield were all closed, many members of the municipality attending the funeral, as did also the vicar of Sheffield and twenty-four clergymen. By his will he left 900*l.* to be distributed to various charities. His memoirs have been published in seven octavo volumes by John Holland and James Everett, to which we have been indebted for most of the facts in this notice.

MONTGOMERY, ROBERT, was born at Bath in 1807. Of his boyish years we know nothing, but he appeared before the world as an author at an early age, conducting in his native city a weekly publication called 'The Inspector,' which had but a short existence. His next publication was 'The Stage-Coach,' dated 1827 in his collected works; and in the same year he issued 'The Age Reviewed: a Satire,' an octavo volume, the poem being very fully illustrated with notes. The work was very decidedly directed against irreligion and scepticism, and this has formed the key-note of all his subsequent poems. In 1828, though stated to have been written two years earlier, he published 'The Omnipresence of the Deity;' it became astonishingly popular, and eight editions are said to have been sold in as many months. In the same year appeared another volume, 'A Universal Prayer; Death; a Vision of Heaven; and a Vision of Hell;' a second edition of which appeared in 1829, dedicated to Sharon Turner. 'Satan' quickly followed. All were successful; and encouraged by this success, and the advice and assistance of Mr. S. Turner and the Rev. W. L. Bowles, he entered himself in 1830 at Lincoln College, Oxford, with the intention of devoting himself to the Church. He graduated B.A. in 1833, passing in the fourth class, and M.A. in 1838. His residence at the university provided him with a new subject for his prolific muse, and in 1831 he produced a poem, with historical notes and engraved embellishments, under the title of 'Oxford,' which, though extremely laudatory, created more ridicule than applause among the members of the university. In 1832 he published 'The Messiah, a Poem, in Six Books,' which was dedicated to Queen Adelaide; and in 1833 'Woman, the Angel of Life.' In 1835 Mr. Montgomery was ordained, and for a time his ministerial labours seem to have nearly superseded his poetic efforts, a small volume on the local associations and scenery around his first curacy, Whittington in Shropshire, being the only exception until 1842. He quitted Whittington in May 1836, and became minister of Percy-street chapel, London; whence he removed, about the beginning of 1838, to St. Jude's episcopal chapel in Glasgow. Here he continued until December 1842, drawing large audiences; but his preaching excited so much controversy and bitterness of spirit that he resigned the incumbency, and returned to London, where he immediately published 'Luther, or the Spirit of the Reformation.' In October 1843 he resumed his ministry at Percy-street Chapel, where he continued till his death. He now began the publication of a number of prose theological works, the issue of which was continued till 1854. Neither was poetry altogether neglected. Besides some smaller things, he wrote in 1842 a series of 'Meditations' upon engraved Scripture subjects, published by Fisher; 'Sacred Meditations and Moral Themes,' 8vo, 1847; 'The Christian Life, a Manual of Sacred Verse,' 12mo, 1849; 'Lyra Christiana—Poems on Christianity and the Church,' 32mo, 1851; 'Lines on Wellington,' and 'The Hero's Funeral,' 8vo, 1852; and 'The Sanctuary, a Companion in Verse for the English Prayer-Book,' 1855. On December 3 of this year he died at Brighton, in his forty-ninth year, all his exertions in the cause of religion having been unrecognised by any preferment in the Church.

That Montgomery's poetical works should have been so successful as they undoubtedly have been, has excited much surprise. As early as 1830 Mr. Macaulay, in noticing a third edition of 'The Omnipresence of the Deity,' in the 'Edinburgh Review,' ascribed the poet's success to unblushing puffery. That his works have been most inordinately puffed is certainly true; but no amount of puffery would have carried a poem through twenty-six editions (which the 'Omnipresence' has reached), without some other qualities. These we think may be found in the gravely important nature of the subjects he has generally chosen, and the class, a numerous one, which he peculiarly addressed. This class, rejecting poetry usually as secular or profane, were pleased with his mediocrity; they welcomed him on account of his themes; he was earnest and sincere; and, prejudiced in his favour, to them his turgidity appeared eloquence, his obscurity assimilated to the mysterious, his vagueness kept him clear from points of doctrinal difference, his poetical adornments, though often selected without taste and scattered without fitness, kept attention alive; and as in so voluminous a writer it would be scarcely possible not to find some passages containing good thoughts happily expressed, these were produced as answers to objecting critics. As a preacher he drew large audiences, and his services were often asked and given in favour of charitable purposes. His style of preaching in some measure resembled that of his poetry; he ranted, was affected, and vague; but his ranting was accepted as earnestness, his affectation as refinement, and his vagueness as a happy generalising. His manners were engaging, and he always acquired the esteem and regard of his congregations, who on more than one occasion gave him substantial marks of their attachment.

MONTICELLITE. [MINERALOGY, *S.* 1.]

MOORE, THOMAS, was born in Aungier-street, Dublin, on the 28th of May, 1779. His father was a small tradesman, and both his parents were Roman Catholics. He was early placed at school under a Mr. Whyte, who paid much attention to elocution, who was fond of dramatic representations, and in whose school R. B. Sheridan had once been. Moore, a quick and lively boy, became a favourite pupil, and as early as 1790 exhibited his talents in reciting an epilogue at a private theatrical entertainment: other dramatic exhibitions were got up by his parents, for which he wrote epilogues or prologues. When he first began to rhyme, he says, he cannot remember; but in 1793 he contributed two poems to the 'Anthologia Hibernica,' a Dublin magazine, which were inserted, to his intense gratification. In this year the restrictions which prevented Roman Catholics from studying at the Dublin University were removed, though all honours and offices were still denied them. His mother, who wished him to be a lawyer, induced his father to enter him at Trinity College in the summer of 1794. At college he pursued the usual studies with tolerable success, gaining several marks of distinction, though, feeling an inability to write Latin hexameters, he substituted on one occasion some English verses, which were approved of by the judges, and for which he received a reward. He continued also to write verses for the 'Anthologia' while it existed, and afterwards for other publications. He learned to play the piano from his sister's teacher, Italian from the priest of the family, and French from an emigrant acquaintance. In the second year of his college attendance he soared yet higher, and wrote a masque with songs, which was performed in his father's drawing-room.

Born a Roman Catholic, accustomed from infancy to hear the wrongs of his fellow-religionists descanted on, influenced by his friendship with Emmett and others, and perhaps soured by his pretensions to a scholarship in the university being unavailable on account of his faith, it is little to be wondered at that he took a lively interest—though fortunately he was too young to be made an active participator—in the plots preparatory to the rebellion of 1798. He was examined before Fitzgibbon, the vice-chancellor; but as he could honestly avow himself ignorant of any plot, he was discharged. He at length took his degree of B.A., and left the university; but he had already commenced a translation of the so-called odes of Anacreon, a specimen of which he laid before the provost of the college, Dr. Kearney, with a hope to obtain a classical premium. Dr. Kearney thought the translation good, but that the subject was not likely to be patronised by the Board. Moore was then entered at the Middle Temple in London, whither he went, scantily supplied with money, to study law. In London he was introduced to Lord Moira, Lady Donegal, and others; he moved in a fashionable circle; he published in 1801 his 'Odes of Anacreon;' and of course paid little attention to his legal studies. His next publication, in 1802, was 'The Poetical Works of the late Thomas Little,' for which he received 60*l.* They were severely blamed and much read, and their somewhat loose morality did not prevent them from securing him friends, on account of their poetical ability. In 1803, by Lord Moira's influence, he was appointed to a government situation at Bermuda. In January 1804 he arrived there, having stayed upwards of a month at Norfolk in Virginia. He at once found that the situation did not suit him, and in March he left Bermuda, appointing a deputy to fulfil his functions. He then journeyed over a part of America, going from New York to Virginia, and back by Philadelphia and Boston to Niagara and Quebec. With the society in America he was much dissatisfied, and recorded his sentiments in some satirical poems. In November 1804 he was back in England. Here he expected much from Lord Moira's patronage, but only succeeded in getting the appointment of barrack-master in Dublin for his father. In 1805 he published 'Odes and Epistles,' which being in a similar style to the Little poems brought upon him the castigation of Jeffrey. This occasioned a bloodless duel, the cause of much merriment at the time, and led to a firm friendship between the combatants. He was now leading a life of fashionable excitement among the aristocracy of England, a visitor to Lord Moira at Donington Park, and a constant guest at Lansdowne House and Holland House. As early as 1797 Moore's attention had been attracted to Bunting's collection of Irish melodies, and at intervals he had written words for several of them, which he was accustomed to sing himself with much effect. In 1807 he entered into an engagement with Mr. Power to produce a work founded on them, in which he was to adapt the airs and furnish the words, while Sir J. Stephenson was to provide the accompaniments. This work was not completed till 1834, and upon it his true fame will rest. His amatory poems, though sweetly and playfully written, will always give offence to persons of good taste; his satires, however successful in attacking ephemeral subjects, will perish with the events to which they allude; but the melodies, combining beautiful words, purer morals, and good music, will have a lasting existence. They have an entirely original character; they have not the vigour, the truth to nature, and the deep passionate feeling of our other great lyrical poet, Burns, but they are never, as he sometimes is, coarse; they have a uniform elegance, a lightness, a pathetic tenderness, a play of wit, a brilliancy of fancy, and a richness of adornment, which, though too often giving the impression of being artificial, are always pleasing. In the same class may be included the songs written under the title of 'National Airs,' published in 1815. We cannot however place the 'Sacred Songs,' which he published in the same year, in the same category. In them there is a strained adaptation of scriptural words and ideas, with a lack of earnestness, that render them distasteful. In 1808 he published, anonymously, two poems, 'Intolerance' and 'Corruption;' and in 1809 'The Sceptic.' They were not very successful. Moore's muse was too sportive, his fancy too playful, his heart too genial, for him to excel in severe satire which he here attempted.

In 1811 he married Miss Bessy Dyke, a truly estimable woman, to whom he ever continued fondly attached, and who was the source of all his purest happiness for the remainder of his life. In the autumn of the same year his opera of 'M.P., or the Blue Stocking,' was produced on the stage. It was but moderately successful, ran a few nights, and has never been repeated, though some of the songs, published separately in his collected works (from which the opera is omitted), well maintained his lyrical reputation. Moore had now made up his mind to live by his pen; he quitted London, and went to reside with his family at Mayfield Cottage, near Ashbourne in Derbyshire, where in 1813 he produced the 'Twopenny Post-Bag, by Thomas Brown the Younger.' The wit, the variety, the ease, and the playfulness of these satires, directed against the Prince Regent and his ministers, made them immediately popular, and fourteen editions went through the press in a twelvemonth.

As early as 1812 Moore had contemplated the writing of an Oriental poetical romance, and his friend Mr. Perry of the 'Morning Chronicle' stipulated for him with Messrs. Longman, the publishers, that he should receive for a quarto volume the sum of three thousand guineas: this was agreed to; but it was not till 1817 that 'Lalla Rookh' at length appeared. It was eminently successful; it has passed through many editions, and it has been frequently translated. It may however be doubted whether it will contribute to his permanent fame. It is brilliant, melodious, in the 'Fire Worshippers' it is energetic, but it wants dramatic consistency and characterisation; it is untrue to nature, it is cloying with its sweetness, it is oppressive with its imagery; the feelings described are almost uniformly sensuous, and the art of the composition is painfully apparent. Immediately after the publication of 'Lalla Rookh,' he made a trip to Paris in company with Mr. Rogers, and this enabled him to produce 'The Fudge Family in Paris,' a series of poetical epistles, an entertaining collection of satirical remarks on character and political events, which was published in 1818. While seeing 'Lalla Rookh' through the press he had removed to Hornsey near London, and here in September 1817 he lost one of his children. Early in 1818 he learned that his deputy in Bermuda, "after keeping back from me the proper receipts of my office," he writes in one of his letters, "has now, it seems, made free with the proceeds of a ship and cargo deposited in his hands, and I am called upon by a monition from Doctors' Commons, to be accountable for it." The claim was for about 6000*l.*, of which little was hoped to be recovered from the deputy. On this occasion his friends flocked round him with offers of assistance, but he declined receiving any, as he preferred paying the money, whatever it might be, by the earnings of his pen. In 1819 he accompanied Lord John Russell to Paris, and extended his journey to Italy, visiting Rome in company with Chantrey the sculptor, and Jackson the painter. This expedition was recorded in 'Rhymes on the Road,' published together with 'Fables of the Holy Alliance,' the same year; they were said to be 'extracted from the Journal of a Travelling Member of the Pococurante Society,' and are serious, political, artistical, and satirical by turns. As the law proceedings respecting the defalcations were still pending, he did not return to England; but, sending for his family, took up his abode at Paris, where he continued until 1822. He purposed to work hard; but the gaiety of the place, the interruption of visitors, and probably anxiety as to his ultimate loss, prevented his carrying his intentions into full effect. He had entered into an engagement to write a life of Sheridan; but in Paris he found himself, or thought himself, so unfurnished with materials, that he gave it up and 'The Loves of the Angels,' a poem, issued in 1823, and the prose-poetical romance of 'The Epicurean' (published in 1827), were the only additional works produced during his residence abroad.

The claim with regard to the Bermuda defalcation had by this time been settled by Mr. Moore's friends in London, having been reduced to 740*l.*, which was paid by a cheque from Lord Lansdowne, and repaid by Moore, chiefly from the proceeds of his 'Loves of the Angels' and his 'Fables of the Holy Alliance.' He now settled at Sloperton Cottage, near Bowood, the residence of the Marquis of Lansdowne; and in 1824 issued the 'Memoirs of Captain Rock.' He at once began in earnest his 'Life of Sheridan,' which was published in 1825. In 1827 'The Epicurean' was published, with some fragments of a poem called 'Alciphron,' on the same materials.

Before 1821 Lord Byron had presented Moore with his manuscript autobiography, for his especial benefit, but not to be published till after his death. In this year, in order to raise money, Moore had sold it to Mr. Murray, with an engagement to edit it, for 2000 guineas; and the manuscript was assigned to, and deposited with him, in April 1824. In this month Byron died; and on the news reaching England, Moore was anxious to redeem the manuscript, which he considered he had a right to do: Lady Byron and the family were desirous that the manuscript should be destroyed, as they considered its publication would be alike hurtful to their feelings and injurious to the character of his Lordship, and offered to repay Mr. Murray the sum he advanced. Moore refused to accede to this; he was willing to defer to their feelings, to suppress or alter what was unfit to be made public, or even to burn it if competent persons should decide that its publication would be improper; but insisted that in any case he alone should be the loser. After a long and unpleasant altercation he repaid the 2100*l.* with interest to Mr. Murray, the manuscript was burnt, and he engaged for the like sum to write a 'Life of Lord Byron' for the Messrs. Longman. This he did, but ultimately the copyright was transferred to Mr. Murray, by whom it was published in 2 vols. 4to in 1830. In 1831 he wrote 'The Life of Lord Edward Fitzgerald;' and 'The Summer Fête,' celebrating an entertainment given at Boyle Farm in 1827. To this followed 'The History of Ireland,' which appeared in 'Lardner's Cyclopædia' in successive volumes. This was his last work of importance. In 1835, during the administration of Lord Melbourne, a pension of 300*l.* a year was bestowed on him by the Queen as a reward for his literary merits. It was bestowed in good time: he had become unwilling or unable to labour as he had done, and family bereavements distressed him. Of his two sons, one died in Algeria in the service of the French; the other died of consumption in 1842. In 1841 he commenced an edition of his collected poetical works, including the scattered pieces with which he had enriched almost every newspaper and magazine of the metropolis, and they were issued in ten monthly volumes. For the last three years of his life he was afflicted with a softening of the brain, which reduced him to a state of mental incapacity, though without pain, during which the sedulous attention of his wife was most exemplary. He died on the 25th of February 1852, and was buried in the churchyard of Bromham, near Devizes.

Of Moore's poetical genius we have already spoken. To his prose there is less praise to be given. His biographies, with many sparkling passages, are all faulty, diffuse, and uncharacteristic. His 'History of Ireland' is his best work, as it is an interesting and careful production, though not an impartial one.

Moore's character in many respects was truly estimable. His affection for his parents was unfailing and indelible: it carried him in early life safely through the seductions of fashionable society, as he would commit no extravagance that might require them to contribute to his expenses; it induced him to postpone his own hopes of official advancement to the provision of a small place for his father; and of the 3000*l.* received for 'Lalla Rookh,' 2000*l.* was left in the hands of the publisher to pay the interest to his parents. To his wife and family he showed the fondest attachment, and it was duly reciprocated. It has been urged against him that he too often left his wife in solitude while he was fluttering in fashionable circles; but it should be remembered that he believed much of his fame, and consequently his fortune, depended on his keeping himself well before that world which alone could become purchasers of the expensive quartos in which shape his works first appeared; nor should it be forgotten that even in these circles he always avowed himself proud of his wife, introduced her to all his aristocratical friends, and frequently urged her to mix more with them, which her native good sense made her decline as much as possible, while she ever willingly submitted to those absences she considered useful to their mutual interests. As a friend he was faithful, kind, and generous; and he secured the esteem of many of the most eminent men of his day. As a politician he was consistent in his principles, though not always right or always unchanging in his opinions. He was vain: but few men have had so much pains taken to make them so, petted as he was from his boyhood till old age withdrew him from the world, and his vanity was harmless and never obtrusive. The strongest proofs of it are given in his own private journal, published after his death in the 'Memoirs, Journal, and Correspondence of Thomas Moore,' by Lord John Russell, in 1853-55, in 8 vols.

MORACEÆ, a natural order of Exogenous Plants which were formerly placed as a sub-order of *Urticaceæ*. The species are trees or shrubs, with a milky juice, sometimes climbing. The leaves are commonly lobed and rough. The flowers are small, monœcious, and collected in heads, spikes, or catkins. The ovules are solitary and suspended. The embryo lies in the midst of fleshy albumen, hooked, with the radicle long, superior, folded down towards the cotyledons.

Although the Mulberry and Fig grow in Europe, all the *Moraceæ* are extra-European. The species inhabit the temperate and tropical latitudes of both hemispheres, often forming vast forests. The genus ***Ficus*** is the most distinguishing feature of this order. [Ficus.] Most of the plants of this order furnish caoutchouc. [Caoutchouc.] The fruit of the Mulberry is edible, and the leaves of the genus ***Morus*** are the food of the Silk-Worm. [Morus.] Several species of ***Dorstenia*** are used in medicine. [Dorstenia.] Other genera of this order yielding useful products are ***Broussonetia*** and ***Maclura***. [Broussonetia; Maclura, *S.* 2.]

This order embraces 8 genera and 184 species.

MORCHELLA, a genus of *Fungi*, one of the species of which is eatable. *M. esculenta*, the Morel, springs up in orchards, woods, and cinder-walks, early in the spring and summer, and is believed to be most plentiful in places where fires have been made. The country people in Germany are so persuaded of this, that they formerly set fire to woods in order to obtain a crop of morels, of which they are very fond. At last the practice was put down by law. This fungus has a stalk from one to three inches long, and a spherical cap, from the size of a pigeon's egg to that of a swan's, hollow, pale-brown, or even gray, and deeply pitted all over its surface, the depressions being separated by raised anastomosing lines. The plant has a slight smell and an agreeable taste, and is employed for various purposes of cooking, both fresh and dried. In the former state it is most commonly stewed or stuffed with force-meat; in the latter it is employed as an ingredient in sauces. In this country it is of rather rare occurrence.

MOREL. [Morchella, *S.* 2.]

MORETON BAY. [Australia, *S.* 2; Wales, New South.]

MORINGACEÆ, a small natural order of Exogenous Plants, embracing the species of the genus *Moringa*. They are characterised by the possession of a many-leaved calyx, perigynous petals and stamens, 1-celled anthers, stipitate and consolidated siliquose fruit, and seeds without albumen. This order is referred by most botanists to a position near *Leguminosæ*, but Lindley places them in his *Violales*. They are natives of the East Indies and Arabia.

The root of *Moringa pterygosperma* has a pungent odour with a warm biting and somewhat aromatic taste. The seeds of this plant are called by the French Pois Queinques and Chicot. They are the Ben-Nuts of old writers, from which the Oil of Ben was extracted. It is chiefly used by perfumers as the basis of various scents. It does not readily freeze, and on this account is used by watchmakers. The flowers, leaves, and other parts of this plant are added to curries in India.

MORMONS. [Smith, Joseph, *S.* 2; Utah, State of, *S.* 2.]

MORPHOLOGY is that branch of science which treats of the laws which regulate the forms assumed by Plants and Animals. When this term was originally introduced into natural history science, its application was confined to the explanation of the changes which occur in the conversion of the leaves into the parts of the flower in plants. It is now however generally recognised as the science of form in the organic kingdoms. Schleiden, in his 'Principles of Scientific Botany,' treats of what is usually called the structure of plants, under two heads, that is General and Special Morphology. The following are his definition and remarks upon this subject:—

"Morphology is the study of the forms of plants, and of their several parts. It is divisible into a general branch, which elucidates all that has reference to plants and their organs in general, and a special branch, which treats of plants according to their principal groups, as well as their individual organs; and this latter branch again is separable into two parallel sections, namely the delineation of external form, and the delineation of internal structure, or of the peculiar composition of plants and their parts from various tissues.

"In my methodological introduction I have endeavoured to show that the external morphology of plants is really the most important section of botany. A mere glance at the history of the science will convince any one of the truth of this view; for it is truly wonderful to observe how far it has succeeded, to the almost entire neglect of all other scientific knowledge, in taking possession of the materials by merely examining its exterior, and arranging it in such a manner that the systems which in recent times have taken another path—I allude to the anatomico-physiological—have scarcely effected more than the introduction of extremely trifling changes, in some instances clearly untenable, and others at best of very doubtful validity. The morphological method of observation has certainly, from the origin of the science, been the basis of all treatises on botany; but those who have thus pursued it have been far from taking a strictly scientific view of the question, or seeking in this way for the solution of its difficulties. This task is two-fold, at once empirical and theoretical. In its first character the study requires us to examine into and characterise the fundamental forms which, as types, or conceptions of generic and specific shapes, constitute the basis of individual forms. In its second character this study has to unfold the natural laws according to which these types are formed, and which control and explain the deviations that occur in individual forms from their prototypes. For the first or empirical part of our researches, we may congratulate ourselves on having some little information, although of a very fragmentary nature; but in the second or theoretical department we have scarcely even an indication to guide us. That the solution of the difficulties must be sought by beginning from the simplest case is evident, and here Schwann has certainly shown eminent acuteness in establishing the analogy between the formation of crystals and that of cells; but unfortunately we have not yet brought the law of crystalline formation into the dominion of science. Thus at the present time we can do no more than specify the problem presented to botany, the solution of which is alone to be expected when the mathematical construction of the formation of crystals lies perfectly complete before us. If however this is ever to be effected, we must enter upon all possible construction in a very different way from what has hitherto been done. For this purpose we must consider somewhat more exactly the characteristics of organic form, especially the vegetable, as opposed to the inorganic. The inorganic form, the crystal, is permanent when once formed; it is unchangeable; the individual (the individual existence) is the form itself, and by its solution and change of form a new individual arises. In the plant, on the other hand, the form is not stable or permanent, but an ever-changing one. The analogies between the two hold good only in the simplest cases. The nucleus of a crystal originates in a definite form, and then passes through a series of forms, until it reaches the deduced crystalline form. As such it then remains unchangeable until the individual is destroyed with the form. Thus certainly it has a very simple history of development, but this continues merely so long as something is still being added to that which is already present, until the whole is completed. The cell is formed in a manner somewhat analogous to this, originating in a definite form, and passing through a series of changes, which, as it appears, only contribute new matter until the form is complete; this then remains stationary until its solution and the consequent destruction of its individuality. It is however wholly different in combined forms, and these it is which, with few exceptions, compose what we term plants. Here a number of cells combine together within definite external limits; but these cells themselves do not enter into the form as dead particles of the mass; they continue to develope new cells, whilst the old ones are partially destroyed: the newly originated cells change, by their arrangement, the form of the whole, and, since formation of new parts and destruction of the old are continually going on, the general boundary of the whole never appears as anything definitely fixed. As, however, this metamorphosis is constant in its nature, and only occurs in individual parts, we cannot regard each one of the forms resulting from this process as a new one, but merely as a slight modification of the one immediately preceding it; and this peculiar connection brings the whole to us as one individual, which, at its first appearance, may be entirely different in all its parts, both in shape and material, from what it is at last; but in the conception of which we must comprehend the whole series of changing forms, wherein the widely distant members have perhaps no element identical, if we would attain to scientific knowledge, if we would understand the object, and not merely acquire a disjointed, uncomprehended, and incomprehensible impression. From these considerations it follows, granting the paramount importance of the morphological method of observation, that we gain nothing by the comprehension of the forms complete at any one moment, but that we must trace out the law of morphological development, and direct our scientific inquiries, not to an individual complete at any one period, but to the comprehension of the collective constant series of normally changing forms. The conception of genera and species in botany is consequently, therefore, not merely the result of a comparison but also of a connection of the various individual characteristics with each other. In this manner we should lay a firm foundation for the inductions to lead us to a theory of organic morphology, if we could but succeed in completing the theory of the formation of inorganic forms. As yet we are far from this point, and simply because it is only in the most recent times, and yet very imperfectly, that the importance of the study of the history of development has been acknowledged; although, without this, botany would be wholly divested of all scientific principle. This deficiency renders it impossible as yet to treat morphology with scientific logical development, or in accordance with a perfectly systematic mode of arrangement, as will but too obviously appear in my manner of treating this subject, although the blame of this is only partially to be imputed to me. It seems however practicable perfectly to state the problem, and to this end I subjoin the following remarks:—

"We have to construct the laws of morphological formation, and to delineate the forms themselves. The first remains for the present a mere problem, the solution of which must be reserved for succeeding times. The second may be accomplished, although imperfectly. I say imperfectly, because, instead of those complete series of development of which we ought alone to treat, we only know a few individual conditions; and therefore the greatest portion of the task still lies unperformed before us. Here we must again distinguish between—1. Series of forms which occur in all or in very many plants of a very different nature, and may therefore especially servo as the foundation of the study of vegetable forms; that is, General Morphology. 2. Series of forms which are only peculiar to definite groups of plants: Special or Comparative Morphology. These two would further branch off into the consideration of form without reference to its composition from the different forms of the elementary organs: External Morphology; and into the consideration of the manner in which forms are composed from individual tissues: Internal Morphology (the theory of structure—'Comparative Anatomy'). This last part falls however away from General Morphology; for all that we can, for the present at least, say is, that every plant is composed of the different forms of the elementary organs which have already been treated of. Even with respect to the second part, in regard to Comparative Morphology, it appears to me unadvisable to divide the two sections, on account of our deficiency of material; I shall, therefore, in the examination of the individual groups and parts of plants, subjoin all that is known concerning their structure."

MORRISON, SIR RICHARD, architect, was born about the year 1767, and was the son of John Morrison, architect, of Cork. He was at one time intended for the Church, but subsequently became a pupil of James Gandon, the architect, in Dublin. Through his godfather, the Earl of Shannon, Morrison obtained a government appointment in the Ordnance department, but had to relinquish it in consequence of reductions, when he got into practice as an architect, and in the course of his life erected a large number of buildings. For a few particulars of some of these, reference may be made to Weale's 'Quarterly Papers on Architecture' (vol. i.), in which there is a memoir of *William Vitruvius Morrison*, son of Sir Richard, who was sometime in practice conjointly with his father, and who died at the age of forty-four. Sir Richard Morrison was last employed for Lord Longford and the Earl of Howth. His knighthood was received during the viceroyalty of the Earl de Grey. He left considerable property, including a well-stocked library, and died on the 31st of October, 1849, at the age of eighty-two. He was president of the Irish Institute of Architects.

MORTLAKE. [SURREY.]

MORTON, SAMUEL GEORGE, M.D., celebrated as an Ethnologist, was born at Philadelphia in the United States of North America in 1799. His parents were members of the Society of Friends, and he had the misfortune to lose his father early in life. His mother however married a second time when young Morton was thirteen years old, and from his step-father he seems to have derived a liking for the study of natural history. After leaving school he was placed in a counting-house, but his taste for natural science led him to abandon business and enter the medical profession. He was accordingly placed with Dr. Joseph Parrish of Philadelphia, who, although unconnected with any public medical office, had the highest reputation for the management and education of young men studying the medical profession. He attended the lectures and passed through the course of instruction prescribed for the students of medicine in his native city, and received his diploma of Doctor of Medicine in March, 1820. He was at the same time admitted a member of the Academy of Sciences (Philadelphia). Soon after this event he sailed for Europe, and, after visiting an uncle—Mr. James Morton of Clonmel, in Ireland,—he repaired to the University of Edinburgh. Here he studied two years, and graduated in medicine in 1823. His inaugural thesis was entitled, 'Tentamen inaugurale de Corporis Dolore.' During his period of preparation for graduating in Edinburgh he visited France and Italy, and made a stay in Paris. He returned to America in the summer of 1824, just in time to witness the departure of some of the most eminent literary and scientific men in Philadelphia to join in the ill-starred social experiment of Mr. Robert Owen at New Harmony in Indiana. He became immediately an active member of the Academy of Sciences, and commenced his contributions to its transactions by a geological paper. It was entitled, 'Analysis of Tabular Spar from Bucks County.' He subsequently contributed many papers on Geology and Palæontology to the transactions of the Academy. Several of the most important of these papers were published in a separate volume entitled, 'Synopsis of the Organic Remains of the Cretaceous Group of the United States.' This was a very valuable contribution to Geology, and was received with the warmest commendations by European geologists. He cultivated generally the natural history sciences, and wrote several papers on zoological subjects.

Whilst pursuing natural history with success, he did not neglect to cultivate professional knowledge. In 1834 he published a work entitled 'Illustrations of Pulmonary Consumption; its Anatomical Character, Causes, Symptoms, and Treatment.' He also edited an edition of Dr. Mackintosh's 'Practice of Physic,' with notes and additions. From 1839 to 1843 he filled the chair of anatomy in the medical department of Pennsylvania College. In 1849 he published 'An Illustrated System of Human Anatomy, Special, General, and Microscopic.'

His previous labours, however, were but preparations for the great works on which his reputation as one of the first ethnologists of his day is founded. The line of his research on the races of men lay more particularly in their anatomical configuration, and especially in the structure of the skull. During his researches, he made one of the most valuable collections of skulls extant, and which is now in the possession of the Philadelphia Academy of Practical Sciences. The origin of this collection may be given in his own words:—"Having had occasion," he says, "in the summer of 1830 to deliver an introductory lecture to a course of anatomy, I chose for my subject 'The different Forms of the Skull as exhibited in the Five Races of Men.' Strange to say, I could neither buy nor borrow a cranium of each of these races, and I finished my discourse without showing either the Mongolian or the Malay. Forcibly impressed with this great deficiency in a most important branch of science, I at once resolved to make a collection myself." The result of this determination was not only his great collection, but the two magnificent works, entitled 'Crania Americana,' and 'Crania Egyptiaca.' These works embraced not only an account and illustrations of the skulls, but general ethnological observations on the races of men. The collection on which these works were founded contains 951 human crania, collected from all parts of the world, 278 crania of mammals, 271 of birds, and 88 of reptiles and fishes.

Although in his earlier writings he maintained the specific unity of the human race, in the latter part of his life he was led to doubt this view, and to express his conviction of the existence of a diversity of species among men. This view has been strongly insisted on, in a work published since his death, under the title of 'Types of Mankind.' This work, edited by Messrs. Nott and Gliddon, contains a large mass of matter by the editors and others, with many "Excerpta" from Morton's inedited papers. In these he undoubtingly avows his belief in an "aboriginal plurality of races;" and expresses his conviction, that "man will yet be found in the fossil state as low down as the Eocene deposits, and that he walked the earth with the megalonyx and palæotherium." It is only right to add that these views have not been generally received; and that our most distinguished ethnologists, palæontologists, and geologists have not indorsed his later doctrines. Dr. Morton died at Philadelphia, after a short illness of five days, on the 17th of May, 1851.

MOSANDERITE. [MINERALOGY, *S.* 1.]

MOSQUITO. The following is an account of the structure of *Culex Mosquito*, the Mosquito of the Americans, by an American observer:—

"The male mosquito differs considerably, as is well known, from the female; his body being smaller and of a darker colour, and his head furnished with antennæ and palpi in a state of greater development. Notwithstanding the fitness of his organs for predatory purposes he is timid, seldom entering dwellings or annoying man, but restricts himself to damp and foul places, especially sinks and privies. The female, on the other hand, gives greater extension to her flight, and, attacking our race, is the occasion of no inconsiderable disturbance and vexation during the summer and autumn months.

"The head of the male mosquito, about 0·67 mm. [millimètres] wide, is provided with lunate eyes, between which in front superiorly are found two pyriform capsules nearly touching each other, and having implanted into them the very remarkable antennæ.

"The capsule, measuring about 0·21 mm., is composed of a horny substance, and is attached posteriorly by its pedicle, while anteriorly it rests upon a horny ring, united with its fellow by a transverse fenestrated band, and to which it is joined by a thin elastic membrane. Externally it has a rounded form, but internally it resembles a certain sort of lamp-shade with a constriction near its middle; and between this inner cup and outer globe there exists a space, except at the bottom or proximal end, where both are united.

"The antennæ are of nearly equal length in the male and the female.

"In the male the antenna is about 1·75 mm. in length, and consists of 14 joints, 12 short and nearly equal, and 2 long and equal, terminal ones, the latter measuring together 0·70 mm. Each of the shorter joints has a fenestrated skeleton with an external investment, and terminates simply posteriorly, but is encircled anteriorly with about 40 papillæ upon which are implanted long and stiff hairs, the proximal sets being about 0·79 mm. and the distal ones 0·70 mm. in length; and it is beset with minute bristles in front of each whorl.

"The two last joints have each a whorl of about 20 short hairs near the base.

"In the female the joints are nearly equal, number but 13, and have each a whorl of about a dozen small hairs around the base. Here, as well as in the male, the parts of the antennæ enjoy a limited motion upon each other, except the basal joint, which, being fixed, moves with the capsule upon which it is implanted.

"The space between the inner and outer walls of the capsule, which we term confidently the auditory capsule, is filled with a fluid of moderate consistency, opalescent, and containing minute spherical corpuscles, and which probably bears the same relation to the nerve as does the lymph in the scalæ of the cochlea of higher animals. The nerve itself of the antenna proceeds from the first or cerebral ganglion, advances towards the pedicle of the capsule in company with the large trachea which sends its ramifications throughout the entire apparatus, and, penetrating the pedicle, its filaments divide into two portions. The central threads continue forwards into the antenna and are lost there; the peripheral ones, on the contrary, radiate outwards in every direction, enter the capsular space, and are lodged for more than half their length in sulci wrought in the inner wall or cup of the capsule.

"In the female the disposition of parts is observed to be nearly the same, excepting that the capsule is smaller, and that the last distal antennal joint is rudimental.

"The proboscis does not differ materially in the two sexes; but the palpi, although consisting in both instances of the same number of pieces are very unlike. In the female they are extremely short, but in the male attain the length of 2·73 mm.; while the proboscis measures but 2·16 mm. They are curved upwards at the extremity.

"If an organ of hearing, similar to that described by Treviranus as belonging to the *Blatta orientalis*, exist in the head of the Mosquito, the tympanum must be of exquisitely minute proportions, because the head, which has a diameter of only 0·67 mm., is almost entirely occupied by the corneal plaques, the capsules, and the attachments of the neck and of the buccal apparatus. The membrana tympani must therefore be so small as to preclude the idea of its being put in vibration by any sounds other than those infinitely more acute than are produced by the insect itself, and the use of such an organ for the purposes of intercommunication must be highly problematical. But no trace of such a disposition is to be found in the head, nor very certainly, also, in the body; and we are obliged to look for some organ which may answer the requirements of an effective auditory apparatus.

"The position of the capsules strikes us as extremely favourable for the performance of the function which we assign to them: besides which there present themselves in the same light the anatomical arrangement of the capsules, the disposition and lodgment of the nerves, the fitness of the expanded whorls for receiving, and of the jointed antennæ fixed by the immovable basal joint for transmitting, vibrations created by sonorous modulations. The intra-capsular fluid is impressed by the shock, the expanded nerve appreciates the effect of the sound, and the animal may judge of the intensity, or distance, of the source of sound, by the quantity of the impression; of the pitch, or quality, by the consonance of particular whorls of the stiff hairs, according to their lengths; and of the direction in which the modulations travel, by the manner in which they strike upon the antennæ, or may be made to meet either antenna, in consequence of an opposite movement of that part.

"That the male should be endowed with superior acuteness of the sense of hearing appears from the fact, that he must seek the female for sexual union either in the dim twilight or in the dark night, when nothing save her deep sharp humming noise can serve him as a guide. The necessity for an equal perfection of hearing does not exist in the female; and accordingly we find that the organs of the one attain to a development which the others never reach. In these views we believe ourselves to be borne out by direct experiment, in connection with which we may allude to the greater difficulty of catching the male Mosquito.

"In the course of our observations we have arrived at the conclusion that the antennæ serve, to a considerable extent, as organs of touch in the female; for the palpi are extremely short, while the antennæ are very moveable, and nearly equal the proboscis in length. In the male however the length and perfect development of the palpi would lead us to look for the seat of the tactile sense elsewhere; and in fact we find the two apical antennal joints to be long, moveable, and comparatively free from hairs; and the relative motion of the remaining joints very much more limited." (Dr. Christopher Johnston, *Quarterly Journal of Microscopical Science.*)

MOTACILLA, MOTACILLINÆ. [Blue Bird; Blue Breast; Sylviadæ; Wagtails.]

MOTELLA, a genus of Fishes belonging to the family *Gadidæ*. It has the following characters: Body elongated, cylindrical, compressed posteriorly, the first dorsal fin very slightly elevated, delicate in structure, scarcely perceptible; second dorsal and anal fins long, continued nearly to the base of the tail.

M. vulgaris, Mustela marina (Ray), *Gadus tricirratus* (Bloch), the Three-Bearded Rockling, Sea-Loche, Whistle-Fish, Three-Bearded Cod, Three-Bearded Gade, has the following characters: The length of the head compared to the length of the body alone, without the caudal rays, is as one to four; the depth of the body equal to the length of the head; the first dorsal fin delicate in structure; the first ray elongated, the rest hair-like; the second dorsal fin commencing immediately behind the end of the first, and reaching along the back to the tail, but ending a little short of the base of the caudal rays; ventral fins with the first two rays elongated, the second most so, the two disunited; the other five rays nearly equal, united, and short; pectoral fins rather large and rounded; the vent half-way between the point of the chin and the end of the fleshy portion of the tail; the anal fin commences immediately behind it, is one-fourth less in length than the second dorsal, and ends on the same plane with it; the tail moderate in size, and rounded at the end. The fin rays in number are—2nd D. 55; P. 20; V. 7; A. 49; C. 18. The head is depressed; the mouth wide; the jaws nearly equal, but when separated the lower jaw is the longer, with one barbule at the chin; a mixture of large and small teeth in each jaw; the upper jaw with one barbule on each side the middle, between the lip and the nostril; inner part of the upper lip crenate; the irides golden yellow; the anterior portion of the body of the fish cylindrical, or slightly depressed; the tail compressed; the general colour of the body and head is a rich yellow-brown, spotted on the top of the head, along the back, the pectoral, dorsal, and caudal fins, with rich chestnut-brown; the lower part of the sides, the ventral and anal fins pale yellow-brown approaching to white, and without spots.

Young fish of this species are of a uniform brown colour, until they have acquired 6 or 7 inches in length; in this condition they are the *Mustela alia* of Ray. (Yarrell.)

This fish is common on the coasts of Cornwall, and also on the coasts of Ireland.

M. cimbria (*Gadus cimbrius*, Linnæus), the Four-Bearded Rockling. This fish has been taken in Scotland, and is common in the Baltic and the southern coast of Sweden.

M. quinquecirrata (*Gadus mustela*, Linnæus), the Five-Bearded Rockling. This fish is common on the British coast. Its habits resemble those of the Three-Bearded Rockling, and by some naturalists it is regarded as a variety of that species.

M. glauca (*Ciliata glauca*, Couch), the Mackerel Midge. This fish has been taken on the coasts of Cornwall by Mr. Couch. It dies instantly on being taken out of the water. It is like the young of some of the other species, but it has not been observed to grow.

M. argenteola (*Gadus argenteolus*, Montagu), the Silvery Gade. This fish is a miniature representative of the Three-Bearded Rockling, as the last is of the five-bearded species. It was first described by Montagu, and is admitted as a distinct species by Yarrell.

MOULMEIN, a town and port in the Tenasserim Provinces, which form a part of the British possessions on the eastern side of the Bay of Bengal. Moulmein is situated near the Gulf of Martaban, at the confluence of the rivers Saluen, Attayen, and Gyeng, in 16° 30′ N. lat., 97° 44′ E. long.: the three rivers when united are called the Moulmein River. It is 10 miles S. by E. from Martaban, and 30 miles N. by E. from Amherst. [Amherst.] Moulmein has a good harbour, which admits vessels of 600 or 800 tons. Being favourably situated for commerce, and free from duties of import and export, it has drawn away much of the commerce which belonged to Martaban, and has in a great measure superseded Amherst. The population is estimated at upwards of 10,000. The exports are teak-timber, rice, tobacco, ivory, stick-lac, cocoa-nuts, and live-stock. The imports are cotton goods and other manufactures.

MOUNTMELLICK. [Queen's County.]

MOUNTRATH. [Queen's County.]

MUCIC ACID. [Chemistry, *S.* 1.]

MUCORACEÆ, an order in Lindley's alliance *Fungales*. The species have a floccose thallus and the spores surrounded by a vesicular veil or sporangium. They are amongst the smallest forms of *Fungi*, and attack decaying vegetable and animal matters. They are frequently known by the name of Moulds. [Mouldiness; Fungi; Entophyta, *S.* 2.; Mildew.]

MUDARIN. [Chemistry, *S.* 1.]

MUDGE, WILLIAM, LL.D., F.R.S., a major-general in the army, the third in succession of the directors of the series of geodetical operations, which resulted in the Trigonometrical Survey of Great Britain and Ireland, the production of the 'Ordnance Maps' by its means, and the measurement of the English Arc of the Meridian. The history of family and hereditary talent, and the occupation of certain offices by a succession of gifted men, have frequently been illustrated in this work. They are again forcibly recalled by the name now commemorated. The Rev. Zachary Mudge, sometime master of the Grammar School at Bideford, in Devonshire, and vicar of Abbotsham, afterwards a prebendary of Exeter and vicar of St. Andrew's, Plymouth, was the author of an 'Essay for a New Version of the Psalms,' and of a much-admired volume of sermons, published in 1727. He died April 3rd, 1769, and was eulogised by Dr. Johnson, whose intimate friend he had been. Thomas Mudge, his second son, born at Exeter in

1716, was apprenticed to the celebrated watchmaker, George Graham, and became himself one of the most eminent mechanists of his time: a select committee of the House of Commons, assisted by a committee of men of science, philosophical instrument makers, and watchmakers, including Atwood, Ramsden, Troughton, and De Luc, declared in 1793, that it was "admitted on all hands that Mr. Mudge was one of the first watchmakers which this country has produced." In consequence of a report made by the select committee, a reward of 3000*l.* was granted by parliament for his improvement in the construction of chronometers. His decease took place shortly after, in 1794. A full account of his invention, and of the circumstances in the history of chronometry connected with it, will be found in a work published by his son, Thomas Mudge the Younger, entitled 'A Description, with Plates, of the Time-keeper invented by Mr. Thomas Mudge,' &c., Lond., 1799, 4to.

The fourth son of the vicar of St. Andrew's was Dr. John Mudge, F.R.S., for many years an eminent physician at Plymouth, who published treatises on the inoculated smallpox, and on catarrhous coughs. But he acquired a higher reputation in practical optics, founded on a paper in the 'Philosophical Transactions,' vol. lxvii., "containing directions for making the best composition for the metals of reflecting telescopes, together with a description of the process for grinding, polishing, and giving the great speculum the true parabolic form." For this paper, in which an anticipation of Newton was verified, the council of the Royal Society awarded him the Copley Medal for the year 1777, on which occasion Sir John Pringle, M.D., Bart., the president, delivered one of his celebrated discourses.

William Mudge, the subject of the present article, son of Dr. John Mudge, was born at Plymouth in 1762, and having received his principal education as a cadet in the Royal Military Academy at Woolwich, was appointed to the Royal Artillery, in which corps he served abroad for some time. After his return to England, the Trigonometrical Survey of England and Wales, which had been commenced by General Roy, was placed, by the recommendation of Dr. C. Hutton, under the superintendence of Lieut.-Col. Edward Williams, R.A., Lieut. Mudge, also on Dr. Hutton's recommendation, being appointed his personal associate in the work, and being promoted shortly afterwards to the rank of Captain. The survey, which had suffered some interruption after the decease of the former director, was actively resumed in 1791. In the 'Philosophical Transactions' for 1795 and 1797, are two papers of great length, by Lieut.-Col. Williams, Captain Mudge, and Mr. Isaac Dalby, giving an account of the Survey as carried on from 1791 to 1796. Not long afterwards Captain Mudge succeeded to the office of superintendent, and in 1798 he became a Fellow of the Royal Society. In the 'Philosophical Transactions' for 1800, he continued the account of the progress of the survey during the years 1797, 1798, and 1799; and having attained the rank of Major, R.A., he gave in the volume for 1803, 'An Account of the Measurement of an Arc of the Meridian, extending from Dunnose, in the Isle of Wight . . . . to Clifton, in Yorkshire . . . . in course of the operations carried on for the Trigonometrical Survey of England, in the years 1800, 1801, and 1802.' Major Mudge, who united with energy of character, mathematical talent and culture, and the valuable faculty of readily observing and appreciating the existence of corresponding qualities in others, recognising a kindred spirit in Lieutenant Colby, R.E., conferred an inestimable benefit upon the national work which he conducted, by securing his services as his chief personal assistant. In 1802, with Colby's assistance, he measured the base on King's Sedgmoor; in 1806, that on Rhuddlan Marsh; and during his superintendence a third base was measured by Colby on Belhelvie Links, near Aberdeen, in 1817. [Colby, Thomas, *S.* 2.]

In 1799 had appeared, as a kind of demi-official publication, in 4to, vol. i. of an 'Account of the Survey from the Commencement in 1784, to the end of the Year 1796,' revised from the 'Philosophical Transactions,' by Captain Mudge and Mr. Dalby. The second volume, published in 1801, was edited by Captain Mudge alone, and continued the account to the end of the year 1799; it was, in fact, a separate issue of the paper communicated to the Royal Society in 1800, already noticed. The third volume, 'by Lieut.-Col. William Mudge, of the Royal Artillery, F.R.S., and Capt. Thomas Colby, of the Royal Engineers,' published in 1811, continues the account of the Survey, as carried on from 1800 to 1809. But a very small proportion, however, of the whole body of observations was contained in these volumes, and no further account of the survey was made public until long after the decease of Mudge, when, in 1842, his successor Colby published all the observations made with Ramsden's zenith sector. The maps, however, known as those of the Ordnance Survey, on the scale of one inch to a mile, were first produced under Mudge's superintendence, and were issued from time to time (after an interval during the war, in which they were withheld from publication), admirably executed, and of the highest value in reference to the topography of the country.

Whilst General Mudge was superintendent, but by the personal exertion of Captain Colby, the principal triangulation of the survey was extended, as just indicated, to the north of Scotland. But in that of South Britain, as it had been carried on under his orders in former years, his successor had to correct errors and supply many omissions. These, as we are informed by competent authority, "had resulted from the hurried manner in which the work was performed, from the very imperfect means placed at General Mudge's disposal, and from the want [since supplied] of a legislative enactment for the preservation of the various trigonometrical observing stations throughout the country, which want sometimes led to a failure of identity between the observing and observed points; so that, all things taken into consideration, it is rather to be wondered at that the work should, generally speaking, be so good as it is known to be." ('Mem. Roy. Ast. Soc.,' vol. xxii., p. 213.)

General Mudge was afterwards appointed lieutenant-governor of the Royal Military Academy at Woolwich; into the administration of which he is stated to have introduced many excellent regulations, which were afterwards extended, under his direction, to the Military Seminary founded by the East India Company at Addiscombe. In addition to the public employments and distinctions which have been mentioned, he was a member of the Board of Longitude, a Fellow of the Society of Antiquaries, a member of the Geological Society, and Honorary LL.D. of the University of Edinburgh. The Royal Academy of Sciences of Paris elected him a correspondent, and the Academy of Sciences of Copenhagen, a Fellow. He died at his house in Holles-street, London, on the 17th of April, 1821, in his fifty-eighth year, leaving a widow, with three sons and a daughter.

One of the sons, Richard Zachary Mudge, who entered the army in 1807, and served in the Peninsula, became eventually a lieutenant-colonel in the royal engineers and F.R.S. He also was attached to the Trigonometrical Survey, in which, after Captain Colby had been appointed superintendent, he was entrusted for some years with the local charge of the 'drawing-room' in the Tower of London—where the results of the Survey were laid down, and the maps actually constructed—during the absence of his chief on other duties. He afterwards retired from the service, and entered into business as a banker in Devonshire. He died at Teignmouth on the 24th of September, 1854, aged sixty-five.

MUDWORT, the common name of the species of the genus *Limosella*. This genus belongs to the natural order *Scrophulariaceæ*. It has a 5-cleft calyx; a 5-fid bell-shaped equal corolla; a globose 2-valved capsule, with a central placenta, free, or connected with a short dissepiment below, 1-celled.

L. aquatica is the only British species. It has lanceolate spathulate leaves on long stalks; pedicles axillary, crowded, shorter than the petioles. It has small white or rose-coloured flowers. It is found growing in muddy places, where water has stagnated.

MULLET. [Mugilidæ; Mullus, *S.* 2.]

MULLUS, a genus of Fishes belonging to the group *Acanthopterygii* and the family *Percidæ*. The species have the body thick oblong; profile of the head approaching to a vertical line; scales large, deciduous; two dorsal fins widely separated, the rays of the first spinous, those of the second flexible; teeth on the lower jaw and palate only; two cirri at the symphysis of the lower jaw; branchiostegous rays 4. There are two species of this genus found in Europe, and both are inhabitants of the seas of Great Britain.

M. surmuletus, the Striped Red Mullet, or Striped Surmullet, has the following fin-ray formula:—D. 7—1 + 8; P. 17; V. 1 + 5; A. 2 + 6; C. 13.

The forehead, nape, cheeks, and operculum are covered with scales; irides pale-yellow; mucous-pores abundant; the colour of the body is from a pink to a bright-red; the membrane of the first dorsal-fin is tinged with yellow; those of the other fins transparent; the axilla of the ventral fin furnished with a pointed scale; the vent placed under the commencement of the second dorsal fin.

The Striped Red Mullet is abundant on the southern coasts of Great Britain, but is rarer on the eastern and northern coasts. This fish is good eating, and is sent in large numbers from the coasts to the London market. In the month of August, 1819, 5000 were taken off Weymouth, and in one week during the month of May, 1831, 10,000 were sent to London from Yarmouth. The Striped Red Mullet was a favourite dish amongst the ancient Romans, and large prices were paid for them. "A fish of 3 lbs. weight produced a considerable sum to the fortunate fisherman, while the cost of a fish of 4½ lbs., says Martial, was ruinous. A Mullet of 6 lbs. is recorded to have produced a sum equal to 48*l.*; one still larger 64*l.*; and even 240*l.* were given for three of unusual size, procured on the same day, for a repast of more than usual magnificence." (Yarrell.) On the coasts of Great Britain this fish seldom exceeds 14 inches in length.

The Striped Red Mullet spawns in the spring, and the young are 5 inches long in October. Their food consists of the softer crustaceous and molluscous creatures. The cirri, which are generally placed near the mouth, seem to act as organs of feeling, whereby these animals are enabled to distinguish their food. Mr. Yarrell says, "On dissecting these appendages in the Mullet, the Common Cod, and others, I found them to consist of an elongate and slender flexible cartilage, invested by numerous longitudinal muscular and nervous fibres, and covered by an extension of the common skin. The muscular apparatus is most apparent in the Mullet, the nervous portion most conspicuous in the Cod. These appendages are to them, I have no doubt, delicate organs of touch, by which all the species provided with them are enabled to ascertain, to a certain extent, the qualities of the various substances with which they are brought in contact, and are analogous in function to the beak, with its distribution of nerves, among certain wading and swimming birds which probe for food beyond their sight; and may be considered another instance, among the beautiful provisions of nature, by which in the case of fishes feeding at great depths, where light is deficient, compensation is made for imperfect vision." ('British Fishes,' vol. i., p. 34.) This and the next species must not be confounded with the Gray Mullet, which belongs to a very different family of Acanthopterygious Fishes. [Mugilidæ.]

M. barbatus, the Plain Red Mullet, the Surmullet, the Red Surmullet. This fish is much rarer on the British coasts than the last. They seem to be equally abundant in the Mediterranean. The fin-rays are as follows: D. 7—1 + 8; P. 16; V. 6; A. 1 + 6; C. 15. The scales are somewhat smaller than in the last and present some structural differences.

(Yarrell, *History of British Fishes.*)

MURÆNOIDES (Lacépède), a genus of Fishes belonging to the section *Acanthopterygii* and the family of *Gobiadæ*. The species have been included under the genera *Blennius* of Linnæus, and *Gunnellus*. They have the head small, muzzle obtuse; body elongated, smooth; scales minute, covered with a mucous secretion; dorsal fin extending the whole length of the back, the rays simple; ventral fins very small; teeth small, pointed, detached.

M. guttata, the Spotted Gunnel or Butter-Fish, is distinguished from its congeners by the consistence and quantity of mucous secretion by which its sides are covered. It is known from the true Blennies by its dorsal fin being but little elevated above the line of the back, and by its elongated, slender, and compressed body, from which circumstance it has obtained the name of Swordick in Orkney and Svardfisk in Norway, from a supposed resemblance to the blade of a sword. It is a common fish on the coasts of Great Britain, where it is often found in the little pools left by the tide. It feeds on small *Crustacea* and the spawn and fry of other fishes. In Greenland it is eaten, but it is only used for bait in this country, its flesh being hard. The length of the head is equal to the depth of the body, and is, when compared with the whole length of the body and head of the fish, without including the tail-fin, as one to eight. It is said to attain the length of 10 inches, but its more frequent length on the British shores is from 5 to 7 inches.

Mr. Yarrell states that the Spotted Gunnel of America is identical with the British fish.

MUREXAN, MUREXIDE. [Chemistry, *S.* 1.]

MUSCALES, an alliance of Acrogenous Plants in Lindley's arrangement of the Vegetable Kingdom. It includes two divisions:—1. *Hepaticæ*; 2. *Musci*. The *Hepaticæ* include the orders *Ricciaceæ*, *Marchantiaceæ*, *Jungermanniaceæ* and *Equisetaceæ*. The *Musci* include the orders *Andræaceæ* and *Bryaceæ*.

MUSCARDINE, the name given to a disease to which silk-worms are subject, and which often causes great injury to those who cultivate these animals for the sake of their silk. This disease is attended with the development of a fungus belonging to the genus *Botrytis*, and has been named by Balsamo and Montagne *B. Bassiana*. This plant, which is characteristic of the disease, can be propagated by the introduction of spores into a healthy caterpillar. The result of the changes produced upon the blood and tissues of the animal is its death. This disease is much more common some years than others. It frequently spreads to other insects; and the caterpillars of other *Lepidoptera* can be inoculated by the spores of the *Botrytis*. When once the disease has appeared there seems to be no means of checking it. The best mode of prevention is to take care that the caterpillars are not over-crowded, and that they have a sufficient supply of fresh food. The predisposition to this disease amongst silk-worms seems to be brought on by the same causes as those which act upon the human system, and render it favourable to the attacks of epidemic diseases.

(Robin, *Hist. des Végétaux Parasites.*)

MUSCAT, a sea-port town on the east coast of Arabia, in the province of Oman, is situated on a peninsula which is joined to the island of Muscat by a reef of rocks, in 23° 48′ N. lat., 58° 40′ E. long., and has about 60,000 inhabitants. High lands to the south and west, and the island towards the east shelter the harbour, the entrance to which is from the northward, and protected by forts on each side; within there is room enough for a large fleet to moor in 4 or 5 fathoms water. A fort close to the town, and two other forts on the western side of the harbour command the whole of the port. The town is surrounded by walls and otherwise strongly fortified. The houses are only one story high, with the exception of some handsome stone buildings erected by the Portuguese. There are also some houses built in the Persian style, and an aqueduct.

Muscat is a great commercial entrepôt, and has a very active trade. A large number of ships belong to it, and trade to British India, Sumatra, the Malay Peninsula, the Red Sea, and eastern coast of Africa, the Comoro Isles, and Madagascar. Indeed wherever Arab traders are met with between Africa and China, they may be set down as belonging to Muscat. The port is resorted to by ships from every port of Persia and Arabia. British and French merchantmen trading to the Persian Gulf stop at Muscat to sell and purchase goods. Besides its maritime commerce, Muscat carries on an extensive trade with the Arab tribes of the interior. The principal articles of the commerce of Muscat are—asafœtida, almonds, raisins, pistachio nuts, socotrine aloës, gum ammoniac, sulphur, gum copal, and saltpetre. Other articles are frankincense, pearls, gall-nuts, coffee, cocoa-nut-oil, galbanum, hides, cotton-wool, mother-o'-pearl, gum, bees'-wax, raw silk, indigo, tortoise-shell, rhinoceros-horns, pepper, cochineal, cinnamon, sugar, rice, sandal-wood, dates, saffron, wheat, horses, salt, dried fish, &c. Most of these articles are imported in Arab vessels from Persia, Zanzibar, Africa, and Western Arabia, and are exported to India, the Mauritius, Bourbon, Calcutta, Bombay, America, France, Zanzibar, &c. The tissues imported at Muscat are British and American long-cloths, British calico-prints, India shawls, Chinese silks, &c. The country near the town is barren; but provisions, fruits, vegetables, and fresh fish are abundant in the markets. Bullocks, sheep, and fowls are to be had at a reasonable price. The annual imports into Muscat are probably under-estimated at a million sterling. Imports pay a duty of 5 per cent. if coming from Arabia, America, or Great Britain; 4 per cent., if coming from Bourbon. No duties are charged on exports. There is a large town called *Muttra*, 3 miles to the westward, nearly as large as Muscat. There is a good road between the two places. At Muttra vessels can be hauled ashore. In the interior there is another large town called *Rostak*.

Muscat was a place of considerable trade before the arrival of the Portuguese in the Indian Ocean, and it was then subject to Ormuz. Albuquerque took it in 1507, but had immediately to put down a bloody insurrection of the Arabs. On the destruction of Ormuz, Muscat became the principal centre of trade in this part of the East, and yielded enormous profits to the Portuguese, who held the town till 1648. During this interval they built the fortifications and greatly improved the city, having erected a handsome church, a college, and many other public structures, besides many superb stone houses. After being gorged with wealth the Portuguese treated the natives so badly and put so many restrictions on their commerce, that they took up arms and drove the Portuguese to their ships. Many unsuccessful attempts were made by the Portuguese to recover the town.

Left to themselves, the Arabs of Muscat—expert seamen, skilled in the use of fire-arms—soon raised a maritime force which overawed not only the neighbouring coasts, but also the European powers in India. By 1694 they had made themselves masters of several places in the Persian Gulf, and were threatening Gombroon; and the British government, acting upon the report of their resident at that place, proposed to send out an armament to clear the Indian seas, and "to root out that nest of pirates the Muscate Arabs." In 1707 the Arabs obtained permission to build ships at the ports of Pegu from the king of that country; and their fleets, comprising ships of from 30 to 50 guns, annoyed trade in the Indian Ocean, and frequently made descents on the towns along the Malabar coast. With the Persians they were almost continually at war; although Persian traders were always permitted to trade at Muscat or any of its dependencies, all Persian ships of war were considered fair game. Since the beginning of the present century they have laid aside their piratical practices, and have confined themselves principally to commerce; and during the rule of the present Imam the territorial dominions, naval power, and commercial importance of Muscat have increased so vastly as to entitle him to be numbered among the great powers of the world. He has commercial treaties with Great Britain and the United States, and has opened intercourse with several European powers.

The Imam of Muscat claims as his possessions in Asia all the south-east coast of Arabia from the frontier of the British settlement of Aden to Ras-el-Had; all the territory of Oman along the east coast of Arabia, the sea-coast and islands in the Persian Gulf, including the Bahrein Islands and the pearl-fishery contiguous to them; and the coast of the Mukran. In Africa he claims sovereignty over all the coast from Cape Delgado to Cape Gardafui, including the ports of Montgallow, Lindi, Quiloah, Melinda, Lamoo, Brava, Magadoxa, &c.; and the valuable islands of Mafea, Zanzibar, Remba, Socotra, &c. Only a small part of this immense territory is garrisoned by his troops; but all, or nearly all, of it is tributary to him. He rules with patriarchal and despotic sway, but it is said in a just and liberal spirit. His government is strict and to Europeans courteous. A foreigner may walk the streets of Muscat at any hour of the night unmolested. Goods are piled up in the streets exposed night and day, and pilfering is never attempted.

The Imam derives his revenue, which is more than adequate to his expenditure, chiefly from commerce, in which he employs a great number of merchant vessels; from import dues on foreign merchandise; and from tribute money or the equivalent presents made him by princes under his sway. His naval force, more efficient than that of all the native emperors and princes from the Cape of Good Hope to Japan, numbered in 1837 15 vessels, carrying from 6 to 74 guns; 50 baghelas (one-masted vessels of 200 to 300 tons), carrying 8 to 18 guns; and 10 balits (one-masted vessels of 100 to 200 tons), carrying 4 to 6 guns. The number of vessels belonging to the port of Muscat at the same time, was estimated at 2000 of all sizes, a very large proportion of these being small craft. He has intelligent officers and abundance of sailors; but he keeps only a small number of regular troops, as he can have any number of Bedouins whenever he wants them, merely for the clothing and maintenance. His naval force however is sufficient to enable him to maintain his power against all native pretensions over all the territories he claims as his own.

MUSCIDÆ. The House-Fly (*Musca domestica*) is very common in houses in England. Its favourite position is the window, on the panes of which it may be constantly seen walking up and down. The power which this insect possesses of walking upon smooth upright surfaces has in consequence been a frequent theme of conjecture, and of not a small amount of observation. Dr. Derham, in his 'Physico-Theology,' speaking on this subject, says that flies have "skinny palms to their feet to enable them to stick to glass and other smooth bodies by means of the pressure of the atmosphere, after the manner as I have seen boys carry heavy stones with only a wet piece of leather clapped on the top of a stone."

This opinion, which has been entertained by the majority of entomologists of the present day, has acquired additional weight by the elaborate investigations of Sir Everard Home, undertaken at the suggestion of Sir Joseph Banks, with the assistance of that (then) unrivalled microscopic artist, M. Bauer, and published in the 'Philosophical Transactions' for 1816. The suckers, of which several kinds of flies possess three to each foot, are attached beneath the base of the claws, and are of an oval shape and membranous texture, being convex above, having the sides minutely serrated, and the under concave surface covered with down, or hairs. In order to cause the alleged vacuum, these suckers are extended; but when the fly wishes to raise its legs they are brought together, and folded up as it were between the hooks. Messrs. Kirby and Spence have likewise adopted this opinion, considering it as "proved most satisfactorily." Other authors of no mean repute have however entertained a different opinion, and have entirely rejected the idea of a vacuum being produced. Thus Dr. Hooke describes the suckers as palms, or soles, beset underneath with small bristles, or tenters, like the cone-teeth of a card for working wool, which he conceives gives them a strong hold upon objects having irregular or yielding surfaces; and he imagined that there is upon glass a kind of smoky substance, penetrable by the points of these bristles. The same opinion is also given by Shaw in his 'Nature Displayed;' and more recently, Mr. Blackwall has considered that the motions of the fly are to be accounted for upon mechanical principles alone; thus, upon inspecting the structure of the parts of the suckers, it was immediately perceived that the function ascribed to them by Dr. Derham and Sir E. Home is quite incompatible with their organisation. "Minute hairs, very closely set and directed downwards, so completely cover the inferior surface of the expanded membranes, improperly denominated suckers, with which the terminal joint of the foot of flies is provided, that it cannot possibly be brought into contact with the object on which those insects move, by any muscular force they are capable of exerting. The production of a vacuum between each membrane and the plane of position is therefore clearly impracticable, unless the numerous hairs on the under side of these organs individually perform the office of suckers; and there does not appear to be anything in their mechanism which in the slightest degree countenances such an hypothesis. When highly magnified, their extremities, it is true, are seen to be somewhat enlarged; but when they are viewed in action or in repose, they never assume a figure at all adapted to the formation of a vacuum." Moreover, on enclosing a House-Fly in the receiver of an air-pump, it was demonstrated to the entire satisfaction of several intelligent gentlemen present that the fly, while it retains its vital powers unimpaired, can not only traverse the upright sides, but even the interior of the dome of an exhausted receiver; and that the cause of its relaxing its hold, and ultimately falling from the station it occupied, was a diminution of muscular force, attributable to impeded respiration. Hence Mr. Blackwall is induced to believe that insects are enabled to take hold of any roughness or irregularity of surface, by means of the fine hairs composing the brushes, the most carefully polished glass not being found free from flaws and imperfections when viewed in a favourable light with a powerful lens. A still different opinion has been maintained by other authors upon this subject, who, setting aside all idea of a vacuum, have conjectured that the suckers, as they have been termed, contain a glutinous secretion, capable of adhering to well-cleaned glass; thus Abbé de la Pluche states that when the fly marches over any polished body, on which neither her claws nor her points can fasten, she sometimes compresses her sponge, and causes it to evacuate a fluid, which fixes her in such a manner as prevents her falling, without diminishing the facility of her progress. "But it is much more probable," he adds, "that the sponges correspond with the fleshy balls which accompany the claws of dogs and cats, and that they enable the fly to proceed with a softer pace, and contribute to the preservation of its claws, whose pointed extremities would soon be impaired without this prevention." Notwithstanding the ridicule which has been thrown upon this opinion in a recent entomological work, it appears, from still more recent investigations, to be the best founded of any hitherto advanced. Thus, in general, the foot of the fly is described as being composed of two hooks and two flaps, or hollow cups, which act as suckers. Rymer Jones, in his 'General Outlines of the Animal Kingdom,' 1841, says—"The House-Fly is furnished with a pair of membranous flaps, which, under a good microscope, are seen to be covered with innumerable hairs of the utmost delicacy; these flaps, or suckers, as they might be termed, adhere," &c.

The structure of the foot of the fly has recently been examined by Mr. Hepworth, who says:—"The flap varies in form in different species, from an irregular circle to that of an irregular triangle; and viewing it from one side, it is somewhat thicker at the base (near its attachment), the under surface being, when isolated, convex, but perfectly flat as a whole, when applied to the surface of that form. It appeared to be composed of an upper and under layer of areolar tissue, or something similar to it, between which a bundle of tubes, along with the fasciculi of a large muscle pass; these are placed at its base, and (sometimes protected by a 'coat of mail,' formed by long scales overwrapping each other as a Venetian blind, or in alternate ones, as the scales of a fish, &c., but more frequently wanting) expand in a radiated form; each tube, as it passes along with its fellows on each side, gives off a number of tubules alternately with them; these dip downwards from the under surface, and become expanded into trumpet-shaped extremities, the flap, becoming thinner and thinner as it approaches its margin, which sometimes terminates in an irregularly serrated edge, and at others by finely pointed hairs. The fly has the power of attaching itself to smooth surfaces by these trumpet-shaped extremities, and also of secreting a fluid from them, when vigorous, and it has occasion to make extra exertions; but in a partially dormant state (the best for making observations), it does not appear to be able to give out this secretion, although it can still attach itself; indeed this fluid is not essential for that purpose: when it is secreted, it is deposited on the glass with great regularity. I have often attempted to preserve these markings by applying colouring matter whilst they were moist, but have not yet succeeded. The tubules are often seen protruding from under the margin of the flap in a semi-arch-like form, giving it a fringed appearance. The foot of the male *Dytiscus* is a type, not only of many of the beetle tribe (not aquatic), but of the whole of that of flies possessed of flaps. The first joints of the tarsus of the anterior legs of this insect are extremely dilated, so as to form a broad circular palette. On examining the inferior surface of this expanded portion, it is seen to be covered with a great number of sucking cups, two or three being larger than the rest, but they form collectively a wonderful instrument of adhesion." ('Quarterly Journal of Microscopical Science.')

MUSCLE, MUSCULAR TISSUE. [Tissues, Organic, *S.* 1.]

MUSK-BEETLE. [Cerambycidæ.]

MUSK-ORCHIS. [Herminium, *S.* 2.]

MUSK-OX. [Ox.]

MUSK-ROOT, the root of a plant brought to this country from Russia and Persia, and known also by the name of Sumbul. This root exhales a powerful smell of musk, and has been used in medicine as a substitute for that substance. The plant yielding it is not known, but the root has the appearance of belonging to the natural order *Umbelliferæ*. Its tissues are full of starch.

MYCETOCHARUS. [Cistelides.]

MYGINDA. [Aquifoliaceæ.]

MYOPHONUS. [Corvidæ.]

MYOPTERIS. [Cheiroptera.]

MYOSU'RUS (from μῦς, a mouse, and οὐρὰ, a tail, the seed being seated on a long receptacle "which looks exactly like the tail of a mouse"), a genus of Plants belonging to the natural order *Ranunculaceæ*. It has a calyx of 5 sepals, prolonged into a spire at the base; the petals 5, with a filiform tubular claw; the capsules closely imbricated upon a long filiform receptacle, not bursting; the seed pendulous; the embryo inverted with the radicle superior. The only species of this genus is *M. minimus*, which has a simple leafless single-flowered stem 2 to 5 inches high. It has a very long receptacle, numerous carpels, and linear leaves. It grows in damp places and in fields. It is a native of Europe and America. The American plant has been described as *M. Shortii*, but there is every reason to believe it is the same as the British and other European plants.

MYOTHERA. [Merulidæ.]

MYRIAPODA, an order of Invertebrate Animals belonging to the class *Articulata*. This order is represented by such species as the Centipede and Gally-Worm. They may be regarded as an intermediate form between the lower and higher forms of Articulate animals. They agree with the Annulose forms in the longitudinal extension of their trunk, in the similarity of the segments from one end of the body to the other, and in their cylindrical form. On the other hand, they possess more complete eyes than any of the Vermiform tribes, and their respiratory apparatus and the parts of their organisation are more nearly allied to Insects. Their covering is firm, and of a horny character.

The division into segments is very distinct, a flexible membrane being interposed between each pair of firm rings or plates. The legs and other appendages are inclosed in the same kind of integument, and their joints are formed in the same manner as those of the body. We find in this class however two distinct types of conformation, of which one approximates most nearly to the Vermiform tribes, and the other to that of the higher *Articulata*; in the former of which the *Iulus* (Gally-Worm) may be taken as an example. The body is generally cylindrical, or nearly so; the number of segments is considerable, and most of them bear two pairs of thread-like legs, so that the number of these members sometimes amounts to 160 pairs. The legs are very imperfectly developed, being scarcely large or strong enough to sustain the weight of the body, and their articulations being indistinct; and the animal seems rather to glide or crawl with their assistance, like a serpent or a worm, than to use them as its proper instruments of locomotion. This kind of movement is facilitated in some species by the incomplete inclosure of the body in the consolidated integument, for this merely forms plates above and below, which are connected at the sides by soft membrane; so that the trunk can be easily placed in any direction. When at rest the body is rolled up in a spiral form; so that the legs, concealed in the concavity of the spire, are protected from injury. The animals do not move with rapidity, and they chiefly feed upon decomposing organic matter. In the higher division, on the other hand, of which the *Scolopendra* (Centipede) may be taken as the type, the body is flattened, and each segment is completely inclosed in its horny envelope; the number of segments is not very great, never exceeding 22, and being sometimes as low as 12; and each segment bears a pair of well-developed legs, on which these animals can run with considerable rapidity. Still their bodies are possessed of considerable flexibility; and they are thus enabled to wind their way with facility through very narrow and tortuous passages, in search of the insects, &c., which constitute their food. In both orders, the first segment, or head, is furnished with numerous eyes on each side, and also with a pair of jointed antennæ; the mouth is adapted for mastication, being furnished with a pair of powerful cutting jaws; and it is also provided, in the Centipede and its allies, with a pair of appendages, formed by a metamorphosis of the legs of the first segment of the body, which are adapted not merely to hold and to tear the prey, but to convey poison into the wounds thus made, this poison being ejected through a minute aperture near their points. (Carpenter.)

The alimentary canal is mostly divided into gullet, stomach, and intestine. The stomach usually presents distinct muscular walls. The circulatory organs consist of a dorsal vessel, which propels a current of blood from behind forwards, which is distributed to the body and respiratory organs. In the higher forms respiration is effected by means of tracheæ, which convey air into the interior of the body as in Insects. The nervous system is arranged in a double series of ganglia, as in most of the Articulated Tribes. They possess cephalic ganglia, which meet above the œsophagus, and form a two-lobed mass, from which nerves proceed to the eyes and antennæ. In many parts of the double series of cords the ganglia of each side unite. The muscular apparatus is very complicated, consisting of a series of distinct muscles for the movements of the segments and legs. The sexes are separate. The embryo at the period of hatching consists of but few segments, but these increase in number till it is fully grown by the subdivision of the penultimate segment. The first number of segments is eight or nine, and they go on increasing in number till there are sixty or seventy. The larva has no legs, these organs making their appearance after the first moult. During their growth these animals have a considerable power of regenerating lost portions of their body as the legs and antennæ, but this power is lost when they cease to develope.

Mr. Newport divides the *Myriapoda* into two orders—*Chilopoda* and *Chilognatha*. [CHILOPODA; CHILOGNATHA.] The following synopsis of the genera of these two orders is drawn up from the list of the specimens of *Myriapoda* in the collection of the British Museum (1844):—

Order I. *Chilopoda.*
  Family 1. *Cermatiadæ.*
    1. *Cermatia*, Illiger. 9 species.
  Family 2. *Lithobiidæ.*
    1. *Lithobius*, Leach. 9 species.
    2. *Henicops*, Newport. 1 species.
  Family 3. *Scolopendridæ.*
    1. *Scolopendra*, Linnæus. 38 species.
    2. *Cormocephalus*, Newport. 8 species.
    3. *Rhombocephalus*, Newport. 2 species.
    4. *Heterostoma*, Newport. 7 species.
    5. *Theatops*, Newport. 1 species.
    6. *Scolopocryptops*, Newport. 1 species.
    7. *Cryptops*, Leach. 5 species.
  Family 4. *Geophilidæ.*
    1. *Scolopendrella*, Gervais. 1 species.
    2. *Mecistocephalus*, Newport. 2 species.
    3. *Necrophlœophagus*, Newport. 3 species.
    4. *Gonibregmatus*, Newport. 1 species.
    5. *Geophilus*, Leach. 6 species.

Order II. *Chilognatha.*
  Family 1. *Glomeridæ.*
    1. *Glomeris*, Latreille. 4 species.
    2. *Zephronia*, Gray. 6 species.
    3. *Sphærotherium*, Brandt. 2 species.
  Family 2. *Polyxenidæ.*
    1. *Polyxenus*, Latreille. 1 species.
  Family 3. *Polydesmidæ.*
    1. *Fontaria*, Gray. 3 species.
    2. *Polydesmus*, Latreille. 12 species.
    3. *Strongylosoma*, Brandt. 2 species.
    4. *Craspedosoma*, Leach. 2 species.
    5. *Cambala*, Gray. 1 species.
  Family 4. *Iulidæ.*
    1. *Platops*, Newport. 5 species.
    2. *Iulus*, Linnæus. 12 species.
    3. *Blaniulus*, Gervais. 1 species.
    4. *Spirobolus*, Brandt. 9 species.
    5. *Spirostreptus*, Brandt. 15 species.

(*Monograph of the Class Myriapoda, Order Chilopoda*, by George Newport; *Linnæan Transactions*, vol. xix.; Carpenter, *Principles of Comparative Physiology*.)

MYRIOSPERMINE. [CHEMISTRY, *S.* 2.]

MYRISTIC ACID. [CHEMISTRY, *S.* 2.]

MYRMICA, a genus of Insects belonging to the order *Hymenoptera*, and the family *Formicidæ*. It is one of the genera formed out of the Linnæan genus *Formica*. Unlike that genus, however, it possesses a sting. The peduncle of the abdomen is composed of two knots, the antennæ are exposed; the maxillary palpi are long and 6-jointed, and the mandibles triangular. *M. rubra* is a common British species.

MYROBALANS. This is a name applied to almond-like kernels of a nut or dried fruit looking like a plum, of which there are several sorts known in the East. They are the produce of various species of *Terminalia*, as *T. Bellerica*, *T. Chebula*, *T. citrina*, and *T. angustifolia*. They vary from the size of olives to that of gall-nuts, and have a rough, bitter, and unpleasant taste. Many of the trees of this tribe, which are all natives of the tropical regions of Asia, Africa, and America, are used for tanning, and some for dyeing. They are highly valued by dyers, creating, when mixed with alum, a durable dark-brown yellow. Myrobalans fetch in the Bombay market 8*s.* to 26*s.* the Surat candy of 821 lbs. The bark and leaves of *T. Catappa* yield a black pigment, with which Indian ink is made; the seeds are eaten like almonds. A milky juice is said to flow from *T. angustifolia*, which, when dried, is fragrant, and, resembling Benzoin, is used as a kind of incense in the Catholic churches in the Mauritius. The fruit of *T. Bellerica* and of *T. Chebula*, both useful timber-trees, indigenous to the East Indies, are used medicinally as a tonic and astringent. One hundred and seventeen cwts. of Myrabalans were shipped from Ceylon in 1845.

The annual imports of Myrobalans into Hull, amount to about 1600 cwts. The quantity which arrived at Liverpool was 185 tons in 1849 and 851 tons in 1850; 27,212 bags in 1851, and 19,946 bags in 1852; they came from Calcutta and Bombay, and are also used for dyeing yellow and black. The price in January 1853 was 6*s.* to 12*s.* per cwt. The average annual imports into the United Kingdom may be taken at 1200 tons.

Myrobalans is also the English name given by Lindley to the natural order *Combretaceæ*, which yields these fruits.

(Symonds, *Commercial Products of the Vegetable Kingdom*.)

N

NAAS, county of Kildare, Ireland, a market and assize town, and the seat of a Poor-Law Union, is situated on the Dublin and Limerick road, in 53° 13′ N. lat., 6° 40′ W. long., distant 20¼ miles S.W. from Dublin by road. The population in 1851 was 3132. Naas Poor-Law Union comprises 38 electoral divisions, with an area of 216,622 acres, and a population in 1851 of 44,863.

Naas was in early times a seat of the kings of Leinster. In 1419 a parliament was held in it. The town obtained charters from Henry V., Elizabeth, and James I. It returned two members to the Irish Parliament, but was disfranchised at the Union. Naas is pleasantly situated in a fertile and improved district. It consists of a street extending along the Dublin road, with several branches on each side. In the main street is the parish church, an old building in the early English style, enlarged in 1822, and again a few years back. There are a large Roman Catholic chapel, with a nunnery adjacent; an Independent chapel; a diocesan school; and several schools partially endowed. The town also contains a market-house, a county court-house, and gaol, a large infantry barrack, a fever hospital, dispensary, and Union workhouse. There are the remains of an Augustinian monastery in the town; and a rath or high conical mound, on which the states of Leinster are said to have held their assemblies. A branch of the Grand Canal passes near the town. Quarter and petty sessions are held. The market-days are Monday, Thursday, and Saturday. Fairs are held twelve times a year.

NABALUS, a genus of Plants belonging to the order *Asteraceæ*. Two of the species, *N. Serpentarius* and *N. albus*, are found in North America, and have, with many other plants, a repute as a remedy for rattle-snake bites. They have a milky juice in their roots, which is very bitter.

NAIAS, a genus of Plants the type of the natural order *Naiadaceæ*. It has imperfect solitary sheathed flowers with no perianth. The barren flowers consist of one stamen, the fertile flowers have a single short style with two or three filiform stigmas. There is one British species.

N. flexilis has very narrow and very minutely denticulate, ternate, or opposite leaves, the sheaths ciliate-denticulate. The ovary is solitary and the style is short. It has been found in but one locality, and that is near Roundstone, Connemara, in Galway, Ireland.

NAIDES, a group of Abranchiate *Annelida*. The species have the elongated body and rings less marked than in the Earthworms. They live in holes which they bore in mud at the bottom of water, and from which they are constantly protruding their bodies. Some have black points on their heads, which have been regarded as eyes. To this family belong a large number of little-studied forms of very minute fresh-water worms. The smaller ones are sometimes called Vibrios, of which the very common ***Vibrio fluviatilis*** of the amateur microscopist is an example. It also appears to embrace the ***Stylaria*** of Lamarck, the ***Proto*** of Oken, and the ***Clymene*** of Savigny.

NAPHTHA is a compound of Carbon and Hydrogen, frequently found in the neighbourhood of coal-deposits, and in other parts of the earth. It contains 82·2 of carbon and 14·8 of Hydrogen. It is a limpid or yellowish fluid, lighter than water, and hence called Mineral Oil. Its specific gravity is 0·7 to 0·84. It hardens and changes to the substance called Petroleum on exposure to air. It may be obtained from Petroleum by heat, which causes it to pass off in vapour.

Naphtha issues in large quantities from the earth in Persia and the Birman Empire. At Rangoon, on one of the branches of the river Irawaddy, there are upwards of 500 naphtha and petroleum wells, which afford annually 412,000 hogsheads. In the peninsula of Abcheran, on the western shore of the Caspian, naphtha rises through a marly soil in vapour, and is collected by sinking pits several yards in depth, into which the naphtha flows. There is an abundant spring near Amiana, in the Duchy of Parma. Mr. Dana says that in the United States it was formerly collected for sale by the Seneca and other Indians; the petroleum is therefore commonly called Genesee or Seneca Oil, under which name it is sold in the market.

Petroleum is used as lamp-oil in Birma, and when mixed with earth or ashes as fuel. Naphtha is used both for fuel and light by the inhabitants of Bakou, on the Caspian. The vapour is made to pass through earthen tubes, and is inflamed as it passes out, and used in cooking. The spring at Amiana is used for illuminating the city of Genoa.

Naphtha has been recently used as a medicine, and is found to be a good stimulant in some chronic diseases. It has been externally applied as a lotion in cutaneous affections. It is sometimes substituted for drying oil in making paint. It is also employed for preserving the metals of the alkalies potassium and sodium, which cannot be kept in contact with any substance containing oxygen.

The Rangoon petroleum contains the compound Paraffine. This substance has also been obtained pure in a liquid form from the coal-pits of Derbyshire. It is used for the purpose of diminishing the friction of machinery as a substitute for sperm-oil. It is now obtained artificially from coal, and also in a solid form, from which candles are made.

(Dana, ***Manual of Mineralogy;*** Gregory, ***Handbook of Organic Chemistry.***)

NAPHTHALINE. [CHEMISTRY, *S.* 2.]

NAPIER, SIR CHARLES JAMES, G.C.B., was the eldest son of Colonel the Hon. G. Napier, comptroller of accounts in Ireland, by the Lady Sarah Lennox, daughter of Charles, second duke of Richmond. He was born at Whitehall, on the 10th of August, 1782. Having received his early education under his father in Ireland, he obtained his first commission as ensign in the 22nd foot before he had completed his twelfth year, and first saw active service during the Irish rebellion of 1798, and again in the insurrection of 1803. In 1806, having obtained his company, he joined the British forces in Spain, and commanded the 50th regiment of foot during the terrible retreat on Corunna under Sir John Moore, on which occasion he received five wounds and was taken prisoner. Being allowed to go to England on parole, he found his friends actually in mourning for him as dead, and administering his effects; and he employed his period of compulsory inactivity by writing on colonies, colonisation, and military law, and an essay on the state of Ireland. In 1809 he again joined the British army in the Peninsula as a volunteer. He had two horses shot under him in the desperate conflicts on the banks of the river Coa, and was severely wounded at Busaco; he also took part in the hard-fought battle of Fuentes de Oñoro, and in the second siege of Badajoz, as well as in a considerable number of lesser skirmishes. In 1813 we find him serving in a floating expedition on the coast of the United States, and occupying his time by the capture of American vessels, and frequent descents upon the coast. He returned to Europe a few days too late to be present at the battle of Waterloo, though he took part in the storming of Cambray, and accompanied the British army to Paris.

Not long after this, while stationed in the Ionian Islands, he was appointed governor of Cephalonia. Here his administrative powers were first developed; and the success of his governorship is proved by the fact that to the day of his death the Cephalonese called him their 'father,' and sent to him an annual tribute of the produce of their vines. While holding this post he joined with Lord Byron in a scheme for the deliverance of Greece. He was shortly afterwards superseded—an event which he regarded, whether rightly or wrongly, as a great affront and indignity.

After a short command of the military district of the north of England, in 1838 and 1839, Sir Charles Napier, now a major-general, was ordered in 1841 to take command of the army in Bengal. This was the turning-point of his career. At Bombay he attracted attention by his energetic plans of military reform, to which he continued to devote himself until the appointment of Lord Ellenborough to the governor-generalship of India. At his suggestion Sir Charles Napier drew out the plan of an Afghan Campaign. Sinde at this time was in a very disordered condition, and the British influence and prestige had been much impaired by the disasters in Cabul. The Ameers of Sinde were perfidious, and as they would be bound by no treaty, he resolved to subdue them by open attack. From the first his plans were eminently successful. He blew up the fortress of Emaum Ghur, which was always deemed impregnable. Having accomplished this exploit, which was characterised by the late Duke of Wellington as one of the most curious and extraordinary of all military feats, he pressed on, and with a very inferior force in point of numbers routed the Ameers at Meeanee, February 17, 1843. In a few days the army took possession of Hyderabad, and outflanking Shere Mohammed (surnamed the Lion) by a dexterous manœuvre, drove him from the field with prodigious slaughter. Having now become master of the fair territory of Sinde, Sir Charles Napier set vigorously to work to improve its condition. He re-organised the native society, re-distributed the collectorates of taxes, ameliorated the native law, put down the 'suttee' system, and set the tenure of land on a more just and judicious footing. Whilst in the midst of carrying out these reforms Lord Ellenborough was recalled by the East India Company, and Sir Charles Napier felt that he had lost his best friend and supporter. His Indian services are thus summed up, in the words of his brother Sir William Napier, in his 'Narrative of the Administration of Scinde:'—"Two years only elapsed since he quitted Sukkur to make war on the Ameers, and in that time he had made the march to Emaum Ghur in the great desert, gained two great battles, reduced four large and many smaller fortresses, captured six sovereign princes, and subdued a great kingdom. He created and put into activity a permanent civil administration in all its branches, conciliated the affection of the different races which inhabited Scinde, had seized all the points of an intricate foreign policy, commenced a number of military and other well-considered public works, and planned still greater ones, not only suited to the exigences of the moment, but having also a prospective utility of aim." And all these works he performed in spite of a press of correspondence, long journeys on camels and horseback beneath a tropical sun, and under frequent and severe attacks of illness, at the age of sixty-three, and in spite of every mortification that malice and intrigue could devise against him. Unwilling to leave Sinde without some permanent proof of his ascendancy over the popular mind, and the consciousness of having contributed to its temporal prosperity, he persuaded the people to change the feudal system of land-tenure for that of landlord and tenant, considering that such was the best plan of forming loyal subjects by raising a class of farmers and small landholders attached to the government by ties of a personal and pecuniary interest.

In 1847 Sir Charles Napier returned home, and met with an enthusiastic reception; but ever ready at the call of duty, he re-embarked for India in March 1849, at the suggestion of the Duke of Wellington, on hearing of the then recent reverses which we had sustained in the Sikh campaign. Happily however on his arrival at Bombay he found that the tide had turned, and that his military services were no longer needed. There was no enemy to contend with in the field, and no principality to administer; so he set his active mind to work forthwith to carry out a system of military reform, his immediate object being to school the luxury and extravagance of the British officers into a simple and severe mode of living. In this work he was partially successful.

He returned to England in 1850, but his health and spirits were fast failing, and the last time that he appeared in public was on the occasion of the funeral of his friend and patron the Duke of Wellington, in November 1852. He died of a gradual decline at Oaklands, his seat, near Portsmouth, on the 29th of August, 1853, like a gallant soldier, under the old colours of the 22nd regiment and other trophies of his European and Indian career, and was buried in the ground attached to the garrison chapel at Landport, near Portsmouth. Sir Charles Napier was twice married—first in 1827, to Elizabeth, daughter of John Oakley, Esq., of Deal, Kent, by whom he had two daughters; and secondly, in 1835, to Frances, daughter of William Philipps, Esq., and widow of Captain R. Alcock, R. N. A bronze statue of the conqueror of Sinde has been erected by subscription in Trafalgar-square.

NAPLES.—The continental territories of the kingdom of the Two Sicilies are divided into 15 provinces, the area, subdivisions, and population of which are given in the subjoined table. The provinces beyond the Faro are given under SICILY, *S.* 2.

Provinces.	Area in Square Miles.	Districts.	Communes.	Population in 1851.
Napoli . . .	381	4	65	822,142
Terra-di-Lavoro . .	2,493	5	230	752,012
Principato Citra .	2,262	4	158	558,809
Principato Ultra . .	1,407	3	132	388,414
Basilicata . .	4,145	4	121	501,222
Capitanata . . .	2,916	3	62	318,415
Terra di Bari . .	2,358	3	53	497,432
Terra d'Otranto . .	2,871	4	120	409,000
Calabria Citra . .	2,619	4	146	435,811
Calabria Ultra (II.) .	2,063	4	151	381,147
Calabria Ultra (I.) .	2,194	3	104	319,662
Molise or Sannio .	1,777	3	135	360,549
Abruzzo Citra . .	1,243	3	121	312,399
Abruzzo Ultra (II.) .	2,519	3	110	329,131
Abruzzo Ultra (I.) .	1,297	2	72	231,747
Total . .	32,475	52	1840	6,612,892
Population of Sicily at the Census of 1851 . .				2,091,580
Total population of the kingdom of the Two Sicilies .				8,704,472

NARBERTH. [PEMBROKESHIRE.]

NARCISSUS, a genus of Plants belonging to the class Endogens and the natural order *Amaryllidaceæ*, among which it is known by its flowers growing upon a scape, and having a cup at their mouth; the stamens, which are opposite the sepals being longer than the others. It consists of bulbous plants principally inhabiting the warmer parts of Europe.

The following is the arrangement of the European species of this genus given in Mr. Wood's 'Tourist's Flora:'—

***A.* Leaves flat, linear, obtuse; tube of corolla short, obversely conical; crown campanulate dentate.**

N. Pseudonarcissus, the Daffodil. Scape 2-edged striate; flowers nearly sessile in sheath; crown erect, nearly as long as segments of corolla; stamens equal. It is found in woods and meadows throughout Europe.

N. minor, a native of Europe.

N. incomparabilis has the scape 2-edged. It is found in France and Italy and the coasts of the Mediterranean, and is naturalised in Great Britain.

***B.* Leaves nearly flat; flowers hypocrateriform.**

I. Scape nearly terete.

N. calathinus. Scape 2-4-flowered. A native of the Isles of Glenans and of Brittany.

N. dubius. Scape 2-6-flowered. Mediterranean and France.

N. chrysanthus. Scape 3-10-flowered. Found near Grasse, in France.

II. Scape 2-edged.

a. Crown yellow.

N. poeticus. Scape 1-flowered; petals white. It is found on open heathy fields in Norfolk and Kent, in Great Britain; it is also found in Austria and various parts of Italy.

N. radiiflorus. Scape 1-flowered; striate. It is found in Austria, Styria, and the Vallais.

N. biflorus, with linear-obtuse keeled leaves; scape compressed, 2-edged, striated, 2-flowered, crowned, very short, concave, crenate at the pale margin; the petals of a pale sulphur colour. It is found in sandy fields in the south of England, and in Ireland; also in France and Italy.

N. patulus, *N. præcox*, and *N. Tazetta*, are other European species belonging to this section.

b. Crown and petals white.

N. polyanthus. Scape slightly 2-edged, 8-20-flowered. It is found near Toulon and Nice, in stony places.

N. niveus. Scape 6-10-flowered. It is a native of France.

N. unicolor. Scape 10-15-flowered. It is found at the base of Vesuvius.

C. Leaves convoluto-setaceous.

N. serotinus. Scape 1-flowered. It is found near Palermo, on open hills.

N. cupanianus has the scape 1-7-flowered, and is found on the coasts of Corsica, Sardinia, Calabria, and Sicily.

D. Leaves semi-cylindrical and channeled.

N. lætus has the scape 1-3-flowered. Found near Grasse, in France.

N. ochroleucus. Scape 4-8-flowered. Found in fields near Toulon.

N. odorus. Scape 1-5-flowered. It is found in the fields and olive-grounds of Lucca.

N. Jonquilla, the Jonquil. Scape 2-6-flowered. It is found in Italy. *N. intermedius* is probably a variety of this species.

N. Bulbocodium. Scape 1-flowered. A native of heaths in France.

The species, from their hardiness or gay colours, or sweet smell, have long been favourite objects of cultivation, especially the Daffodils, Jonquils, and Tazettas. A very full account of them will be found in the 'Amaryllidaceæ' of the Honourable and Reverend William Herbert, p. 292 (8vo, London, 1837), who however divides the genus into six others, after the example of Salisbury and Haworth; but as those genera are not likely to be adopted by botanists, with the exception perhaps of the genus *Corbularia*, no account need be given of them. With regard to *Corbularia*, to which the name of Hoop-Petticoat Narcissus is given, and of which five supposed species are enumerated, the peculiar form of the flower and the delicate stamens of that plant may perhaps entitle it to be regarded as a peculiar genus; the species are pretty, all yellow flowered, with the single exception of *C. cantabrica*, a little plant with white flowers found on the mountains of Biscay and the Pyrenees, but now lost in our gardens.

NATAL, a British colony on the south-east coast of Africa, is bounded S.W. by the river Umtacoune (about 30 miles W. from the Umzincula, the previous boundary), N.E. by the river Tugala, N.W. by the Drachenberg or Quathlamba Mountains, and S.E. by the Indian Ocean. The colony lies between 29° 20′ and 30° 50′ S. lat., 29° 40′ and 31° 25′ E. long. The area is about 20,000 square miles. The white population in 1853 was 7029, the native population 112,988.

The Drachenberg or Quathlamba Mountains form a broad range which runs nearly parallel with the coast, at a distance varying from 60 to 90 miles from the shore. The average height of the range may be estimated at 8000 or 9000 feet above the sea, and the summits are covered with snow at least four months in the year. On the north-west, or interior side, a table-land slopes gradually down almost from the summits of the mountains, exhibiting extensive plains, diversified by a few isolated mountain-groups and low ranges of hills. There is no pass in the whole range between 28° 30′ and 31° S. lat. practicable for horses or wheel carriages, and there are very few for pedestrians. Coal occurs not far from the sources of the Tugala, and ironstone is frequently found. Copper has been discovered within 20 miles of Pietermaritzburg. In Natal the country gradually rises from the sea to the foot of the mountains. A few mountain groups occur, which are offsets from the Drachenberg range. The country is diversified with hill and dale.

The rivers are very numerous, and all flow eastward to the sea. Two of the largest are the Tugala and the Umzincula; they both rise in the Drachenberg Mountains. The Tugala receives several tributaries, of which the principal are the Buffalo River, which forms a portion of the boundary to the north, and the Bushman River; and it reaches the sea in 29° 15′ S. lat., 31° 25′ E. long. It has a bar at the mouth, and is not navigable. The Umzincula flows through a rugged and almost inaccessible country, and falls into the sea in 30° 50′ S. lat., 29° 20′ E. long.

Along the coast, in summer, the average temperature is about 74° Fahr.; in winter about 63°. Nearer the mountains the climate becomes colder. The rains generally commence in March, and end in September. Thunder-storms are of frequent occurrence, and are very violent. The climate, on the whole, is pleasant and healthy.

The climate and soil have been found suitable for the cotton-plant, but it is doubtful if it can be cultivated profitably. Indigo, sugar, and coffee are cultivated, and it is expected that sugar and coffee will become articles of export. Tobacco, maize, sweet potatoes, oranges, pine-apples, and pumpkins are raised in abundance. Cattle thrive well; but the climate does not appear to be suitable to the growth of wool. Horses are liable to sickness in the spring months, and many die. The soil is generally more fertile than in the Cape Colony, nor does it appear to suffer so much from droughts.

The elephant, which was formerly common in the colony, is now nearly driven away. The lion and leopard are still met with along the mountain ranges. Hyænas, jackals, wild dogs, ant-bears, and porcupines are numerous. The hippopotamus abounds in several of the rivers, and in the Tugala are numbers of small crocodiles. The larger antelopes are becoming scarce, but there are still many of the smaller ones. The vulture, rock-eagle, and Kaffir crane are common. Several valuable timber-trees grow on the declivities of the mountains and in the mountain valleys.

The colony of Natal is divided into the districts of Pietermaritzburg, D'Urban, Umvoti, Impafane, Tugala, and Umzinyate, and a tract in the south-west part of the territory. The principal town in the colony is *Pietermaritzburg*, founded by the Dutch boers in 1840, and containing about 3000 inhabitants. It is situated on an offset of the Drachenberg Mountains, in 29° 30′ S. lat., 30° 2′ E. long., about 50 miles W.N.W. from Port Natal. It contains a barrack, ordnance stores, and Dutch, Episcopal, and Methodist places of worship. It is well supplied with water. *D'Urban*, the only port of the colony, is situated on the east side of the inlet called *Port Natal*, which is a bay completely landlocked, and affording good anchorage. The entrance is narrow, and is impeded by a bar, on which there is sometimes not more than two fathoms of water. The cape at the entrance of Port Natal is in 29° 53′ S. lat., 31° 2′ E. long. Verulam, Windsor, and Western are the largest of the villages.

The white population of the colony is mostly composed of the original Dutch settlers who remained after the dispersion of the boers in 1842, and of the immigrants who have since arrived chiefly from Great Britain. The native population, consisting mostly of Tulas, are an intelligent and docile people, and make excellent servants. They are scattered in kraals along the banks of the rivers, and round the mission stations along the coast and western boundary. The British commissioner manages the affairs of the aborigines, and is regarded as their protector and chief. British, American, and Norwegian missionary societies have mission stations in the colony.

Natal has a lieutenant-governor, who is assisted by an attorney-general and an auditor-general, a collector of customs, a surveyor-general, a crown prosecutor, and a government secretary, who form a legislative and executive council. The revenue in 1854 amounted to 28,454*l* 13*s.*; the expenditure to 31,642*l.* 12*s.*, the excess of expenditure over income having arisen chiefly from the construction of public buildings, roads, &c. The imports in 1854 amounted to 124,722*l.* 6*s.* 9*d.*; the exports of colonial produce to 37,039*l.* 15*s.*, of which the wool exported was valued at 5141*l.* 15*s.* A bishopric of Natal was created in 1853. There are episcopal ministers at Pietermaritzburg and D'Urban.

The colony of Natal owes its origin to the Dutch boers (farmers), who in the year 1836 emigrated northward beyond the boundaries of the Cape Colony, and established themselves in small communities, with their families and cattle, in different parts of the unoccupied territory. These emigrants in 1838 employed their commandant, Pieter Retief, to enter into a treaty with Dingaan, the chief of the Zooloos. Retief crossed the Drachenberg Mountains, accompanied by 70 or 80 farmers, and their families and attendants, who visited Dingaan at his place of residence, preparatory to forming their intended establishment in the vicinity of Port Natal. They were received by the Zooloo chief and his warriors with every demonstration of kindness, but were treacherously surrounded and slain in the midst of professedly friendly festivities. The farmers scattered over the territory were next attacked successively, and upwards of 600 men, women, and children were killed, besides those who had been previously massacred at Dingaan's residence. The great body of emigrants, who still remained behind the Drachenberg Mountains, sent off expedition after expedition against Dingaan, and at length, in February 1839, succeeded in putting him to flight. The greater part of the Dutch farmers then removed to Port Natal, where, in December 1839, they hoisted the tricolor flag, and proclaimed an independent republic, with Andries Wilhelm Pretorius for president. The British government refused to acknowledge their independence, and Sir George Napier, then governor of the Cape Colony, sent some troops to take possession of Port Natal. They entrenched themselves, and maintained their position till the arrival of reinforcements by sea, in June 1842, when the Dutch were compelled to submit. By a proclamation dated August 21, 1845, the colony of Natal was established by the British government.

NATURALIZATION. A simple and inexpensive method of obtaining naturalization has been provided by the statute 7 & 8 Vict., c. 66, which enables the Home Secretary to give a certificate entitling an alien, on his taking an oath of allegiance and fidelity, to all the capacities and rights of a British subject, except those of sitting in Parliament, or being a member of the Privy Council. These capacities and rights, when granted, are considered to confer on the alien a temporary character only as a subject; that is, the alien cannot, on returning to his own country, there claim the protection of the British flag, as if he were a natural-born subject. The same statute declares the right of every *alien amy* to hold every species of personal property, except chattels real; and every *resident alien amy* to hold lands or houses for residence, trade, business, or manufacture, for a term not exceeding twenty-one years; this occupation not, however, conferring any right to vote for a representative in Parliament.

The statute enables all persons born abroad of a *mother* who is a natural-born subject, to take any real or personal estate by devise, purchase, or succession; and it naturalizes *de facto* any alien woman who marries a British subject; in consequence of which, the notorious Mrs. Manning when indicted with her husband for murder, was held not entitled to a jury *de medietate linguæ*.

NAUVOO. [UTAH.]

NAVARRETE, MARTIN FERNANDEZ DE, a Spanish scientific naval officer and historical investigator, who had the good fortune to bring to light materials of unusual value. He was born at the town of Abalos in Old Castile on the 9th of November 1765; and his uncle, who was afterwards Grand Master of the Knights of Malta, being high in influence among them, he was received into the Order of St. John of Jerusalem on the 9th of August 1768, or three months before he was three years old. The Count of Peñaflorida, the patron of the school of Vergara, where he studied Latin and mathematics, took a fancy to send to Don Tomas Iriarte, the then fashionable poet, the verses in which some of the boys had celebrated his popular poem of 'Music' and Iriarte was so pleased with those of Navarrete that he began a literary correspondence with him, and invited the young scholar to visit him at his house at Madrid. Soon after, in 1780, Navarrete entered the naval service, and became a 'guardia marina,' or midshipman, at Ferrol. In the next year, on board of the Concepcion, he was one of the Spanish fleet under Cordova, which, during that part of the American war, cruised unassailed in the English Channel; and he was at the disastrous attack of the Spanish floating batteries on Gibraltar, in September 1782. After some cruises against the Moors and Algerines, Navarrete was, in 1789, obliged to quit active service for some time on account of the state of his health, and his character of a naval and literary man combined procured for him the commission from the new king, Charles IV., to examine the national archives to form a collection of documents relative to the naval history of the kingdom, and in particular that of the voyages of discovery which have conferred such immortal honour on Spain. This was the commencement of Navarrete's great work, the first volume of which did not appear till thirty-six years after. In 1793 the Spanish declaration of war against the French republic recalled him to sea, and in 1796 the declaration of war with England kept him there; but his health was still weak, and when in 1797 his friend Langara became minister of marine he provided Navarrete (now risen to the rank of captain in the navy) with a post in his office at Madrid. His life after this appears to have been as undisturbed by violent changes as a life in that country and time could possibly be. At the outset of the war of independence he refused to accept office under the French, and he removed to Seville, but he took no active share in the war. He was re-instated in office as soon as Ferdinand returned, and for many years continued to be the great naval authority of Spain, the moving power of the Admiralty, although the title he bore was that of chief of the Hydrographic department, to which he was appointed in 1823. In the midst of his official duties his zeal for literature never slackened: he left behind him two volumes of poems, though he never showed them to any but his most intimate friends. As a member of the Spanish Academy, he proposed, about 1815, the new system of orthography which was adopted for its Dictionary, and has been followed by many of the Spanish writers. As secretary of the Academy of San Fernando, which is that of the Fine Arts, he was always at his post, and to their 'Transactions,' and those of the Academy of History, he was a contributor of valuable papers. He was also the author of numerous works, some of which are of great importance from the information they contain. He held his offices and also a distinguished place in the literary society of Madrid through several revolutions; and in 1834, when the Estatuto Real established a chamber of peers on the French model, he was one of the first peers created. He died at Madrid, on the 8th of October 1844, at the age of seventy-eight.

The great work of Navarrete is the 'Coleccion de los Viages y Descubrimientos que hicieron por Mar los Españoles desde fines del siglo XV.' ('Collection of the voyages and maritime discoveries made by the Spaniards since the close of the 15th century'). The work was to consist of seven quarto volumes: the first and second were published in 1825, the third in 1829, the fourth and fifth in 1837, the sixth and seventh, chiefly consisting of documents relating to Columbus, have not yet appeared in print, but the materials for them were left by Navarrete at his death, arranged for publication and only awaiting the introductions and notes he intended to add to them. The book is described by Humboldt as "one of the most important historical monuments of modern times." Washington Irving, who went to Madrid expressly for the purpose of translating it, afterwards changed his intention, and wove the new matter which it supplied into the 'Life of Columbus,' in which in fact little belongs to Irving, except the style. This mode of dealing with the materials was perhaps the best that could have been adopted under the circumstances. A French translation of Navarrete's works which was commenced never advanced beyond a few volumes. Navarrete was a man who let no day go by without searching into something, who habitually read with a pen in his hand, who had an excellent memory for names and dates, and other small facts of all kinds, and a talent for combining their results; but he lacked the power of condensation; he was not the man to write a European classic; his prejudice as a Spaniard of the old school influenced not only his writings, but in its absolute theory interfered with his dignity as an historian. Perhaps he did himself an injury by the learning with which he loaded his volumes. In his 'Coleccion' the number of new documents brought forward in the first two volumes, is said to have been five hundred, and while the work is one which is absolutely indispensable in every large library, and necessary to be consulted by every inquirer into the subject of which it treats, it is little read and is mainly known as a mine for others to dig in. One of the most interesting volumes of the Hakluyt Society, Mr. Major's letters of Columbus, is for the most part taken from it; but there are few other documents in the collection of such surpassing interest as these.

The other great work with which Navarrete was connected was the 'Coleccion de Documentos Ineditos para la Historia de España,' or 'Collection of Unpublished Documents for the History of Spain,' commenced by him in 1842 in conjunction with Don Miguel Salvá and Don Pedro Sainz de Baranda. It was and is published in numbers, and one of the editors on bringing a number to Navarrete once remarked "Well, volume three is done at last;" "Three," the old man replied with vivacity, "I wish there were three hundred, and that I saw them on my shelves. Without such publications we shall never have a history of Spain." He died when it had reached the fifth volume, and the last numbers we have seen belong to the twenty-fifth, and were issued in 1855, by Don Miguel de Salvá and the Marquis de Pidal, the latter a member of the Spanish Cabinet, and also eminent as a man of letters. This collection is one of the most important now publishing in Europe, and is, like Navarrete's previous one, indispensable in every large library. It has been frequently laid under contribution by English and American writers; in particular by Mr. Helps, Mr. Prescott, and Mr. Stirling.

Among Navarrete's other works is the most copious life of Cervantes yet written, originally prefixed to a new edition of 'Don Quixote,' and afterwards separately published in 1819. It contains a very large number of new facts which he had unearthed by patient research. A work entitled 'The Life and Writings of Cervantes, by Thomas Roscoe,' which was published by Tegg in 1839 as a portion of Murray's 'Family Library,' appears to be entirely taken from Navarrete, without acknowledgment; at least in several passages that we have compared we have been unable to discover any difference. A history of the part that the Spaniards took in the Crusades, which was contributed by Navarrete to the 'Memoirs' of the Spanish Academy of History, and a translation of which was inserted by Michaud in his 'Histoire des Croisades,' was a portion of a general history of maritime affairs in Spain which he left behind him complete, and which is likely to be published by the Spanish Academy of History, in two or three volumes quarto. That academy issued in 1846 a 'Dissertation on the History of the Nautical and Mathematical Sciences in Spain,' which Navarrete had, it is said, been at work upon occasionally for fifty years. His next important work after that is a view of the discoveries of the Spaniards on the western coasts of North America, prefixed to a narrative of the 'Voyage of the Sutil and Mexican on the Coasts of California,' published in 1802. The book was frequently referred to in the disputes between the English and American governments respecting the Oregon territory.

A collection of the smaller works of Navarrete, 'Coleccion de Opusculos,' was commenced in 1848 by his sons, but has not been carried farther, we believe, than two volumes, though it was intended to consist of five or six, comprising a selection from his correspondence, and an extended account of his life and times. The two volumes mainly consist of short biographies of Spanish literary men and seamen, which had mostly been scattered in periodicals and transactions of academies.

NAVENBY. [LINCOLNSHIRE.]

NAVICULA. [DIATOMACEÆ, *S.* 2.]

NAVY BAY, a natural harbour lying between the Atlantic coast of New Granada and the island of Manzanilla. The island, which is a mile and a quarter long, a mile broad, and covered with luxuriant trees and shrubs, is separated from the mainland at its southern extremity by a channel of about 60 feet wide and about 10 feet in depth. A projecting reef stretching out from the mainland at the north-eastern extremity of the bay forms a natural breakwater. The harbour thus formed is accessible at all seasons; it is secure in every wind, with a depth of 6 to 7 fathoms in the middle, and 3 to 4 fathoms within 60 feet of the shore, and capable of containing 300 sail. Navy Bay is the Atlantic terminus of the Panama railway, which from hence to Gatun (7 miles) is carried over a swamp supported on piles. A lighthouse has been erected at the western point of the island.

Aspinwall city, founded in 1851, is situated on the island, the terminus of the railway, and is now the depôt of the eastern side of the isthmus, instead of Chagres, from which it is distant 7 miles, and which has been since nearly altogether abandoned.

NAYLAND. [SUFFOLK.]

NEANDER, JOHANN AUGUST WILHELM, Professor of Theology in the University of Berlin, and a member of the Consistory of the province of Brandenburg, was born of Jewish parents, at Göttingen, on the 15th of January 1789. His early youth was spent in Hamburg, where he was educated at the Gymnasium, and at the Johanneum, a college founded on the site of the old cathedral, in which is placed a large public library. While pursuing his studies here he became a sincere and zealous convert to the Christian faith, assuming the name of Neander ('a new man,' from the Greek) on his baptism. He then, in 1806, repaired to the University of Halle to study theology, and thence removed to that of Göttingen. After a short stay in Hamburg, in 1811, he transferred himself to the University of Heidelberg, where his remarkable theological attainments obtained him in 1812 the situation of Professor Extraordinary of Theology; and in the same year his reputation occasioned him to be called to a similar office in the University of Berlin. From that time his whole life was devoted to the advancement of Christianity by his writings, which have continued to gain an ever-extending influence, and to the interests of the university and of the students under his care. The earliest published work which established his reputation was 'The Emperor Julian and his Times,' which at once showed that in this branch of Church history he was a master of his art. This appeared in 1812; in 1813 was issued 'St. Bernard and his Times,' and others followed—on the principal Gnostic systems, on St. Chrysostom and the Eastern Church, on Tertullian and his writings, 'Memorable Occurrences from the History of Christianity and Christian Life,' between 1818 and 1826. These however were only the preparatory labours for his valuable work, 'Universal History of the Christian Religion and Church,' in 5 vols., issued successively between 1825 and 1845. The history, he says, is at once "a speaking proof of the Divine power of Christianity; a school of Christian experience; a voice sounding through centuries for the edification, the instruction, and the warning of all who are willing to hear." The development of the Christian Church and faith during the Apostolic times formed the subject of his next work, 'Geschichte der Pflanzung und Leitung der Kirche durch die Apostel,' in 2 vols., published in 1832-33. In these works he has with great ability combated the neologism and rationalism so prevalent in Germany, to which he was ever as active an opponent as Schleiermacher, Hengstenberg, or Tholuck. In 1835 he issued 'Das Leben Jesu in seinem geschichtligen zusammenhange' ('The Life of Jesus in its Historical Relations'), a work which was written in direct refutation of that of Strauss bearing a similar title, and which with his 'General History of the Church,' and the 'History of the Apostolic Church,' have had great influence in England, and been highly valued. His reputation as a lecturer was also great, and his lectures were numerously attended. After a short illness he died on July 14, 1850. His smaller occasional writings were collected by himself, and published in 1829 under the title of 'Kleinen Gelegenheitsschriften,' for the benefit of the Bible Society of Berlin, of which he was always an earnest supporter. The 'Life of Christ,' 'History of Christianity,' 'History of the Planting of Christianity and of the Apostolic Church,' and other of his works have been translated into English, and form a part of Bohn's 'Ecclesiastical Library.'

NEBRASKA, a Territory of the United States of North America, established by Act of Congress 1854, occupies the tract of unreclaimed country north of the Nebraska River up to 42° N. lat. It is bounded E. by the state of Iowa, from which it is divided by the Missouri River; N. by the North-West territory; W. by the Rocky Mountains, which divide it from the Oregon and Utah Territories; and S. by the Territory of Kansas. The area is 335,866 square miles. The population in 1856 was 10,716.

This country and Kansas have hitherto been usually spoken of together [Kansas, *S.* 2], and the descriptions published have included both. Like Kansas, Nebraska has on the east, extending down to the valley of the Missouri, extensive tracts of prairie lands; on the west a broken and hilly country, rising into the mountainous tract of the Rocky Mountain range; while the centre is occupied by a broad apparently irreclaimable waste, forming the northern part of the Great American Desert, and the home of numerous wandering tribes of Indians. But Nebraska has a larger share than Kansas of this desert land, and in other parts it is believed a less fertile soil.

The Missouri, as we have said, forms its eastern boundary, and the only actual settlements, so far as we know, yet made in this territory are on its banks. The chief river belonging to the territory, and that which gives it its name, is the Nebraska, which is formed by the union, in 41° 5′ N. lat., 101° 21′ W. long., of two branches from the Rocky Mountains. The united stream flows in a generally eastern direction to the Missouri, into which it falls about 50 miles below Council Bluffs, and about 600 miles above the confluence of the Missouri with the Mississippi. It is a very rapid shallow stream, fordable, except during floods, in almost every part; and full of islands covered with cotton wood, willows, and shrubs, and of shifting sandy shoals: it is thought to be unavailable for navigation by steam-boats of light draught for more than 40 miles. At its confluence with the Missouri it is 600 yards wide. One of the two main routes for emigrants to Oregon and the Pacific lies along this river quite up to the Rocky Mountains. The chief affluents of the Nebraska belonging to this Territory are the Loup Fork, Elkhorn, and Wood rivers.

The chief settlement yet formed is Council Bluffs on the Missouri, which is within this Territory, though previous to its organisation assigned to Iowa, under which state it will be found noticed. It is of considerable local importance as the last civilised resting place of the emigrant to the 'far west,' who here makes his final arrangements and purchases, previous to entering upon what has hitherto been commonly known as the Indian country. Council Bluffs was established as a government Indian agency station. Bellevue, a little lower down the Missouri, is the only other civilised settlement in the Nebraska territory, with the exception of a military station for the surveillance of the Indians. The chief tribes of Indians in Nebraska are the Pawnees, Poncahs, Omahas, Ottoes, &c.; but we have no account of their numbers or condition.

The Act of Congress which erected Nebraska into a Territory, leaves it open to settlement by citizens of the United States, and to aliens who make the usual declaration of their intention to become citizens; and defers to the inhabitants themselves the power to determine whether slavery shall be permitted to exist within the territory.

NECKAR-KREIS (Circle of the Neckar), a province in the north-west of the kingdom of Würtemberg, is bounded N. and W. by the grand-duchy of Baden, E. by the circles of Jaxt and Danube, and S. by that of Schwarzwald. Its length from north to south is 55 miles; its breadth is about 36 miles; its area is 1278 square miles; and its population in 1852 was 501,034. The province is traversed by several ranges of moderately high forest-clad hills, which run in a western or north-western direction from the Rauhe Alb, or Alps of Suabia, in the east of the kingdom. It takes its name from the river Neckar, which, rising on the Baden frontier in the south of the Schwarzwald, runs in a general north-eastern direction to the centre of the kingdom of Würtemberg, whence it flows northerly past Heilbronn, below which it turns to the north-west, crosses the territory of Baden till it reaches that of Hesse-Darmstadt; of this it forms the boundary to its entrance into the Rhine at Mannheim, after a course of about 170 miles. The Neckar receives in this province the Enz, the Kocher, the Jaxt, and a great number of small streams. It is navigable for small craft from Cannstadt. There are several lakes and mineral springs in the province. The soil of the valley of the Neckar and of the other rivers is exceedingly rich and fertile. The chief products are wheat, hemp, wine, silk, and wood. Horned cattle, sheep, and horses of good breed are numerous. Railroads run from Stuttgardt to Heilbronn, and from Stuttgardt to Ulm and Frederikshaf on the Lake of Constance (from Ulm a line runs east to Augsburg). From the former line a branch is constructed to join the great trunk line along the right bank of the Rhine at the Bruchsal station, between Carlsruhe and Heidelberg.

Towns.—Stuttgardt. Cannstadt. Esslingen. ***Heilbronn***, 28 miles N. by railway from Stuttgardt, is situated on the right bank of the Neckar, which is here crossed by a wooden bridge. It is surrounded with high walls and a deep ditch, and contains some good buildings, the most interesting of which are the church of St. Kilian, the town-hall, and the house of the Teutonic Knights, now used as a barracks. Heilbronn has a gymnasium, a public library, and about 10,000 inhabitants, who are actively engaged in trade, and in the manufacture of silver ware, carpets, tobacco, white lead, chemical products, gunshot, paper, &c. The navigation of the Neckar below this town is much facilitated by the Wilhelm's Canal. ***Ludwigsburg***, N. of Cannstadt, a mile from the left bank of the Neckar, is a well-built town, with 6208 inhabitants, exclusive of the garrison. The town, which, for its size, is one of the prettiest in Germany, has long wide streets, mostly lined with trees. The principal building is the former royal palace, one of the largest in Germany; it contains a great number of pictures of the old German and Flemish schools. The other remarkable objects are the military college, the lyceum, and the arsenal. Woollen cloth, linen, calico, jewellery, leather, nails, and cannon are amongst its industrial products.

NECROPHORUS, a genus of Coleopterous Insects belonging to the family *Silphidæ*. The antennæ are terminated by a nearly globular 4-jointed mass; the body is parallelopiped; and the maxillæ have no horny teeth. There are several species of this genus. They have obtained the name of Burying Beetles, from the peculiar instinct which they exhibit of burying the dead bodies of small animals, such as moles, mice, frogs, &c., as a receptacle for their eggs and larvæ. Their powers of perception are very strong, and it is surprising how soon they discover a dead body fitted for their purpose, round which they may be observed flying, with the elytra elevated, their dorsal surfaces being applied together. They soon creep beneath the body, and commence scratching up the earth from the sides and under the animal, which by degrees descends into the pit which is thus gradually deepened. When it has reached a sufficient depth the earth is thrown over it, and the insect deposits its eggs upon the carcass, so that the larva, when hatched, finds itself in the midst of a repast, disgusting enough, but suited to its taste. The larva is long, of a dirty-white colour, with the upper surface of the anterior segments armed with a scaly plate of a brown colour, and with small elevated points upon the hinder segments. They have also six scaly legs, and the jaws are robust. When they have attained their full size they bury themselves still deeper in the earth, where they construct an oval cell, the inner surface of which they coat with a gummy secretion. These insects, like many others which feed upon carrion, have a strong odour like musk. The habits of these insects have been especially studied by M. Gleditsch, and more recently by various persons in France, who have written upon the subject of destroying moles, and by whom various points in their economy have been elucidated.

There are a considerable number of species of this genus, some of the largest of which (*N. grandis*, Fabricius) have been observed in North America. There are seven British species, five of which are distinguished by the golden-coloured bands of the elytra. These species vary amongst themselves in the form of the thorax, the structure of the hind legs, the markings on the elytra, and the colour on the club of the antennæ. One of the most common species is the *Silpha Vespillo* (Linnæus), in which the posterior tibiæ are curved, and the trochanters furnished with a strong spine. The species vary also in length from half an inch to an inch and a third, which is the length of *N. germanicus*, the largest and rarest of the British species. (Westwood.)

NEEDLE-ORE. [MINERALOGY, *S.* 1.]

NELSON. [ZEALAND, NEW, *S.* 2.]

NEMALITE. [MINERALOGY, *S.* 1.]

NEMATODES. [ELATERIDÆ.]

NEMATOIDEA. [ENTOZOA.]

NENAGH. [TIPPERARY.]

NERITA, NERITIDÆ. [TURBINIDÆ.]

NERVOUS TISSUE. [TISSUES, ORGANIC, *S.* 1.]

NETHERLANDS. The area and population of the Kingdom of the Netherlands are distributed over 11 Provinces, as follows:—

Provinces.	Area in Square Miles.	Population.
North Brabant . .	1976·2	405,525
Guelderland . . .	1962·0	387,423
North Holland . .	955·0	514,755
South Holland . . .	1169·6	591,493
Zealand . . .	670·4	165,075
Utrecht	534·2	155,324
Friesland . . .	1260·9	259,508
Overyssel	1280·8	227,683
Gröningen . . .	882·5	197,101
Drenthe	1027·0	87,944
Limburg . . .	848·5	211,401
Total . . .	12,567·1	3,203,232

NEUKOMM, THE CHEVALIER SIGISMUND, a celebrated German composer, was born at Salzburg in 1778. Being related to the family of Haydn, he received his early musical education from Michael Haydn, the elder brother of the author of 'The Creation.' From him Neukomm acquired that predilection for sacred music which distinguished him throughout his career. At the age of twenty he went to Vienna. Joseph Haydn received his young relative most kindly, and made him his pupil: and the friendship, thus begun, lasted without interruption during the whole of the great master's life. Neukomm's close and unbroken intercourse with Haydn, and admiration of his genius, had a sensible effect on the formation of his own style, which is marked not only with Haydn's regularity, symmetry, and clearness, but with many of Haydn's characteristic traits of musical phraseology.

After having gained a high reputation in Germany, Russia, and France, Neukomm came to England for the first time in 1829; and his reception by the public was such as to induce him to pass much time in this country. His residence in England was an active period of his life. It was here that his greatest works, the oratorios of 'Mount Sinai' and 'David' were produced. 'Mount Sinai,' originally composed to German words, was afterwards adapted by himself to an English version of the text, and performed for the first time at the Derby Musical Festival of 1831. 'David,' the poem of which was originally written in English, was composed expressly for the Birmingham Musical Festival, and performed in 1834. During the same period he gave the English public many vocal pieces, both sacred and secular, which obtained general popularity. Among these, his sacred cantatas, 'Miriam,' 'The Prophecy of Babylon,' and 'Absalom,' are remarkable for their grandeur, expression, and perfect adaptation of the music to the English poetry, for Neukomm was a perfect master of our language. 'The Sea' was for a long time the most popular song of the day; and though it has given places to newer favourites, it is still frequently heard, and always with pleasure. Neukomm's latest work was 'Twenty Psalms selected from the authorised English Version,' for the use of singing-schools, choral societies, churches, and chapels of every persuasion. It was written for the Association for the Revival of Sacred Music in Scotland, and published by that body at Edinburgh in 1853. It possesses great value. The most beautiful of the Psalms are selected, and the music, in a plain and simple style, has the grand and solemn beauty which characterises Neukomm's sacred works. A collection of Voluntaries for the Organ—an instrument on which Neukomm was one of the greatest performers in Europe—is among the most important works produced by him in England. There is scarcely a branch of his art which he left untouched. His instrumental compositions, symphonies, quartets, sonatas, &c., are very numerous and of much merit; but it is on his great sacred works that his permanent fame will rest.

In the course of his long life Neukomm received many of the honours due to the highest distinction in his art. He was invested with several orders of knighthood, in France, Portugal, and Prussia. He was a member of the Royal Academy of Arts in Prussia, and most of the principal musical institutions and societies in Europe and the United States. He was a Doctor of Music in the University of Dublin, and he was one of the jury of our great London Exhibition in 1851. For several years he was afflicted with an ophthalmic complaint, at one time almost amounting to deprivation of sight; but he partially recovered from it, and resided at Bonn, enjoying, till he was fourscore, a green old age and an honoured retirement. He died in April, 1858.

NEVIN. [CAERNARVONSHIRE.]

NEW GRANADA. [GRANADA, NEW.]

NEW GUINEA. [PAPUA.]

NEW JERSEY. [JERSEY, NEW.]

NEW MEXICO, a Territory of the United States of North America, lying between 31° and 38° N. lat., 103° and 117° W. long. It is bounded S.E. and E. by the State of Texas, from which it is divided on the S. by the parallel of 32° N. lat., and on the E. by the meridian of 103° W. long; N. by the Territory of Utah; W. by the State of California; and S. by the Republic of Mexico. The area of New Mexico is estimated at 210,774 square miles. The white population was 61,525 in 1850. The Indian population was estimated by the Commissioner of Indian Affairs in 1853 at 45,000. The Territory of New Mexico was formed in 1850 out of the country ceded by Mexico to the United States, with the addition of a portion of that claimed by Texas.

Surface, Hydrography, &c.—The Territory of New Mexico, as at present constituted, consists of two distinct sections, which will probably at some future day be separated into two distinct territories or states: the one comprising the country occupied by the two great ranges into which the Rocky Mountains are in this part separated; the other the country west of those Mountains. The former, or New Mexico proper, is a rugged mountainous country, with a valley about

20 miles wide, formed by the Rio Grande del Norte, traversing it from north to south. The western range of the Rocky Mountains bears various names, as the Sierras de Anahuac, de los Mimbres, de los Grullas, Mogollon, Madre, &c.; but the name now most commonly given to the greater part of it is the Sierra Madre. Many of the most northern summits of this range are covered with perpetual snow, and may be from 9000 to 12,000 feet above the sea. The southern portion is probably from 6000 to 8000 feet above the sea. The eastern range, which runs nearly parallel to the other, is known in the northern part as the Sierra Obscura, and in the southern as the Sierra Sagramento, though the latter name is commonly applied to it throughout. These mountains rise very abruptly from the eastern plain into lofty peaks and knobs variously disposed, with fertile valleys between them. Some of the northern summits of this ridge are also covered with perpetual snow, and the altitude appears to be on the whole somewhat greater than that of the western ridge. Pines generally grow on the higher mountains, cedars and occasionally oaks on the lower ones. The narrow tract bordering the Sierra Sagramento on the east is very elevated, and forms the western boundary of the extensive plain north-west of Texas. The narrow valleys by which the mountain streams reach the plain are often heavily timbered, and the soil appears to be fertile; but the intervening spaces have an arid soil, which is only covered with vegetation in the early part of the year.

The great valley which lies between these mountain chains forms the district known as New Mexico while the country belonged to the Mexican republic. It is a very elevated tract, the northern part being more than 5000 feet, and the most southern, where it touches the Mexican boundary, 3800 feet above the sea. Through it as mentioned above flows the Rio Grande del Norte. The surface, especially in the upper part, is greatly broken, and the soil throughout is dry and sandy; but where irrigated is generally pretty fertile. Below Santa Fé about 36° 20′ N. lat. is the most fertile part, and there two crops are often obtained annually. This is the most populous and the only civilised part of the country, a large portion of it being occupied by the farms of the old settlers.

The country west of the Sierra Madre, forming nearly two fifths of the territory, is very much varied in surface. It is drained throughout by the Rio Colorado and its tributaries. The northern part is mountainous, and a large part of the eastern boundary is formed by rugged mountains. The interior is considerably diversified, well watered, and appears to be in many parts a fine agricultural country. The middle part is occupied by a great plain drained by the Rio Gila and its affluents, much of which is sandy and barren; but the land in the immediate vicinity of the streams is frequently fertile. The whole is occupied by Indian tribes: the Apaches inhabiting the east and south-east, the Navajoes the north-east, the Pah-Utahs the north-west, and the Pimos the west and south-west.

The Rio Grande del Norte, or, as it is more commonly called, the Rio Grande or Rio del Norte, rises in the Rocky Mountains, near 40° N. lat., not far from the sources of the Arkansas and Colorado. Its course before it reaches the boundary of New Mexico is generally south-east, but throughout this territory it is nearly south. Its direct length from its source to its mouth in the Gulf of Mexico is about 1400 miles, but its course following its windings is full 2000 miles. Throughout New Mexico it is a rapid shallow stream, and has numerous shoals and sand-bars. It appears to be scarcely navigable even by canoes, and though it is well fitted to supply mill-power, it is at present scarcely used except for irrigation. Its lower course is noticed under Mexico. The Rio Puerco is its only tributary of any consequence in this territory; but this stream, though it runs for a considerable distance through a longitudinal valley west of the Rio Sagramento, has, owing to the arid nature of the soil, but little water. The Rio Colorado, which drains the western part of the territory, runs south by west from its source near that of the Rio Grande till it enters New Mexico, when it bears more to the west, and so continues till it quits the territory and opens into the Gulf of California. The Colorado is believed to be navigable for a great distance, but the country through which it flows has as yet been but little explored. Several of its tributaries are also believed to be navigable for considerable distances. The most important tributary in New Mexico is the Rio Gila, which drains the great plain noticed above. It rises in the most southern extremity of the western range of the Rocky Mountains, and after descending into the plain, where it is joined by the San Francisco, an affluent which rises much farther north, it flows through the plain nearly west-south-west to its confluence with the Colorado, about 32° 45′ N. lat. It receives several affluents on both its banks, but none appear to be of much consequence. The other more important tributaries of the Colorado in this state are the Nabajoa and the Yaquesila.

The mountains appear to be mainly composed of eruptive and metamorphic formations; the rocks enumerated consisting chiefly of granite, sienite, basalt, porphyry, &c., but Silurian and Carboniferous strata also seem to have been recognised. New Mexico appears to be rich in minerals, though its resources have been very imperfectly developed. Gold has been found in many places. In the Santa Fé district the peasantry have long been accustomed to employ a good deal of their time in washing the river-sands for gold, and some gold-mines are worked. The Spaniards wrought several silver-mines, but none are now in operation. Copper is said to abound throughout the mountain districts, though only one or two mines are now worked. Iron is also abundant. Coal is said to have been found near the village of James south-west of Santa Fé, and in other places. Gypsum occurs in various parts. On the high lands between the Rio Grande and Rio Pecos and in other places are extensive salt-lakes, or salinas, whence all the salt used in New Mexico is obtained.

The climate differs considerably, but is on the whole temperate; its great characteristic is its dryness. There is a rainy season, from July to October; but the rains are seldom heavy, and never of long continuance. The winters are long, especially in the north; but below Santa Fé the Colorado is seldom frozen firm enough to admit the passage of carriages. In the lower part of the valley of the Colorado the summer temperature occasionally rises to 100° Fahr., but the nights are generally cool. Epidemics are scarcely known.

The grain products are mostly confined to maize and wheat; mezquite is raised in the central valley; peas and beans, onions, red pepper, some fruit, and tobacco are also grown. Agriculture is everywhere in a most primitive state. Even in the central valley the chief dependence is on the raising of stock. Large numbers of horses, mules, cattle, and sheep are reared, there being everywhere extensive pastures; but comparatively little attention has been yet paid to the improvement of the breeds, which are generally small and inferior.

Almost the only manufactures are those for which the natives have long been celebrated—namely, those of coarse and fancy blankets, in great request for the favourite national garment called the 'serapo;' and the chequered woollen-stuff called 'gerga,' used for carpets, as well as for clothing. Most of the imported articles are received by the Missouri overland route by caravans, by way of Independence to Santa Fé.

Of the 61,525 white inhabitants, above 58,000 are the descendants of the Spanish settlers, and all of them are Roman Catholics. The settlers from the older states and territories of the United States were only 761 in 1850. The natives appear to be an indolent but contented race, partaking more of the character of their Indian than their Spanish ancestors. The more laborious work is assigned to the females; not only the household work, and a good deal of the field labour, falls to their lot, but the spinning of the blankets and woollen wares is chiefly done by them. Of the ancient inhabitants of New Mexico the vestiges are still very numerous. They are chiefly what are called Aztec ruins, similar to those described under American Antiquities, *S.* 1. Several are found along the banks of the Colorado and the Grande rivers and their tributaries. The most celebrated are those known as Las Casas Grandes, on the Gilas, noticed under American Antiquities, *S.* 1, p. 98. Some of equal extent, called La Gran Quiviri, occur near the Salinas, between the Rio Grande and the Pecos, about 100 miles S.E. from Santa Fé, where, among other extensive remains, are said to be portions of an aqueduct 10 miles long.

Divisions, Towns, &c.—New Mexico is divided into seven counties. Santa Fé is the political capital, and though there are several other towns, they have necessarily so small a population as to be of little other than local consequence. *Albuquerque*, on the left bank of the Rio Grande, 76 miles S. from Santa Fé, is the only one which requires to be mentioned. It is said to have formerly contained 6000 inhabitants, but it has now little trade or population.

Santa Fé, the capital, is situated about 20 miles E. from the Rio Grande, in 35° 41′ N. lat., 106° 1′ W. long., on a wide plain surrounded by mountains, and at an elevation of 7047 feet above the level of the sea: population, 4846 in 1850. It is an old town, having been founded by the Spanish settlers in 1581, and consists of narrow irregular streets, with houses of a single story, built of adobe, square in form, and having a central area. It contains two Roman Catholic churches, but no other public buildings of any note. The inhabitants are still nearly all of Spanish and Indian descent, but there are a few Americans, who have established two newspapers, one published three times a week and the other weekly. Santa Fé is a place of great trade, being the centre and depôt of the overland route by way of Missouri. The climate is serene and little variable, and the town is said to be very healthy.

The government of New Mexico is based upon the Act of Congress of September 9th, 1850, which established the Territory, and provided that every free white male inhabitant then residing in New Mexico, and all free white citizens of the United States who should subsequently qualify by residence, should be entitled to vote in all elections. The legislative assembly consists of a Council of 13 members, elected for two years, and a House of Representatives of 26 members, elected annually. The governor, as in all the territories, is appointed by the president of the United States. A delegate to Congress is elected by the citizens.

(*Statistical Gazetteer of the United States; American Almanac*, 1854; *Seventh Census of the United States; Official Report;* Humboldt, *Essai Politique sur la Nouvelle Espagne;* Pike, *Exploratory Travels;* Poinset; Lyon, &c.)

NEW ORLEANS. [ORLEANS, NEW.]

NEW ROSS. [WEXFORD.]

NEW SOUTH WALES. [WALES, NEW SOUTH.]

NEWBURGH. [ABERDEENSHIRE, *S.* 1.]

NEWCASTLE EMLYN. [CAERMARTHENSHIRE.]

NEWNHAM. [GLOUCESTERSHIRE.]

NEWPORT, GEORGE, distinguished as a comparative anatomist and physiologist, was born in the county of Kent in 1803. His parents were in humble circumstances, and with but little education he commenced following his father's business. He was indebted to a mechanics' institute at Canterbury for first exciting in him a taste for the study of natural history. He became so well known for these pursuits that, when a natural history museum was opened at Canterbury, he was at once appointed curator. Without any one to guide or direct him, he pursued the study of animals in his own way; and was particularly fond of dissecting any fresh specimen that came under his notice. His love of anatomy and natural history paved the way for his entering the medical profession; and after having served his apprenticeship, according to the requirements of the Apothecaries' Society, with Mr. Weeks of Sandwich in Kent, he finished his medical education at the London University, now University College. Here he attended the lectures of Professor Grant, and soon found that the work he had been pursuing in the country had qualified him for communicating the results of his labours to the world. His first paper was sent to the Royal Society, and was published in the 'Philosophical Transactions.' It was entitled, 'On the Nervous System of the Sphinx Ligustri, Linn.; and on the Changes which it undergoes during a Part of the Metamorphosis of the Insect.' This was speedily followed by other papers, which were read before the Royal Society, and published in the 'Philosophical Transactions.' The principal of these were entitled, 'On the Respiration of Insects;' 'On the Temperature of Insects, and its Connection with the Functions of Respiration and Circulation in this Class of Invertebrated Animals;' 'On the Organs of Reproduction and Development of the Myriapoda;' 'On the Structure, Relations, and Development of the Nervous and Circulating Systems, and on the Existence of a complete Circulation of the Blood in vessels, in Myriapoda and Macrourous Arachnida;' 'On the Reproduction of lost Parts in Myriapoda and Insecta.' He also published a series of papers on kindred subjects in the 'Transactions' of the Linnæan Society.

The labours of Newport, as a comparative anatomist, were chiefly confined to the insect tribes. Of all classes of animals they present the greatest variety of forms, and the largest number of adaptations of structure, to the circumstances in which they are placed. They hence afford a wide field for research to the comparative anatomist. It is however few who are endowed with the patience and delicate manipulative skill which the dissection of their delicate organisms demands. From his youth Newport had taken a delight in investigating the structure of insects, and his paper on the nervous system of the *Sphinx* was received with astonishment, on account of the skill and labour it displayed. In this paper he not only gave a minute account of the anatomy of the nervous system of this insect, but pointed out the relation which existed between the parts of the nervous system in insects and other animals. In the same philosophical spirit he pursued his researches in other departments of insect life. His papers on the respiration and temperature of insects, showed the relation between these two functions long before the chemical changes by which they are accompanied were understood. In his papers also on the reproduction of limbs in articulate animals, the structure of the blood-globule in insects, and the development of the ovum in the same class of animals, will be found a series of researches bearing on all the modern progress of physiology. A résumé of his own researches upon insect anatomy and physiology, with those of other comparative anatomists, will be found in his article 'Insecta,' in the 'Cyclopædia of Anatomy and Physiology.'

Whilst it is as an anatomist and physiologist that Newport takes a first position, his minor works and papers claim for him the highest merit as an entomologist. He was most diligent in his observations on the habits of insects, as is proved by his prize essay on the 'Habits and Economy of Athalia centifoliæ, the Sawfly of the Turnip.' Besides this paper he published many others on the habits of insects. In one of these he announced the discovery of a new genus of Parasites, and worked out their history in the most accurate and beautiful manner. This paper was published in the 'Transactions' of the Linnæan Society, and was entitled, 'The Anatomy and Development of certain Chalcididæ and Ichneumonidæ, compared with their special Economy and Instincts; with Descriptions of a new Genus and Species of Bee-Parasites.' As a systematic entomologist, he devoted his attention to the description and classification of the family *Myriapoda*. The specimens of these insects in the British Museum were arranged, and the catalogue descriptive of them published by the authorities of that institution was drawn up, by him.

Newport early joined the Entomological Society, and contributed many papers to its 'Transactions.' In 1844 he was elected president of this society, and in 1845 he was re-elected.

During the last few years of his life he had devoted great attention to the development of the ova in various kinds of animals. He published two series of papers on the development of the embryo in the ova of the *Amphibia*, and at the time of his death was engaged in drawing up a third. It was in consequence of pursuing this subject that he met with his death. In the spring of 1854, being desirous of obtaining some frogs for the purpose of pursuing his researches, he exposed himself to the malaria of the ponds which these creatures inhabit, and on the 6th of April sunk under a fever thus contracted.

Although Mr. Newport became a member of the College of Surgeons in 1835, and was made an honorary fellow in 1843, he was too devoted to his scientific pursuits to follow his profession. But England has no positions to offer her men of science, and during the latter years of his life he maintained himself on a pension of 100*l.* a year granted him by the government. Even the luxury of belonging to a scientific society has to be paid for, and out of his small pension Newport maintained his connection with the Royal and Linnæan societies, of which he was so distinguished a fellow, and to whose 'Transactions' he contributed so largely. He was twice rewarded with the royal medal of the Royal Society, and was a member of the councils of both the Linnæan and Royal Societies. His works were highly appreciated by Continental philosophers, and he was an honorary member of several foreign societies. He was an amiable, retiring man, little known beyond the limited sphere of men who cultivate the sciences of comparative anatomy and physiology; but his name will become more widely known as these sciences are more studied, and the true value of his researches be more widely appreciated.

NEWSPAPERS. In the 'Penny Cyclopædia,' vol. xvi., an account was given of newspapers down to 1838. Of the foreign newspapers little has to be added; the numbers in different countries may have varied somewhat, but their character remains unchanged, except that in France they have been brought still more under government control. In that country they are liable to an official warning for any infraction of prescribed rules, and after a third warning the publication is suspended.

In treating of the origin of the newspaper, we stated in our previous article that the claims of 'The English Mercuries,' of which three numbers are in the British Museum, purporting to be published at the time of the Armada, were suspected not to be genuine. The suspicion was well founded. In 1839 Mr. Thomas Watts, one of the librarians of the British Museum, published a 'Letter to Antonio Panizzi, Esq.,' in which he proved incontrovertibly that they were forgeries, and that the forgery was perpetrated about 1766. The three numbers, which are marked as 50, 51, and 54, purporting them to be part of a series, contain seven articles, three of which are in print, and four in manuscript. The type is of the date of 1766, but an old style of spelling is affected, while in the manuscript the spelling is modern, with a number of corrections in a different hand-writing; and the manuscript is written on a paper, with the watermark of the royal arms and initials of "G. R." In 1850 Mr. Watts made public the result of his further investigations, which showed that the manuscript was in the hand-writing of Philip Yorke, the second Earl of Hardwicke, and a few of the corrections in that of Dr. Birch. Mr. Watts also proves that the claims of France for the earliest newspaper, the 'Gazette of Paris,' in 1631, are also unfounded, and that the earliest specimen of this branch of literature belongs "to Italy or to Germany." The claim of Germany is strongest: at Augsburg and Vienna printed sheets containing news were published as early as 1524.

Since the publication of the previous article, the abolition of the advertisement duty in 1853 (16 & 17 Vict. cap. 63); the total removal of the stamp duty in 1855, or at least rendering it optional for the purpose of paying the penny postage, which gives the privilege of circulating by post for fifteen days (18 & 19 Vict. cap. 25); and the introduction of machinery, by which from 10,000 to 15,000 copies can be produced perfect in an hour; have united in giving a marked impetus to the extension of newspapers in the United Kingdom. In London there are now (April 1858) published 11 morning papers instead of six. The 'Times,' which usually consists of 16 pages, or two sheets, each containing a printed mass of upwards of 19½ square feet, price 4d.; the 'Morning Advertiser,' the 'Daily News,' the 'Morning Chronicle,' the 'Morning Herald,' the 'Morning Post,' and the 'Public Ledger,' each of 8 pages, and price 4d.; the 'Standard' and the 'Daily Telegraph,' each of 8 pages, the 'Morning Star' and the 'Morning News,' each of 4 pages, the last four published at 1d. each. As there is now no record of the numbers printed, it is impossible to give more than approximations; but it is known that the 'Times' publishes daily from 50,000 to 60,000 copies, and the 'Standard' has asserted that on one occasion it printed 100,000, the general sale nearly approaching that number. It is clear, indeed, that only a very large sale, with numerous advertisements, for which the wide circulation renders them a good medium, can enable these low-priced newspapers to maintain themselves, particularly as some of them, the 'Standard' for example, do not rely on the higher-priced morning papers for the more expensive articles of intelligence, such as the foreign and telegraphic communications, reports in parliament, &c. Of evening papers there are now eight, the 'Express,' the 'Globe,' the 'Evening Herald,' the 'Evening Star,' the 'Sun,' the 'Shipping and Mercantile Gazette,' the 'Shipping Advertiser,' and 'Lloyd's List.' The last two are entirely mercantile, as is the 'Public Ledger,' among the morning papers. Of the others, the 'Globe,' the 'Sun,' and the 'Shipping and Mercantile Gazette,' are papers of 4 pages, price 4d. The 'Express' and the 'Evening Herald' are branches of the 'Daily News' and the 'Morning Herald,' price 2d.; and the 'Evening Star,' price 1d., is an evening edition of the 'Morning Star.' The 'London Gazette' and the 'Patriot,' the organ of the Independent and Baptist dissenters, are published twice a week. The 'Evening Journal,' the 'Evening Mail,' the 'St. James's Chronicle,' the 'Monetary Times,' and the 'Record,' are published three times a week. Of weekly London papers there are altogether 111, but this includes literary papers, such as the 'Athenæum,' the 'Literary Gazette,' 'Punch,' 'Notes and Queries,' and many class publications, such as the 'Solicitor's Journal,' the 'Builder,' and the 'Pawnbroker's Gazette;' but they are all essentially newspapers, though not all political. One remarkable feature is the existence of a considerable number of local papers in London, the 'City Press,' the 'Clerkenwell News,' the 'Islington Gazette,' the 'Islington Times,' the 'Holborn Journal,' the 'Marylebone Mercury,' and several others. These are chiefly papers devoted to local affairs and advertisements, none of them exceeding a penny in price, and some being published at a halfpenny. Some of the other weekly papers are conducted with a large amount of literary and political talent, and are of a higher price, such as the 'Examiner,' the 'Spectator,' the 'Saturday Review,' the 'Press,' the 'Leader,' &c. Others appeal to cheapness and a variety of intelligence, and some of them reach a circulation of upwards of 200,000. Among those which reach a high number are some of the illustrated papers, such as the 'Illustrated London News,' the 'Illustrated Times,' &c. There are many other periodical publications, such as 'Household Words,' 'Chambers's Journal,' &c., which, as not containing *news*, are not included among newspapers. Of local newspapers published in England there are 411, and in Wales 22. Many of these are penny papers, which are mostly published in the smaller towns; but Birmingham has two daily papers and Liverpool one at that price. There are 131 newspapers published in Scotland, and the prices vary from a penny, of which price there are many and some of them daily, to sixpence. In Ireland there are 123 published, but only Belfast and Dublin have any papers so low in price as a penny. In the Isle of Man and the Channel Islands, there are published 13 newspapers, at prices varying from a penny to threepence. In all the preceding statements we have named the price independent of the stamp, which in all cases is charged for extra if a stamped paper is required. As we have already mentioned it is perfectly impossible even to guess at the total number printed, but in 1857 seventy-one millions passed through the post-office, of which about three-fourths bore the newspaper stamp, and the other fourth an affixed postage stamp.

By the Act 18 and 19 Vict., cap. 27, any periodical publication, published at intervals, not exceeding thirty-one days, of which the print does not exceed the prescribed superficies, may claim to be stamped as a newspaper; but in such case the title must be printed on the top of every page, with the date of publication; and, when posted, must be folded so as to show the stamp denoting the duty. Newspapers to be sent abroad by post may be registered at the General Post-office, for which an annual fee of 5*s.* is charged, the year always terminating on the 30th of June. It is not absolutely necessary that the newspaper should be registered, but the English Post-office then charges 2*d.* in addition to the foreign or colonial postage. Before a newspaper can be published a notice must be given at the Inland Revenue Office, Somerset House, or at the District Stamp-office, where the form of a "declaration" will be given, in which is to be stated—the title of the intended paper quoted literally; the place where it is to be printed, giving the number of the house, the name of the street and of the parish in which it is situated, and the name of the occupier if it forms part of a dwelling-house; and the like particulars respecting the place of publication if it differs from the place of printing; the Christian and surnames of the printers and publishers; the number of shares into which the property is divided whenever the number, exclusive of the printer and publisher, exceeds two; and the Christian and surnames, residences, and occupations of every proprietor, with the number of shares belonging to each when exceeding two, exclusive of the printer and publisher. This declaration must be made by the proprietor, or two proprietors, or by two of the largest shareholders where the number exceeds two, who must also furnish two respectable householders as sureties against the publication of seditious, blasphemous, or personal libels, to the amount of 400*l.* in London and 300*l.* elsewhere. A newspaper published before these securities are given subjects the proprietors to a penalty of 20*l.* The paper when published must have across the bottom of the last page or the last column, the names and residences of the printer and publisher, the place of publication, the date, and the price, under a similar penalty for neglect. A supplement must not be issued without the paper itself; and a copy of the paper, which is paid for, must be transmitted to the Stamp-office on the day of publication or the day after in London, Edinburgh, or Dublin, and elsewhere within three days, under the like penalty of 20*l.* for each offence; but the penalties can only be sued for by the Attorney-General or the Stamp-office.

The size and amount of stamp-duty for newspapers are defined as follows by the 16 and 17 Vict., cap. 63: Newspaper stamps are to be 1*d*. only, for a superficies of print, on one side of the paper, not exceeding 2295 inches, whether published as a supplement or not; any supplement that with the paper does not exceed that quantity is to be exempt; and any other supplement to a duly stamped newspaper not containing a superficies on one side of more than 1148 inches of print is to be subject to a stamp of one-halfpenny; and any two supplements not containing more than 2296 inches, to a duty of one halfpenny each, provided each be published on one sheet of paper only. Newspapers not stamped go by post at the book-post rate of a penny for 4 ounces, twopence for 8 ounces, and then ascending by twopence for every fraction of 8 ounces; and any number may be sent in one envelope open at the ends.

NEWT (*Lissotriton punctatus*). [Salamandriæ, p. 336.]

NEWTON. [Lancashire.]

NEWTON ABBOT. [Devonshire.]

NEWTOWN-LIMAVADY. [Londonderry.]

NEWTOWNARDS, County Down, Ireland, a market-town, and the seat of a Poor-Law Union, is situated near the head of Lough Strangford, in 54° 36′ N. lat., 5° 54′ W. long., 12¼ miles E. from Belfast by the Belfast and County Down railway. The population in 1851 was 9567, besides 508 inmates of the workhouse. Newtownards Poor-Law Union comprises 16 electoral divisions, with an area of 93,851 acres, and a population in 1851 of 56,861. The town, pleasantly situated in the midst of hills, is neat, regular, and well built. In the Market-square and principal streets are many good houses. The parish church is a handsome building, erected in 1817. There are chapels for Roman Catholics, Presbyterians, and Methodists, and three National schools. The old parish church, erected in 1632, a large building with a handsome spire, is now used as a court-house. There are a market-house, a bridewell, and a Union workhouse. The weaving and embroidering of muslin afford a considerable amount of employment. Quarter and petty sessions are held. Fairs are held on the second Saturday of every month, and on January 23rd, May 14th, and September 23rd. Near the centre of the town is an octagonal structure, with canopied niches, forming the pedestal of a cross, erected in 1636. Newtownards was incorporated by James II., and returned two members to the Irish Parliament.

NGAMI, LAKE. [Africa, *S.* 2.]

NIAGARA. [Canada, *S.* 2.]

NICÆA (*Nikaia*), an ancient ruined city in Bithynia, in the north-west of Asia Minor, the site of which is marked by the Turkish village of Is-nik. It stood on the eastern shore of the Lake Ascania, and was built or restored by Antigonus, son of Philip, after whom it was called Antigoneia. The name was subsequently changed by Perdiccas in honour of his wife, Nicæa, daughter of Ptolomæus, king of Egypt. The city became early the seat of a Christian bishop. It was destroyed by an earthquake in the latter end of A.D. 325, but it was restored under the emperor Valens in 368. Aided by the Greek Nicephoras Melissenus, the Turks, under Solyman I., took the city (1080), which was made their head-quarters till 1097, when Godefroi de Bouillon, at the head of the Crusaders, took it after a siege of 35 days, and it was again united to the Greek empire. Two years after the establishment of the Latin empire in Constantinople (1204) Theodore Lascaris made Nicæa the Greek capital, which it continued to be till 1261, when in the reign of Michael Palæologus (who was crowned at Nicæa the year before), Constantinople was recovered by the Greeks. In 1333, after an obstinate and bloody siege, the Turks, under Orkan, again took Nicæa, which they made their capital. After the battle of Angora (June 30, 1402) it was taken and pillaged by the followers of Tamerlane. In 1422 it joined in a conspiracy to put Mustapha on the throne of his brother, Amurath II., whereupon the latter reduced the city to obedience, and had his brother and the chief conspirators strangled in his presence.

Sir Charles Fellows, who visited the site of Nicæa, says that the walls form a circuit of four miles. These walls are strengthened with towers. One part is built or repaired with materials of great elegance from an ancient temple; another part is built with Roman brick; a third with marbles of a late age, marked with the sign of a cross and ill-cut inscriptions, showing the repairs made in Christian times; the remaining parts are built of immense stones cut to fit into each other in the cyclopean style. Four large majestic gateways with arched entrances still exist in an almost perfect state, but the inscriptions that once covered them have been nearly altogether effaced. Among the existing remains are many inscribed stones, copies of which are given in Sir Charles Fellows's 'Asia Minor;' ancient bas-reliefs; a few statues; and ruins of an early Greek theatre, "of extremely good workmanship, and colossal, the stones being some nine and others fourteen feet in length." Ruins of mosques, baths, and houses are seen among the gardens and corn-fields which cover a great space within the ancient walls. In the village of Is-nik, which stands in the centre of the ruins, there is a small church, used by the Greeks for their worship, with Mosaic floor and ceiling of the Byzantine age. Every fence, trough, or paving-stone in the village and its neighbourhood is derived from this quarry of art, and many fragments of good sculpture are built into the houses. A Roman aqueduct still conveys water to the town from the neighbouring mountains. In the lake, the waters of which are of transparent clearness, are the remains of an ancient landing-place.

In the history of the church Nicæa is memorable as the place in which the first and seventh œcumenical or general councils were held. The first, held in 325 (June 19 to August 25), in presence of the emperor Constantine, and presided over by Osius, representative of Pope Sylvester, condemned the doctrines of Arius, maintained the divinity of Christ, and declared the consubstantiality of the Son of God with his Father to be an article of faith. The creed founded upon these decrees was drawn up by Osius; it is the Symbolum Nicænum, that is, Nicæne or Nicene Creed, still in use. This council also passed decrees for celebrating the festival of Easter on the same day throughout Christendom. A proposal forbidding priests who were married before receiving holy orders, to live with their wives, was rejected. The council was attended by 318 bishops from all parts of the Roman empire.

The seventh general council, held in 787 (September 24 to October 23), and attended by 377 bishops, condemned the Iconoclasts, and explained the worship of images.

(Fellows, *Asia Minor; Art de Vérifier les Dates.*)

NICARAGUA, Republic of, Central America, occupies the hilly and volcanic region extending from Salinas Bay to the Bay of Conchagua on the Pacific, and back to the Mosquito territory. It may be taken generally as lying between 10° 45′ and 14° 10′ N. lat., 84° and 87° 40′ W. long.; and as bounded E. by the Mosquito Territory; N. by the republic of Honduras; N.W. by that of Salvador; W. by the Pacific Ocean; and S. by the republic of Costa Rica: but the eastern boundary is really undefined, Nicaragua refusing to acknowledge the right of the King of Mosquito to the tract lying along the Caribbean Sea. The area, consequently, is not agreed upon: that really under the authority of the republic does not probably exceed 35,000 square miles, but that claimed is of course much greater. The population may be about 250,000: the chief part of whom are ladinos, or mulattoes, and native Indians.

The coast along the Pacific from Salinas Bay to the Gulf of Conchagua bears nearly north-west. It is throughout rocky, and has some harbours of much value. That which may just now be regarded as the most important, from its being the Pacific port for the Nicaragua route connecting the Atlantic and Pacific Oceans, is San Juan del Sur, north of Salinas Bay, which is formed by two promontories between 400 and 500 feet high, having an entrance above 3000 feet across. The harbour is small, but well sheltered, and affords anchorage in from 2 to 10 fathoms water. About a mile from it is the nearly similar harbour of Nacascolo. Port Realejo, towards the northern end of the state, is also a very good and much larger harbour, and is that which, prior to the opening of the Nicaragua transit route, received most of the foreign vessels trading with the republic. There is a very narrow tract of tolerably level land along a good part of the coast.

Along the western side of the republic, at a few miles from the coast, extends a ridge of low volcanic mountains, highest at the southern end, and generally decreasing in altitude as we proceed northward: though one or two of the isolated peaks in the northern part are among the most elevated. Several of these volcanoes appear to stand alone, or to have scarcely any connection with the main ridge, though standing in its general line of direction. The highest summits appear to be Omotepec, which forms an island in Lake Nicaragua (5100 feet above the sea); Momotomba, at the northern extremity of Lake Managua, about the same height; Mombacho, between Lake Nicaragua and the Pacific (4500 feet); Nindiri, between Managua and Masaga; Felica; El Viejo, and one or two others. Several of these are active volcanoes. Another mountain tract, a part of the mountain system of Honduras, extends along the northern part of the country. This part of Nicaragua is traversed by several ridges, some of whose summits attain a considerable altitude. Between the ridges extend many good-sized valleys, the principal being those of the Rio de Segovia, and the Rio Escondido. The remainder of the state belongs to the plain of Nicaragua, of which, however, the larger portion forms the Mosquito territory. This plain is but little elevated above the level of the sea; the Lake of Nicaragua which occupies a arge part of the Nicaragua section of it, being only 122 feet above the Caribbean Sea. Along the rivers it is wooded; the rest of the plain forms extensive savannahs, covered with a rich verdure, and presenting occasionally a clump of high trees. The climate being excessively hot and moist the white races have not formed any settlements on this plain, and it is only inhabited by independent aboriginal tribes.

The few rivers which in Nicaragua fall into the Pacific, are of short extent and little consequence. Those falling into the Atlantic are longer and more important. Two considerable streams rise, as already mentioned, in the northern part of the republic, the Segovia and the Escondido; the sources of some of their upper branches are not very distant, but their outlets are far apart—that of the Escondido being near the southern, and that of the Segovia towards the northern end of the Mosquito coast. The Segovia flows past the town of the same name, but both rivers belong more to Mosquito than to Nicaragua. The most important river of this republic is the *San Juan*, which forms the boundary between Nicaragua and Costa Rica, and falls into the Caribbean Sea, near 11° N. lat. It is by means of this river and the Lake of Nicaragua, that one of the two great lines of communication is proposed to be opened between the Atlantic and Pacific oceans. The river San Juan is the only channel by which the Lake of Nicaragua discharges its waters into the Atlantic. The Lake or Lagune of Nicaragua is an inland sea, of a lengthened form, being about 100 miles long and 40 miles broad where widest, without narrowing much at either end. It is the reservoir of a great extent of mountainous country, and is deep enough to be navigated by vessels of considerable size, having about 100 yards from the beach generally a depth of about 2 fathoms; and at a greater distance from 5 to 15 fathoms of water along the southern and western banks. It is only very shallow along the north-east shore for a mile and upwards into the lake. It contains several islands, among which that of Omotepec, near the south-western bank between Granada and Nicaragua, is remarkable for a high volcano, and for its fertility and population, being inhabited by a numerous and industrious tribe of Indians, who have a small town, Moyagalpa, possess cattle, and raise maize, rice, &c. The river issues from the south-eastern extremity of the lake; its breadth varies from 100 to 400 yards. About the middle of its course the San Juan receives from the south the Rio San Carlos, and lower down the Serapiqui. About 25 miles from its mouth the river divides into two arms, of which the southern and wider is called Rio Colorado; the other (the San Juan) enters the sea near the harbour of San Juan del Norte. The depth of water in the upper part of the course of the San Juan varies from 9 to 20 feet, but in some places it is so shallow that rapids are produced, and it contains numerous islands. The lower portion of the river, below its bifurcation, is generally shallow. The mouth of the San Juan has a bar with seldom four feet of water upon it. The winding course of the river is somewhat under 100 miles. On the Pacific side there are, however, greater obstacles to the communication between the two oceans than that presented by the channel of the San Juan. At the narrowest part the distance between the Lake and the Pacific is only about 15 miles, and on the coast there is here the good harbour of San Juan del Sur, but the hills upon it rise to between 400 and 500 feet, presenting a formidable barrier to the construction of a canal, while the difference of level between the lake and the sea is 129 feet, and therefore locks would be necessary. The hills might perhaps be in a measure avoided, but the canal would of course be longer. Whether such a canal will ever be formed it would be hard to predicate; especially since the completion of the railway across the Isthmus of Panama has provided so much more rapid a route. But even in the absence of the canal this route has been largely adopted. In 1850 the governments of England and the United States concluded a treaty by which they agreed to co-operate in the establishment of a secure and neutral line of communication between the two seas by way of the San Juan River and Lake Nicaragua, to be open on equal terms to all nations, with a free port at each end of the line. A company was formed for constructing a canal, improving the navigation of the San Juan, and working the communication by steam-boats. The Nicaragua Transit Company have been unable even to attempt to carry out the first and most arduous part of their task, but they have established steam-boats of light draught to navigate the river, and organised a line of carriages to convey the passengers and goods from Nicaragua to San Juan del Sur on the Pacific. During 1854 a very large number of passengers to and from California adopted this route, and it was asserted in some of the advertisements of the line published in New York, that not only was "the Nicaragua Transit route the shortest, safest, and by far the most comfortable and healthful," but that passengers by it had "to travel but 12 miles of land carriage over a good macadamised road." Long before the establishment of this route communication had been maintained between the Atlantic and the towns of Granada and Nicaragua, by the river San Juan and Lake Nicaragua, by means of flat-bottomed vessels called piraguas, of from 5 to 10 tons burden. The passage from Granada to San Juan, or Greytown, is usually made by the piraguas in about 8 days, whilst the return passage being against the stream, occupies from 12 to 15 days. It has been proposed by some as more advantageous to unite the Lake of Managua by a canal with the harbour of Realejo. The country between them is nearly level, and of a firm soil, without being rocky. Besides this, the canal would terminate in the port of Realejo, one of the best harbours on the west coast of America, while that near Nicaragua would end in the smaller harbour of San Juan del Sur. But this canal would be more than twice as long as the other; in addition to which, the Tepitapa, which unites the Lake of Nicaragua with that of Managua, must be rendered navigable. The lake of Managua is 35 miles long, and fifteen miles broad in its widest part. It is deep enough for vessels of considerable size; but the Rio Tepitapa, which brings down the water from the Lake of Nicaragua, and is about 25 miles long, has falls which, in the dry season, are from 6 to 8 feet high, and also several shoals. These obstacles could only be avoided by a canal cut through the level ground on the northern side of the Rio Tepitapa.

The climate of the Plain of Nicaragua, as stated above, is hot and moist, and so unhealthy as to have caused it to be left to the undisturbed occupation of the native races. The thickly wooded banks of the San Juan River are no exception to this observation. The shores of the Pacific, where the population is densest, are also very hot and somewhat humid, but do not appear to be particularly unhealthy, except in the vicinity of the Bay of Conchagua, where however there are comparatively few inhabitants. The hilly districts between the coast and the western banks of the lakes are much milder and more salubrious, as is also the mountainous country of the north. There are regular dry and rainy seasons, as in other parts of Central America, the only difference being that the rains last somewhat longer, and fall in larger quantities. In the hilly country west of the lakes occasional showers also occur out of the regular rainy season.

The soil throughout the occupied districts appears to be very fertile, but agriculture is in a rude state; the roads are almost everywhere insufficient, ill made, and ill kept, and oxen are almost the only animals of draught. Although therefore Nicaragua might with a peaceful and industrious people furnish vast quantities of agricultural produce for other countries as well as for the supply of a greatly increased population, it really affords little more than suffices for domestic consumption. Maize and frixoles are raised in considerable abundance, and form the staple food of the people. Some wheat is grown in the north, chiefly for use in the cities. Sugar, indigo, cotton, coffee, cocoa, and tobacco are all grown, but, except indigo, not to any great extent. A great variety of fruits, including several native kinds, with oranges, lemons, &c., ripen well; and garden vegetables flourish, but little attention is paid to them except by the Indians, who cultivate them for sale in the cities. Indigo, Nicaragua, and Brazil wood, and some other timber and dye-woods and hides are at present the chief articles exported. Cattle are among the principal sources of wealth, very large numbers of them being kept on the plains along the eastern sides of the lakes. Fish are plentiful in the lakes, in which also crocodiles are common. Along the coast pearls used to be found. The mineral resources of Nicaragua have not been very diligently explored. Gold and silver have been found and worked, but not extensively; copper has also been found.

The manufactures are nearly confined to the coarser goods required for home consumption. The chief articles made are coarse cotton and woollen cloths; the cotton being dyed of a purple colour, obtained from a shell-fish caught in the vicinity of San Juan del Sur, is in great request among the Indians, who prefer it to any European dyed goods on account of the greater durability of the colour.

Nicaragua is divided into five departments, which are named after their respective capitals:—Segovia comprises the north-eastern part of the territory; Leon, the north and north-western; Managua, the district south of Leon; Granada, that south of Managua; and Nicaragua, the most southern part bordering on Costa Rica. Leon is the political capital. The following are the principal towns; the populations are merely a loose approximation:—

Leon, the capital of Nicaragua, contained not many years ago, a population of 32,000 inhabitants, but the civil contentions within the town have reduced it to half that number, and destroyed a large proportion of its best buildings. It is situated on the road which leads from the best-cultivated districts of the state to the harbour of Realejo, in 12° 26′ N. lat., 86° 52′ W. long. The city occupies a considerable area, and contains a cathedral, several churches, a university, Tridentine college, &c., but all in a very neglected condition.

Granada, on the north-western bank of the Lake of Nicaragua, population about 12,000, carries on some trade with Jamaica by means of the river and harbour of San Juan, contains several churches and convents; but has no features requiring further notice.

Managua, on the south bank of Lake Managua, is a considerable place containing 10,000 inhabitants. *Masaga*, some little distance S. of Managua, has a population nearly equal to it, but almost all Indians, who are engaged in commerce with the adjacent populous country, and in the manufacture of the various articles of domestic requirement in which they display much skill.

Nicaragua, about two miles from the west bank of Lake Nicaragua, contains, with the suburb of San George, some 15,000 inhabitants, and is surrounded by a district noted for its fertility, especially in cacao and grapes.

San Juan del Sur, on the Pacific, S.W. of the town of Nicaragua, contained but few inhabitants previous to its selection as the Pacific port for the Nicaragua line of communication between the two oceans. The harbour, as already mentioned, is small but convenient, and possesses good anchorage.

Segovia, on the Rio de Segovia, is a small place, whose only claim to notice is that of being the capital of the department of Segovia, the least populous section of the republic. The country around is fertile and healthy, and its mineral wealth is believed to be considerable.

Nicaragua is nominally a Republic with a senate and a chamber of deputies, but the government is really vested in a dictator with the title of Supreme Director. After the declaration of independence, and the formation in 1842 of the republic of Central America [GUATEMALA, *S.* 2; HONDURAS, *S.* 2], Nicaragua formed one of the federal states until the dissolution of the union, when, like the other states, it became an independent republic; and, like them, all hopes of its progress have been since arrested by constant internal discord.

NICOLAS I., PAVLOVICH, Emperor of Russia (styled also Czar and Autocrat of all the Russias), was born in the city of St. Petersburg, July 7, 1796 (June 25, Old Style). He was the third son of the Emperor Paul, Alexander I. having been the first son, and the Grand Duke Constantine the second son. His mother, Sophie Dorothea, a daughter of Friedrich Eugen, duke of Würtemberg, when she became the second wife of the Emperor Paul, became also a member of the Greek Church, and, as is the usage, changed her names to those of Maria Feodorowna.

The Emperor Paul having been assassinated March 23, 1801, Nicolas was left entirely to the care of his mother, who appointed General Lamsdorf his governor, and selected the Countess Lieven and the German philologist Adelung as his principal teachers in languages and literature, and Counsellor Storch as his instructor in general politics and other sciences and arts suitable to his rank and station. He acquired the power of speaking the French and German languages with as much facility as the Russian, and early manifested that preference for military display, military tactics, and the art of fortification, which distinguished him through life.

After the termination of the great European war in 1814, Nicolas was sent to travel, and visited some of the principal battle-fields. In 1816 he came to England, where he met with a cordial reception. He afterwards made a tour in the chief provinces of the Russian empire. On the 13th of July, 1817, he married Frederica-Louisa-Charlotte-Wilhelmina, eldest daughter of Frederic William III., king of Prussia, and sister of Frederic William IV., the present king. She was born July 13, 1798, and her distinguishing name was Charlotte, but on her marriage and entering the Greek Church she assumed the names of Alexandra Feodorowna.

The Emperor Alexander I. having no issue, his next brother Constantine was the legitimate heir to the throne; but, by a document signed August 28, 1823, Constantine renounced his right, reserving to himself the dignity of Viceroy of Poland; so that, when Alexander died at Taganrog, December 1, 1825, Nicolas immediately succeeded him. He did not however become emperor without a struggle attended with much danger. An extensive conspiracy had been organised a considerable time before the death of Alexander among the officers of the Russian army and those of the nobility who were friendly to a constitutional government; and the soldiers and people were taught to believe that the abdication of the Grand Duke Constantine had been obtained by forcible means. When the troops were assembled in the great square fronting the Imperial Winter Palace of St. Petersburg, in order to make a manifestation of their allegiance to the new emperor, the officers, just as the ceremony was about to commence, stepping forward out of the ranks, denounced Nicolas as a usurper, and proclaimed Constantine as their rightful czar. The soldiers followed their officers, with cries of "Constantine and the Constitution!" Milardowich, governor of St. Petersburg, a veteran favourite of the army, and the archbishop, in his ecclesiastical robes, endeavoured to suppress the hostile demonstration, but in vain, and the people showed signs of sympathising with the troops. At this critical moment Nicolas came forward, and, boldly confronting the officers and soldiers, called out with a loud voice, "Return to your ranks—obey—kneel!" The czar's majestic form and undaunted bearing, his pale but calm and stern countenance, and the reverence with which the Russians habitually regard their sovereign, caused most of the soldiers to kneel and ground their arms. The first outbreak was thus checked, but the conspiracy was not suppressed till artillery and musketry had poured freely their missiles of destruction among the gathering masses of the insurrectionists. Colonel Pestel and four other leaders of the conspiracy were executed. Others were sent to the mines of Siberia, where Nicolas continued their punishments with unappeasable severity. He was crowned at Moscow with great pomp and ceremony, September 3, 1826; and at Warsaw, May 24, 1829.

Soon after his coronation, in 1826, the Emperor Nicolas commenced a war with the Shah of Persia, which lasted till the victory over the Persians by Field-Marshal Paskevich, February 28, 1828, led to the treaty of Turkmanchai, by which the Shah, besides undertaking to pay about three millions sterling, ceded to Russia the provinces of Erivan and the countries situated on the lower Kour and the Aras. A war between Russia and Turkey ensued in 1828, during which the Russian army crossed the Danube and took the fortresses of Braila and Varna. In the campaign of 1829, General Diebitch took the fortress of Silistria, defeated the main army of the Turks at Shumla, crossed the Balkan, and advanced to Adrianople, where a treaty of peace was signed September 14, 1829. By this treaty, Nicolas obtained for Russia, besides a large sum as indemnification for the expenses of the war, liberty to trade in all parts of the Turkish empire, trading navigation on the Danube, free passage of the Dardanelles, the fortress and pashalic of Anapa on the eastern coast of the Black Sea, and other additions of territory as well as of political power.

On the 29th of November 1830 an insurrection broke out in Poland. The Polish troops having joined the insurrectionists, the Grand-Duke Constantine, as commander-in-chief, was allowed to retire from Poland with 8000 Russians. In January 1831 the Polish Diet declared the throne vacant, organised a national government under Prince Adam Czartoryski, and prepared for a vigorous defence of their country. They assembled about 60,000 troops; but the Russian armies which advanced against them numbered about 130,000, and had about 400 pieces of artillery. The Poles fought bravely, and were successful in several actions, but sustained an enormous loss at the battle of Ostrolenka, May 26, 1831. The Prussian government prevented the Poles getting supplies of arms and ammunition across their frontier, while the Russians were allowed to have magazines within the Prussian territory. General Diebitch died suddenly on the 9th of June, and was succeeded by Paskevich. Warsaw was besieged on the 6th of September, and surrendered on the 8th. The failure of this insurrection was disastrous to the Poles. The Emperor Nicolas treated them with rigorous severity: several were sent to the mines of Siberia, and many to serve as soldiers in the Caucasus; the Polish constitution was formally abrogated; the chief universities were suppressed, and the libraries removed to St. Petersburg; and on the 17th of March, 1832, by a decree of the emperor, the kingdom of Poland was incorporated with the Russian empire.

In 1837 the Emperor Nicolas made a tour in his Trans-Caucasian provinces. He travelled with great rapidity, but remained at Tiflis from the 20th to the 24th of October, reviewed the troops, gave dinners and a grand ball, and held a levee, which was attended by all persons of distinction in the provinces. He paid a visit of inspection to the fortress of Gumri, since named Alexandropol, near the frontier of Turkish Armenia, and about 45 miles E. by N. from Kars. It was then in process of construction, and is now a fortified position of great strength either for defence or offence against the Turks in Asia Minor. A desultory conflict was at this period carried on between the Russians and the Circassians, but in 1839 war was formally declared by Russia against the Circassians, and has continued with little intermission ever since. In 1844 the Emperor Nicolas paid a second visit to England, and was entertained by Queen Victoria at Buckingham Palace and Windsor Castle from the 1st to the 9th of June. In 1849 he sent a Russian army into Hungary in aid of the Austrians, and the subjugation of that country was accomplished in the month of August of that year.

The last and most important event in the reign of the Emperor Nicolas was the recent war with Turkey and the Western Powers. It was the only unsuccessful and disastrous war in which he had engaged, and the reverses his army experienced probably occasioned a degree of excitement and irritation which shortened his life. It was commenced by the emperor's minister Menzikoff in March 1853 demanding a right of protectorate over those subjects of the sultan who belong to the Greek Church. The claim was refused, and a Russian army occupied Moldavia and Wallachia as a 'material guarantee' for enforcing it. In October the same year the Porte declared war against Russia, and applied to France and England for their promised aid. A Turkish army under Omar Pasha occupied Shumla and the fortresses on the Danube; in November he threw a body of troops across the river opposite Widin, and fortified a position at Oltenitza, on the left bank, which was retained till the termination of the war. The destruction of the Turkish fleet at Sinope in the same month was followed by the advance of the French and English fleets into the Black Sea. The English and French armies were next landed and encamped near Constantinople, whence they removed to the vicinity of Varna. In March 1854 the Russian army crossed the Danube, and besieged the fortress of Silistria, but after great efforts and an enormous loss of men was compelled to raise the siege on the 15th of June, and to retreat across the Danube. The Anglo-French army landed in the Crimea September 14, 1854; won the battle of the Alma; by a flank march seized a position on the south side of Sebastopol, and commenced the siege, which, after a severe struggle, the facts of which are well known, was terminated on the 8th and 9th of September 1855, by the capture of the town and all the forts on the southern side of the harbour of Sebastopol.

Meantime, before this great feat had been accomplished, the Emperor Nicolas died at St. Petersburg on the 2nd of March, 1855, and was succeeded by the present emperor Alexander II. The Empress Alexandra survives him, and he has left issue four sons and two daughters: Alexander, born April 29, 1818; Maria, born August 18, 1819; Olga, born September 11, 1822; Constantine, born September 21, 1827; Nicolas, born August 8, 1831; and Michael, born October 25, 1832.

The Emperor Nicolas was upwards of six feet in height, muscular and well-proportioned, with handsome features. In his personal habits he was simple, abstemious, and indefatigably industrious. He had a taste for the fine arts, and for music, and is stated to have composed some military airs; but his favourite pursuits were connected with the military sciences and military operations. In his political principles he was professedly despotic. He has been heard to say, "Despotism is the very essence of my government, and it suits the genius of my land." The great objects of his public life were the increase of the power of Russia and the extension of her territories to the east, west, and south, by unscrupulous diplomacy, and, when that failed, by war. His grand purpose is now known to have been the possession of Constantinople. By means of that unrivalled military and political position, he trusted to have superseded the Sultan in his empire, and to have become the dominant power in Europe and Asia.

NICOLAS, SIR NICHOLAS HARRIS, was born on March 10, 1799, the fourth son of John Harris Nicolas of Cornwall. He entered the navy early, and attained the rank of lieutenant on September 15, 1815, after having distinguished himself in the capture of several vessels on the coast of Calabria. As he ceased to be employed after the close of the war he turned his attention to antiquarian literature, and his first production was 'The Life of William Davison, Secretary of State and Privy Councillor to Queen Elizabeth,' published in 1823, occasioned probably by his having married in 1822 a daughter of John Davison, a descendant of the family of the secretary. He had entered himself at the Middle Temple, and in 1825 he was called to the bar, but his practice was almost entirely confined to claims of peerage before the House of Lords. About the same time he became a Fellow of the Society of Antiquaries, a member of the council, and a frequent contributor to the 'Archæologia,' but he soon disagreed with them, and wrote several pamphlets against the administration of the affairs of the society, and also pointing out defects in the proceedings of the Record Commission. His industry was extraordinary, and though many of the works he published were those of others, such as 'The Poetical Rhapsody, and other Poems by Francis Davison,' reprinted from the edition of 1608; 'The Literary Remains of Lady Jane Grey;' 'Journal of the Embassy of Thomas Beckington to France in 1442;' 'The Siege of Carlaverock;' 'The History of the Battle of Agincourt;' 'The Privy Purse Expenses of Henry VIII. from November 1529 to December 1552;' 'A Chronicle of London from 1089 to 1483,' from manuscripts in the British Museum; 'Memoirs of Lady Fanshaw, written by herself;' and others; they were all so enriched with memoirs of the persons mentioned, with annotations and other matters, as to assume the character of original works, and are all highly valuable to the historical student. In 1826 he became joint editor with Henry Southern of the new series of the 'Retrospective Review,' of which however only six numbers were published.

Among his most generally useful historical works are: 'Notitia Historica, containing Tables, Calendars, and Miscellaneous Information for the use of Historians, Antiquaries, and the Legal Profession,' 8vo, 1824; afterwards remodelled for 'Lardner's Cabinet Cyclopædia,' under the title of 'The Chronology of History; containing Tables, Calculations, and Statements indispensable for ascertaining the Dates of Historical Events, and of Public and Private Documents, from the earliest period to the present time,' 1835, a most valuable work, which has been more than once reprinted. In his 'Controversy between Sir Robert Grosvenor and Sir Richard Scrope in the Courts of Chivalry, A.D. 1385-1389,' a magnificent work in 2 vols. 8vo, but which was never completed, he had given a memoir of Geoffrey Chaucer; this he afterwards extended to a life, to accompany Pickering's Aldine edition of Chaucer's 'Works,' by far the best life which had hitherto appeared. For the same work he also furnished lives of the Earl of Surrey, Sir Thomas Wyatt, Collins, Cowper, Thomson, Burns, and Henry Kirke White. In 1844 he published 'The Despatches and Letters of Admiral Lord Viscount Nelson,' in 7 vols. 8vo. He had also commenced 'The History of the British Navy,' of which he only lived to complete two volumes. Among his numerous other works were several on the statutes of various orders of knighthood, for which in 1831 he was made a knight of the Hanoverian Guelphic Order, and in 1832 chancellor of the Ionian Order of St. Michael and St. George. After a life of indefatigable industry, spent in producing works nearly every one of which has great historical or professional merit, he died at Cape Curé, near Boulogne, on August 3, 1848.

NICOPOLI, NIKOPOL, in Turkish *Tchingani-Kalé*, the ancient *Nicopolis ad Istrum*, a city in Bulgaria, in European Turkey, and the capital of a pashalic, is situated on the right bank of the Danube, 80 miles S.W. from Bukharest, 280 miles N.W. from Constantinople, and has about 10,000 inhabitants. The Osma on the Bulgarian side, and the Aluta on the Wallachian, join the Danube just above the town. The city, which occupies one of the finest sites in the world, consists of two parts. The fortress and Mussulman town, crowned by many shining minarets, stand on the summit of a lofty limestone cliff above the Danube, several hundred feet high, and surrounded by a ravine. It is a place however of little real importance as a fortress, for it is commanded by heights around it. On the opposite or eastern slope the houses of Bulgarians, Wallachs, and Jews rise in white clusters one above another like an amphitheatre. The Turkish town is defended on every side by batteries and by a stout parapetted rampart, for the protection of infantry; it is further defended by a castle or citadel. There are some large well-built houses, several mosques and baths, but in general the town is ill built. The neighbourhood of Nicopoli, especially on the eastern side, towards Sistova, is very beautiful; much of the ground about the town is laid out in gardens. Nicopoli gives title to a Greek archbishop and a Catholic bishop. Its situation on the Danube makes it a place of some trade.

Nicopoli was founded by Trajan. Several patches of the ancient walls still remain. The sultan, Bajazet I., at the head of the Janissaries, defeated the Hungarians, commanded by their king, Sigismund, and aided by the choicest troops in Europe, under the walls of Nicopoli, Sept. 28, 1396. Sigismund had besieged the town for six days before the arrival of the Turks. The town has often suffered from the Russians.

NIDULARIACEÆ, a sub-order of Plants belonging to the order *Gasteromycetes*, the alliance *Fungales*, and the class *Thallogens*. It includes the genera *Nidularia*, *Cyathus*, *Crucibulum*, *Sphærobolus*, *Thelebolus*, and *Atractobolus*.

NINEVEH. [Nineveh, *S.* 1.] Since M. Botta's first discoveries were made known to Europe still greater additions to our knowledge of Nineveh have been made by Dr. Layard, who spent much time in making excavations in the great inclosure near the Tigris, before mentioned. Here, in the Mound of Nimroud, he discovered the ancient palace of the great Assyrian monarchs; brought to light those colossal human-headed bulls, the kings, warriors, priests, and winged messengers, which form subjects of astonishment to visitors of the British Museum; and gave to learned eyes to read from long cuneiform inscriptions the pompous but interesting catalogue of Assyrian triumphs in war or in architecture. In a word, the discoveries of Dr. Layard have shed light upon one of the darkest periods of history, and laid bare before us the life, arts, and manners of a people of whom previously little more was known than the name. Colonel Rawlinson, Dr. Edward Hincks, and other distinguished British and Continental scholars have made great progress in interpreting the cuneiform inscriptions.

NIOBIUM. [Chemistry, *S.* 1.]

NISI PRIUS. The *nisi prius* clause which gave rise to the use of this phrase in reference to the various matters mentioned under Nisi Prius, p. 241 no longer exists, the writ of *venire facias* which was formerly issued in every case having been abolished by the Common Law Procedure Act 1852. That statute has substituted for the ancient jury process a precept to be directed by the judges to the sheriff previous to each assize, commanding him generally to summon a sufficient number of jurors for the assizes, effecting in this way a considerable saving to the plaintiff.

NISSA, or NISCH, a town in European Turkey, the residence of a pasha, is situated in a fine open plain on the Nissava, a feeder of the Morava, near the frontier of Servia, 60 miles S.S.W. from Widden, and contains about 10,000 inhabitants (4000 Mohammedans and 6000 Christians). Nissa occupies the site of Naïssos, the birthplace of Constantine the Great; but nothing remains of its ancient glory. The town is modern, and by no means remarkable for its beauty. The principal building is the Konak, or palace of the pasha. The defensive works round the Turkish quarter on the right bank of the river, consist of well-built ramparts of great extent, with wattled parapets and a dry ditch. The bazaar on the left bank of the Nissava is surrounded by a trench and palisades. The Christian quarter, which is the largest part of the town, lies beyond the bazaar, and is open to the plain. Nissa is now the chief town of the pashalic of Sophia; it is called Nisch by the Turks. It is the residence of a Greek bishop, and has famous thermal springs. As it is the key to military communications between Thrace, Bulgaria, and Servia, the fortifications of the town are mounted with a considerable number of guns of large calibre, and in good order. The plain of Nissa lying between wooded slopes of the Tesovitch and the little Balkan, two ramifications of the Hæmus, is one of the most beautiful, fertile, and well-tilled districts in Bulgaria. The town was taken by the Turks under the Sultan Amurath I. in 1389, on the march to the battle of Kossova. A couple of miles above Nissa on the road to Sophia, the site of an action between the Turks and Serbs in the same year is marked by a tower of skulls, which is more terrible in name than in reality. It was constructed of stone and lime, but externally heads were imbedded in the mortar. Very few skulls now remain, the Christians having in the course of time removed almost all of them for the purpose of interment, but their places are marked by rows of round holes. The tower is 10 feet square, 15 feet high, covered with a red-tiled roof, and has neither door nor window in it. The interior is said to be a favourite retreat of snakes and lizards. The Austrians took Nissa in 1737.

NOCTILUCA, a genus of Animals usually referred to the class *Acalephæ*. [Acalephæ.] One species only of this genus has been described *N. miliaris*. It occurs occasionally in prodigious numbers around the coasts of England, and is the most frequent cause in this part of the world of the phosphorescence of the ocean. It was first discovered by M. Suriray in 1810.

According to M. Suriray the *Noctiluca* is a spherical gelatinous mass, provided with a long filiform tentacle or appendage, presenting a mouth, an œsophagus, one or many stomachs and ramified ovaries, and thus possessing a certain complexity of organisation. De Blainville confirmed Suriray's account, and placed *Noctiluca*, without doubt most erroneously, among the *Diphydæ*. On the other hand, Van Beneden Verhaeghe and Doyère, denying the relation of *Noctiluca* with the *Acalephæ*—and conceiving its organisation to be of a much more elementary character—relegated it to the *Rhizopoda*.

To this doctrine M. de Quatrefages also attaches the weight of his authority in his valuable essay 'Observations sur les Noctiluques,' published in the 'Annales des Sciences Nat.' for 1850. M. de Quatrefages does not admit the existence of any true mouth or intestinal canal, and considers that the so-called stomachs are nothing but 'vacuoles' similar to those observed in the *Rhizopoda* and *Infusoria*.

Krohn was the first to describe the long cilium which proceeds from the mouth of *Noctiluca*. Mr. Huxley has recently described this animal in the 'Quarterly Journal of Microscopical Science.' (Vol. iii.) He says—

"*Noctiluca miliaris* may be best described as a gelatinous transparent body, about 160th of an inch in diameter, and having very nearly the form of a peach—that is to say, one surface is a little excavated, and a groove or depression runs from one side of the excavation half way to the other pole (échancrure, Quatrefages; Frauenbusenähnliche Einbucht, Krohn). Where the stalk of the peach might be, a filiform tentacle, equal in length to about the diameter of the body, depends from it, and exhibits slow wavy motions when the creature is in full activity. I have even seen a *Noctiluca* appear to push repeatedly against obstacles with his tentacle.

"The body is composed of a structureless and somewhat dense external membrane, which is continued on to the tentacle. Beneath this is a layer of granules, or rather a gelatinous membrane, through whose substance minute granules are scattered without any very definite arrangement. From hence arises a network of very delicate fibrils, whose meshes are not more than 1-3000th of an inch in diameter, and these gradually pass internally—the reticulation becoming more and more open—into coarser fibres, which take a convergent direction towards the stomach and nucleus. All these fibres and fibrils are covered with minute granules, which are usually larger towards the centre."

After describing minutely the structure of this creature, Mr. Huxley concludes—

"Not only does all I have observed lead me to believe that *Noctiluca* has a definite alimentary cavity, but I am inclined to think that this cavity has an excretory aperture distinct from the mouth. The funnel-shaped depression in the post-oral area in fact always appeared, when I could obtain a favourable view, to be connected with a special process of the stomach. On one occasion I observed the sides of this process to be surrounded by fusiform transversely striated fibres or folds; I could not determine which.

"Krohn states that he repeatedly saw the egesta voided 'in the neighbourhood of the groove of the body,' but he could not determine at what exact point, and he inclines to think it must have taken place through the mouth.

"I am equally unable to bring forward direct evidence on this point, and my belief in the existence of a distinct anus is founded simply on the structural appearances.

"In front of and above the gastric cavity is the nucleus, described by Verhaeghe and Krohn. This is a strongly refracting oval body of about 1-460th of an inch in length, which, by the action of acetic acid, assumes the appearance of a hollow vesicle. The anterior radiating fibres pass from it; the posterior from the alimentary canal.

"Quatrefages and Krohn consider that a process of fissiparous multiplication takes place in *Noctiluca*; both of these observers having found double individuals, though very rarely. According to the latter writer, division of the body is preceded by that of the nucleus. I have not had the good fortune to meet with any of these forms, and the only indication of a possible reproductive apparatus which I have seen consisted of a number of granular vesicular bodies, of about 1-2000th of an inch in diameter, scattered over the surface of the anterior and inferior part of the body.

"Such is what repeated examinations lead me to believe is the structure of *Noctiluca*; but if the preceding account be correct, it is obvious that the animal is no Rhizopod, but must be promoted from the lowest ranks of the *Protozoa* to the highest.

"The existence of a dental armature, and of a distinct anal aperture, are structural peculiarities which greatly increase the affinity to such forms, as *Colpoda* and *Paramæcium*, indicated by Krohn. *Noctiluca* might be regarded as a gigantic Infusorium with the grooved body of *Colpoda*, the long process of *Trachelius*, and the dental armature of *Nassula* united in one animal.

"On the other hand, the general absence of cilia over the body, and the wide differences in detail, would require the constitution of at least a distinct family for this singular creature."

In the same volume of the 'Microscopical Journal' is an account of this creature by Dr. Woodham Webb, of Lowestoft.

NOCTUA, a genus of Insects belonging to the Nocturnal *Lepidoptera*, to which the Red Under-Wing Moths belong.

NOLANACEÆ, a natural order of Plants, having erect or prostrate stems; alternate leaves without stipules. Flowers usually showy; calyx 5-parted, valvate in æstivation; corolla monopetalous, with a plaited æstivation usually thickened in the tube; stamens 5, equal, inserted into the tube, alternate with the segments of the corolla; anthers oblong, 2-celled, bursting longitudinally; pistil composed of several carpels, either distinct with a single style, or partially combined into several sets, with a single style seated on a succulent disc; stigma somewhat capitate. Fruit inclosed in the permanent calyx, constructed like the pistil; pericarp woody, often a little succulent: seeds ascending, solitary; embryo curved with either straight or double cotyledons in the midst of a small quantity of albumen; radicle next the hilum. This little order is remarkable for the various modes in which its carpels are disposed without ever being consolidated. In one genus there are but 5, and they are distinct; in another there are 20 combined in fours, in a third the combination is irregular though the number remains 20, and in others they are all wholly distinct. The species are all South American, and chiefly from Chili. Their uses are unknown. There are 6 genera and 35 species.

NONSUIT. The statute establishing the County Courts, 9 & 10 Vict., c. 95, has established one exception to the general rule that a plaintiff cannot be nonsuited against his will, by expressly authorising the judge to enter a judgment of nonsuit, an enactment for which none of the commentators on the Act have attempted to assign any reason.

The practice of giving judgment in the Supreme Courts, *as in case of a nonsuit*, has ceased since the passing of the Common Law Procedure Act, 1852, which provided a simple and more rational method of putting an end to the action. (See Kerr's 'Action at Law,' London, 1857.)

It may be added here that the Crown, being theoretically present in all our courts of justice, cannot be nonsuited; but the Attorney-General, or his representative, may always enter a *nolle prosequi*, which is in effect the same thing.

NORTH AUSTRALIA is at present the designation applied to all that part of Australia, comprising considerably more than one-half of the island, which lies north of the parallel of 26° S. lat. This parallel forms the northern boundary-line of the colonies of New South Wales and South Australia, that of Western Australia remaining unsettled. Coburg Peninsula projects west-north-west from the mainland, between Mount Norris Bay on the north-east and Van Diemen's Gulf on the south, and extends in that direction nearly 60 miles. The greatest breadth of the peninsula is 15 miles, and its narrowest part, where it is joined to the mainland by a neck of land of 5 miles in length, is 2½ miles. On the north side of Coburg Peninsula is the deep inlet named Port Essington, which lies between 11° 6′ and 11° 55′ S. lat., 132° 5′ and 132° 18′ E. long. The inlet, at its entrance, between Point Smith on the east and Vashon Head on the west, is 7 miles wide, and extends south by east about 18 miles; its average breadth is 5 miles. The depth of water varies between 5 and 12 fathoms, and at the southern end it forms three spacious harbours, each of which extends inwards 3 miles, with a width of about two miles; the depth of water is 5 fathoms, with a bottom of stiff mud and sand. These harbours are sheltered from every wind, and afford excellent and secure anchorage. The port forms one of the finest natural harbours in the world; it may be entered with safety both by night and day. Being within the range of the regular monsoon it is accessible to the Malay and Bugis trading proas, and to the junks from China.

The soil of the peninsula is in general indifferent, but in many places it is good, principally on the low flats and hollows, and near tracts which are swampy in wet weather. The vegetation is luxuriant, but suffers much during the dry season. The north-west monsoon, which brings the rainy season, begins about November. The rain during this monsoon falls in torrents, but seldom continues above two or three hours at a time. The general range of the thermometer at this season is from 80° to 95° Fahr. in the shade. The termination of the monsoon is indicated by squalls, and usually a tempest in the early part of April. In May the thermometer ranges between 75° and 95°, the midday heat being 89°. The average heat of the whole year is 83°, or about that of the equator.

With the expectation that, if there were an establishment on the north coast of Australia, it would be resorted to by the traders of the eastern portion of the Indian Archipelago for the sale of their produce and the purchase of European and Indian commodities, a settlement was made in 1824 in Apsley Strait, and called Fort Dundas, and another in 1827 on the Coburg Peninsula, and called Fort Wellington, but both settlements were abandoned in 1828. In 1838 another attempt was made, and the town of Victoria was founded on the western shores of Port Essington. In 1846 the population was stated to be about 60. The Malays did not settle there, as was expected: the climate is unsuitable to Europeans, and the settlement has been abandoned.

The coasts, inlets, and islands of North Australia have been surveyed and named, but of the interior hardly anything is yet known. Melville Island, on the northern coast, between 11° and 12° S. lat., 130° 20′ and 131° 34′ E. long., is one of the largest of the islands. The area is about 1800 square miles. It is separated from Bathurst Island, which lies west of it, by Apsley Strait, which is from 2 to 4 miles wide and 46 miles long. From Coburg Peninsula it is separated by Dundas Strait, which is 15 miles wide. The natives lead a wandering life, living in the dry season on kangaroos and other marsupial animals, and during the wet season on fish, turtles, crabs, and other shell-fish. Their vegetables are the cabbage-palm and the sago-palm.

NORTH LEACH. [GLOUCESTERSHIRE.]

NORTH-WEST PASSAGE. In the article NORTH-WEST PASSAGE an account is given of the series of voyages undertaken for the discovery of a passage westwards from the Atlantic Ocean to the Pacific, through the seas which surround the North Pole, and the narrative is there brought down to the year 1838. We now add an account of the subsequent voyages of exploration, and also of the expeditions sent out in search of Sir John Franklin and his associates.

In the year 1845 the British government sent out another expedition to the Arctic Seas for the purpose of discovery and survey, consisting of the Erebus and Terror, under the command of Sir John Franklin. They sailed from the Thames on the 23rd of May, and on the 26th of July were spoken by the Prince of Wales whaler at the entrance of Lancaster Sound. In consequence of the ships not having been afterwards seen or heard of, a series of searching expeditions were successively fitted out and sent to the Arctic Seas, all of which failed in the main object of finding the missing ships or their unfortunate crews, but one of which discovered the long-sought secret of a North-West Passage.

In 1848 the Enterprise and Investigator, under the command of Sir James Ross, were sent out, and reached Lancaster Sound on the 28th of August. They were not able to get farther west than Leopold Harbour, near the entrance of Prince Regent's Inlet, 73° 5′ N. lat., 90° 12′ W. long., where they wintered. After the ships were liberated from the ice, they were swept eastward by a mass of drift ice into Lancaster Sound, and Sir James Ross brought his ships back to England early in November 1849. In 1848 Sir John Richardson and Mr. Rae made a voyage in boats from the mouth of the Mackenzie River eastward, but without success.

Another searching expedition was fitted out by the British government at the end of 1849. Captain Collinson was appointed to the command of the Enterprise, and Captain M'Clure to that of the Investigator. The two ships left the Thames January 10, 1850, and sailed in company round Cape Horn. Captain M'Clure reached Point Barrow, at the north-eastern extremity of Behring's Strait, August 5, 1850, and then bore to the east, just keeping clear of the American coast. Captain Collinson having failed to force his way through the pack-ice of Behring's Strait, sailed for Hong-Kong, where he wintered. Captain M'Clure reached Cape Parry on the 6th of September. From this point high land was observed to the east-north-east, and named Baring Island, and two days afterwards, still farther to the east-north-east, more land was observed, and named Prince Albert Land. This land is continuous with Wollaston Land and Victoria Land, and extends northward to 73° 21′ N. lat. The Investigator was then navigated northward through a channel which separates Baring Island from Prince Albert Land, and which Captain M'Clure named Prince of Wales' Strait. In sailing up this strait the Investigator several times narrowly escaped destruction, but on the 8th of October was firmly frozen in near the northern extremity of the strait, and remained there during the winter. Parties were sent out to explore, by whom it was ascertained that Prince of Wales' Strait opens into Barrow Strait, and thus was made the first discovery of a North-West Passage.

On the 14th of July 1851 the Investigator was freed from the ice, when great exertions were made to pass out of Prince of Wales' Strait into Barrow Strait, but on the 10th of August, being then in 73° 14′ N. lat., 115° 32′ W. long., strong winds from the N.E. drove the masses of ice against the ship, and Captain M'Clure, thus baffled, resolved to sail southward back again down Prince of Wales' Strait. Having accomplished this, he sailed along the southern coast of Baring Island, and then northward along the western coast. At length, after incurring many risks and encountering difficulties which could only have been overcome by a rare combination of indomitable courage, admirable seamanship, and scientific resource, the Investigator, having rounded the whole island except a portion of the north shore, was got to the station which Captain M'Clure named Mercy Bay, September 24, 1851. This station is on the northern side of Baring Island, in 74° 6′ N. lat., 117° 54′ W. long., on the south side of Barrow Strait. Here then was the discovery of a second North-West Passage; and had there been open water to the east the whole voyage into Baffin's Bay might have been easily accomplished, but unfortunately the Investigator was frozen up in Mercy Bay on the very day when it was entered. The north side of Baring Island was ascertained to be the Banks' Land which Captain Parry saw from Melville Island in 1819.

Melville Island is distant about 60 miles N. from Mercy Bay, and in April 1852 Captain M'Clure sent a travelling party across the ice to it, who deposited a document there, giving an account of the proceedings of the expedition, and of the position of the Investigator. In April 1853, only a few days before Captain M'Clure had made arrangements for deserting his frozen-up ship, the document was discovered by Captain Kellett's officers, and Lieut. Pim, with a party of sailors carrying provisions, was sent from Melville Island to Mercy Bay. As nothing had been heard of the Investigator from the time of her rounding Barrow Point in August 1850, where Captain Kellett was then stationed with the Herald, and who made Captain M'Clure a signal of recall, till April 1853, when Captain Kellett sent his party to the relief of Captain M'Clure and his crew, the excitement of the meeting may be easily imagined. Captain M'Clure remained with his ship till the spring of 1854, when he and his crew were brought to England by the ships belonging to Sir Edward Belcher's expedition. The Investigator, as far as is known, still remains frozen-up in Mercy Bay.

Captain Collinson, after wintering at Hong Kong, passed through Behring's Strait in 1851, and followed very nearly the track of Captain M'Clure up Prince of Wales' Strait, whence he also was obliged to return. He wintered in 1851-2 in 71° 35′ N. lat., 117° 35′ W. long. The winter of 1852-3 was passed in Cambridge Bay, Wollaston Land, 69° N. lat., 105° 30′ W. long. Still struggling on, the winter of 1853-4 found the Enterprise in 70° 8′ N. lat., 145° 30′ W. long. On the 15th of July, 1854, the Enterprise was released from the ice, when Captain Collinson commenced his return voyage. He reached Point Barrow on the 9th of August, and Point Clarence on the 21st.

The other searching expeditions may be more briefly noticed. In 1850 Captain Kellett with the Herald and Plover reached 72° 51′ N. lat., 163° 48′ W. long. In the same year the Advance and Rescue, two small brigs, were fitted out at the expense of Mr. Grinnell, an American merchant, and placed under the command of Lieutenant de Haven. In August, 1850, Captain Ommanney and Captain Penny conducted travelling parties by order of Captain Austin, who commanded an expedition sent out by the British government. Captain Penny discovered that Sir John Franklin's expedition had passed the winter of 1845-6 at the mouth of the Wellington Channel, in a bay between Cape Riley and Beechey Island. Captain Penny also explored the Wellington Channel to a distance of 80 miles from the mouth, and discovered a strait bearing to the north-west, which he named Victoria Channel. Dr. Rae and Commander Pullen also conducted expeditions in 1850.

In May, 1851, the Prince Albert, a small vessel, was equipped at the expense of Lady Franklin, and placed under the command of Mr. William Kennedy. The Prince Albert passed through Lancaster Sound, and wintered in Batty Bay in Regent's Inlet, on the east side of North Somerset. In March, 1852, Mr. Kennedy, with M. Bellot, an enterprising young French naval officer, and six seamen, travelled southward along the east side of North Somerset till they reached Brentford Bay, which they ascertained to be a channel connecting Regent's Inlet with Victoria Strait, the northern part of which strait, called Peel Sound, enters Barrow Strait. They thus discovered a third North-West Passage, and proved that North Somerset is a large island, separated from Boothia Felix by the Brentford channel, which they named Bellot Strait, and found to be 15 miles long and 2 miles wide. They next travelled over the ice of Victoria Strait, then over Prince of Wales' Land due west as far as 100° W. long., then northward to the south-east angle of Ommanney Bay, then eastward to Browne's Bay in Peel Sound, whence, following the coast-line northward they arrived at Cape Walker. They reached the Prince Albert in Batty Bay, May 30th, after an absence of 96 days, and having travelled on foot and with sledges 1100 miles.

Captain Inglefield, in the small screw-steamer Isabel, sailed from the Thames July 6th, 1852. He proceeded along the east side of Baffin's Bay, and entering Whale Sound found that it contained two large openings to the north-eastward. He entered Smith's Sound at the head of Baffin's Bay, and on the 27th of August attained 78° 35′ N. lat., where he found himself in a great sea, only partially encumbered with ice. He was driven back by a violent gale, and afterwards entered Jones's Sound, which he penetrated to 84° W. long., the north coast there suddenly tending to the north-west, whilst the south shore continued its direction westward as far as the eye could reach. The Isabel returned to England in November, 1852.

A searching expedition under Sir Edward Belcher was sent out in 1852. He proceeded up the Wellington Channel, and wintered in 76° 52′ N. lat., 97° W. long. While here explorations with boats and sledges led to the discovery of various coasts and lands. The eastern side of Wellington Channel was named North Devon; the western side is Cornwallis Land, which is separated by a strait from Bathurst Land still farther west. A group of islands in 78° 10′ N. lat. was named Victoria Archipelago. On the 20th of May, 1853, Sir E. Belcher found the sea open in the latitude of Jones's Strait. His words are, "Polar Sea as far as the eye can reach." The gallant young Frenchman, Lieutenant Bellot, in attempting to convey the government despatches from Captain Inglefield to Sir E. Belcher, was blown from the top of a hummock of ice, and was drowned. Sir E. Belcher's ships were liberated from the ice July 14, 1853, and he returned to England the same year. In 1853-54, Dr. Kane, in the Advance, passed through Smith's Sound, and reached 78° 43′ N. lat.

In October, 1854, Dr. Rae returned suddenly to England from the vicinity of Boothia Felix, for the purpose of announcing to the British government that he had obtained some relics which had belonged to Sir John Franklin's companions. He stated that he had met with some Esquimaux in Pelly Bay, who were in possession of watches, silver spoons, telescopes, and other things, which had belonged to the officers and seamen of the Erebus and Terror. These he purchased, and brought with him to England; and he stated that the Esquimaux had informed him, that in the spring of 1850 about forty of the ships' crews were seen (but not by Dr. Rae's informants) near the north shore of King William's Land; that they were dragging a boat over the ice, looked worn and emaciated, and had purchased a seal of the natives. The two expeditions which it was stated the Admiralty intended to send out in November 1854 were not sent. Lady Franklin however, chiefly at her own expense, has sent out an expedition in the Fox, under the command of Captain M'Clintock, which sailed from Aberdeen on the 1st of July, 1857.

The result of all these searching expeditions—of which we have only noticed the most important—has been the discovery of three or four passages by which the Pacific Ocean may be entered from the Atlantic, or the Atlantic Ocean from the Pacific, namely, by the west coast of Baring Island, by the east coast of the same island, through Prince of Wales Strait, by Regent's Inlet through Bellot Strait into Victoria Strait, and probably also by Peel Strait into Victoria Strait. These passages, being all more or less encumbered with ice, may be of little or no commercial importance; but the long-sought North-West Passage has been discovered, many extensive lines of coast have also been traced, and large islands and countries have been found and partly examined. Besides the geographical discoveries which have been incidentally noticed in the course of this narrative, it has been ascertained, by the explorations of Dease and Simpson, Dr. Rae, and Captain M'Clure, that Wollaston Land and Victoria Land are continuous, forming the south coast of the largest of all the islands of the Arctic Seas, the western boundary being Prince of Wales' Strait, the eastern boundary Victoria Strait with its continuation Peel Strait, and the northern boundary Barrow Strait. The northern coast of this large island is deeply indented near the eastern end by Ommanney Bay and Osborne Bay, so named from the explorers. North Somerset is also, as has been stated, a large island, separated from Boothia Felix by Bellot Strait, previously called Brentford Bay; whilst Boothia Felix has been ascertained to be united to the American continent by an isthmus.

In many parts of these cold regions there is an extraordinary abundance of animal life, consisting of moose-deer, hares, ptarmigan, and other game. In 1851, Captain M'Clure says, "On the 1st of April we had 1000lbs. of venison hanging at the yard-arms;" and in 1853, he says, "A supply of game has been kept up during the winter, which has enabled us to issue a meal twice weekly." It seems also to have been ascertained, that north of Smith's Sound and the Wellington Channel there is an extensive Polar Sea, comparatively unencumbered with ice, which was seen by Dr. Kane as well as by Captain Inglefield.

NORTHERN SOVEREIGNTY. This name has been given, but perhaps not definitely, to an extensive tract of country which was annexed in 1848 to the British possessions in South Africa. It includes the whole of the territory west of the Drachenberg Mountains, between the two great branches of the Orange River, the Ky Gareep and the Nu Gareep, comprising a triangular area of about 50,000 square miles.

The Drachenberg Mountains, called also the Quathlamba Mountains, run parallel with the eastern coast of South Africa, at a distance varying from 60 to 90 miles from the shore. They rise to a height of from 6000 to 8000 feet, with towering peaks and rocky ridges, interrupted only by ravines and chasms, and thus form a barrier almost impassable between Kaffraria and Natal on the east, and the Northern Sovereignty on the west. A secondary range, called by the natives Malati, or the Peaks, runs parallel to the principal chain, at no great distance farther inland; and offsets, called the Wittebergen and Sneuwbergen, extend westward from the Drachenberg range, and close in the Northern Sovereignty on the south.

The country immediately west of the mountain ranges is from 5000 to 6000 feet above the level of the sea, and consists of a series of wide plateaus, which, sloping gradually downwards towards the lower course of the Vaal River, terminate in plains of vast extent, sometimes containing numerous isolated and rocky hills, but generally quite flat and without trees. These vast wastes are for the most part without a single human inhabitant, but afford abundant means of subsistence to countless herds of antelopes, quaggas, and other wild animals. All the rivers fall ultimately either into the Ky Gareep or the Nu Gareep. The Ky Gareep or Vaal River, rises between 26° and 27° S. lat., 29° and 30° E. long., about 200 miles W. from Delagoa Bay, in an interior range of mountains bounding the great plains of the north, and flows west, south, and south-west till it meets the Nu Gareep. The Nu Gareep, or Cradock River, rises in the Drachenberg Mountains, about 29° S. lat., 30° E. long. It flows south-west, west, and afterwards north-west, till it joins the Ky Gareep. Its principal affluent from the north is the Caledon; from the south it receives the Stormberg River, the Oorlogs, the Zeekoe River, and others of less importance.

This portion of the continent, being remote from the sea-coast, receives its rain in thunder-storms, chiefly during the summer months, of which December and January are the hottest; and there being no rain during the rest of the year, the climate and soil are then characterised by great dryness, though copious dews fall at night. The smaller rivers are dried up, and the ponds and lagoons are converted into swamps.

The White-Faced Antelope (*Antilope albifrons*), the Spring-Bok (*A. euchore*), the Gnu (*A. Gnu*), and the Quagga (*Equus Quagga*) seem to be in the greatest abundance. They are often seen in countless herds covering an immense extent of the plains, mixed with other species of the antelope, which are less numerous, and with buffaloes. Hyænas are abundant. Lions are very common. The hippopotamus is very common in the larger rivers. Ostriches appear on the great plains in considerable numbers. Timber grows on the slopes of the mountains, but not in the plains. There are salt-lagoons and salt-marshes, and some of the plains are covered with an incrustation of salt.

The white population is estimated to be about 5000, who are chiefly the residue of the Dutch farmers who, in 1836 and following years, emigrated from the Cape Colony, and are settled in villages and in small groups near the rivers. The native population are supposed to amount to about 150,000, who mostly inhabit the Malati Mountains. The Bushmen live among the isolated hills of the interior. The Griquas, who are a mixed breed, arising from the intercourse of Europeans with the natives, are in considerable numbers. They are mostly settled along the banks of the Nu Gareep and of the Orange rivers.

The colony has been distributed into four districts—Bloem Fontein, Caledon River, Winburg, and Vaal River. The principal town is *Bloem Fontein*, situated in 29° 8′ S. lat., 26° E. long., on the high road from the Cape Colony to Natal. It is about 380 miles N. from Graham's Town. It contains about 1000 inhabitants, has an Episcopal church, a Wesleyan Methodist chapel, and barracks. Smithfield, Winburgh, and one or two other villages, are inconsiderable places. There are three or four mission-stations belonging to the British, French, and Prussians.

The country appears to be well adapted for sheep pasturage and the production of wool. The climate seems to have a favourable influence on the fineness of the fleece. Small quantities of gold have been found in the neighbourhood of Smithfield.

When the Dutch inhabitants of the Cape Colony emigrated from it in 1836 and following years, they settled themselves at first in various parts of the territory which is now named the Northern Sovereignty. In 1838 a party of them went to Natal, where they were treacherously murdered by the warriors of the chief Dingaan. [Natal, *S.* 2.] When the Dutch, who had conquered the natives and declared a republic, were obliged in their turn to submit to the English in 1842, the greater part of them fled into the Northern Sovereignty, where they founded the village called Winburg, and proclaimed a new Dutch republic. Little notice was taken of their proceedings till they began to expel from their farms the Dutch farmers who continued to acknowledge the British supremacy, and in 1845, under their leader Pretorius, prepared a large expedition to attack Adam Kok, a Griqua chief in alliance with the British. The chief applied to the colonial government, and two regiments were immediately sent to his assistance, who repulsed the revolutionary Dutch boers. On the 1st of February 1848, Sir Harry Smith, with the assent of the well-affected boers, erected the whole of the territory inclosed by the Ky Gareep and the Nu Gareep into a British colony. This led to another contest, in which Sir Harry Smith defeated Pretorius and his adherents on the 29th of August, 1848. Pretorius fled beyond the Vaal River, and the majority of the boers laid down their arms and submitted to the British government.

NORWOOD. [Surrey.]

NOSE, one of the external apertures of the respiratory system and the organ for the sense of smell. The portion of the nose by which odours are perceived, lies deep back in the cavity to which the external apertures of the nostrils lead; the portion which is prominent upon the face serves merely as the apparatus for inhaling the air which is impregnated with the odour. The most essential parts of the organ are the olfactory nerves, which come off from the olfactory bulbs of the brain [Brain], and passing through numerous holes in the ethmoid bone, which is situated between the orbits and above and behind the nostrils, ramify on the extended surfaces of that bone and the turbinated bones which form on each side the chambers of the nose. The sensitive terminations of the nerves are placed on the surface of a delicate and very vascular membrane which lines the whole cavity of the nose, and which is constantly kept moist by the secretion of a small quantity of mucus, in which the odoriferous particles are caught and for a time retained.

The sense of smell varies considerably, both in degree and in kind, in different animals. It is evidently possessed by insects and many others of the lower animals, but the organs by which they exercise it are unknown. In the higher animals its degree of acuteness is in general marked by the extent of surface of the ethmoid and turbinated bones, over which the olfactory nerves are distributed. In man this surface is proportionally smaller than in other animals, in most of which, besides occupying the greater part of the interior of the face, it is increased by peculiar branchings and convolutions of the thin layers of the bones. Each species has also a sense of smell in some degree peculiar to itself; thus herbivorous animals, though possessing the most delicate power of discerning the differences of vegetable odours, have no evident faculty of discriminating those of most animal substances; while the carnivora, on the other hand, can scarcely distinguish any others than the last. Each species has a fine sensibility for those substances which are of the greatest importance to its own existence, and thus obtains at once a knowledge of their presence in places concealed from all the other senses. Man possesses the sense of smell for a very large number of substances, but not in a very acute degree for any of them. The difference appears the greater between him and other animals in consequence of the neglect of the exercise of this sense which is common (except for particular purposes) in civilised society; but the American Indians and some of the northern Asiatic tribes, by their constant practice in hunting, are said to have acquired a power of scent scarcely inferior to that of the dog.

The olfactory nerve is appropriated exclusively to the sense of smell, and is incapable of perceiving pain or any other sensation. Of the peculiarities by which in different animals it is capable of perceiving only certain odours, we know no more than of the nature of those odours themselves, of whose existence we have no other evidence than that of the sense which they affect.

The sense of smell serves as an adjunct to that of taste, and is subservient in most instances to the same purpose, of providing proper and avoiding injurious food for the sustenance of the body. By it many animals seek out their food, and all select from that which they obtain; and much of that compound sensation which we regard as taste is really due to the smell, as for instance the sensation of the flavour of aromatic substances, which is completely lost by closing the nostrils while we are eating them.

For the full perception of odours it is necessary that the particles charged with them should be drawn with some force into the nose, and we may stand for some time in a very strongly smelling atmosphere without perceiving it if we breathe only through the mouth. The most acute sensation is obtained by the sudden inhalation of a large quantity, or by a succession of short and quick inspirations.

NOTONECTA, a genus of Insects belonging to the family *Hydrocorisæ*, of the order *Hemiptera*. *N. glauca*, the Water-Boatman, is one of our commonest insects. It is about half an inch long, and swims upon its back in order the better to seize its prey.

NUNEATON. [Warwickshire.]

NUSSIERITE. [Mineralogy, *S.* 1.]

NUTRIMENT, NUTRITION. [Food, *S.* 2; Tissues, Organic, *S.* 1.]

NYCTAGINACEÆ, a small natural order of Hypogynous Exogenous Plants, belonging to Lindley's Chenopodal Alliance. They have a tubular often coloured calyx, which separates from its base, the latter becoming a hard spurious pericarp. The species are annuals or perennials often with fleshy roots, or shrubs or trees usually articulated at the tumid nodes. *Mirabilis dichotoma*, the Marvel of Peru of our gardens, may be taken as the type of the order. *M. Jalapa* was at one time supposed to be the plant yielding true jalap. This however is a mistake. [Convolvulaceæ.] The roots of the plants of this order are generally purgative. They are natives of the warmer parts of the world in either hemisphere. They are tropical or subtropical. The order is related to *Polygonaceæ*, *Amarantaceæ*, and *Cannabinaceæ*. It contains 14 genera and about 100 species.

O

OAKINGHAM, or WOKINGHAM. [BERKSHIRE.]

OAT. [AVENA.]

OATH. The privilege long enjoyed by Quakers, Moravians, and Separatists, of giving their evidence upon solemn declaration, is by the Common Law Procedure Act, 1854, extended to all witnesses, who conscientiously object to be sworn. A wilfully false declaration in all these cases involves the party, by the provision of the statute, in the same penalty as wilful perjury.

OCCUPATIONS OF THE PEOPLE. The importance of obtaining as specific and complete an account as practicable of the pursuits and employments of the inhabitants of this country has long been recognised; and in each decennial census of the present century it has been attempted,—with constantly increasing efforts after greater fullness and precision,—to ascertain the number and proportion of the persons engaged in agriculture, commerce, the various trades, manufactures, and professions. In the enumerations of 1811 and 1821, inquiries were instituted as to how many *families* were employed in, or maintained by, agriculture; how many by trade or manufactures; and how many which could not be brought under either of these designations. The answers to these inquiries were given with tolerable fullness. In 1831, it was resolved to ascertain, so far as could be done, the occupation of every male adult twenty years of age or upwards. On that occasion a form, containing a list of one hundred different trades and handicrafts, being those most commonly carried on, was furnished to the overseers in each parish or place required to make a separate return, to be filled up with the number of males aged twenty and upwards; and the overseers were authorised to add to the list such additional trades as were not included in the printed form. But many anomalies and imperfections arose out of this plan; and it was therefore resolved, in 1841, that the enumerator, instead of using a prepared list of one hundred, or any other definite number of trades, should insert each man's description of himself opposite his name. This led to some curious results. In the more important manufactures, the subdivisions of labour entered in the schedules were so minute, that there were no less than 1225 distinct heads of employment (some of them, it is true, identical) in the cotton manufactures of Lancashire; in 1831 the enumerators had entered only 598 for the whole of the country. In like manner, the London occupations, given as 420 in 1831, were 757 in 1841; and the occupations of Great Britain became similarly increased from 598 to 877.

In 1851, to use the words of the Registrar-General, to whom the management of the census of that year was entrusted, "it was considered important to extend the inquiry, so as to show, as nearly as was practicable, the number of men, women, and children in every trade and profession;" and it was further held to be desirable, notwithstanding the great additional labour entailed in abstracting and tabulating the results, "not only to take out the number of persons of each sex in each occupation, but the numbers at each quinquennial period of age: for without this information the relative salubrity of the professions, and a great variety of important questions, cannot be determined." The results of the inquiries instituted are embodied in a bulky but very able report, drawn up by the Registrar-General, which examines the subject as a whole and in detail from various points of view, and in numerous elaborate tables presents the results as digested after a vast amount of labour and consideration.

We proceed to exhibit some of the results obtained, selecting such as will illustrate various industrial phases of British population.

In looking at the tables with regard to the more general results, there are many interesting particulars which become developed. Here is one. The total population for 1851, in Great Britain and the small adjacent islands, is set down at 20,959,477, of whom 10,223,558 are males, and 10,735,919 females. One-half of this total is 10,479,738. Now this is almost exactly identical with the number (10,418,989) of those set down under some domestic appellation, as wife, widow, daughter, grand-daughter, sister, niece, son, grandson, brother, nephew, child under tuition at home, child under tuition at school; that is, persons to whom no occupation whatever is attributed, but who are regarded as dependent on the head of the family for support. Regarded in this light, therefore, just one-half of the population have nothing and do nothing to earn a living; they are the home-members of a family; they may assist in domestic labours, but they do not work at money-getting employments. There are then left half the population, who either possess wealth already accumulated, or exercise their hands and heads in the acquisition of wealth; of this half, one moiety can, with a near approach to correctness, be divided into five equal parts, thus—

About 1,000,000 domestic servants.
" 1,000,000 employed in preparing the materials for dress.
" 1,000,000 employed in making dress.
" 1,000,000 ordinary agricultural labourers (males).
" 1,000,000 other persons, male and female, living by farm and field operations.

Most of these numbers are slightly over the million. If we suppose the two millions of farmers, graziers, gardeners, and in-door and out-door farm servants of every kind, to be all employed in raising food (and this is not such a wide departure from the truth as to vitiate such general results as we have now in view) it brings us to this conclusion: of the total population, about 21,000,000, there are—

Of family dependents, having no definite occupation . . . . . = about one-half.
Of persons supplying dress, food, or domestic service . . . . . = about one quarter.
Of persons employed in all other occupations . . . . = about one-quarter.

When the Commissioners came to prepare their vast tables of the distribution of occupations in the respective divisions, counties, districts, and towns, they had to determine how many different occupations should be given in each table. If the whole 1057 occupations, presently to be adverted to, for males had been tabulated for each and all of the topographical sections, the volumes would have been numerous and bulky beyond all endurance, the labour and expense enormously great, and the practical value very questionable. The list was therefore weeded. Several occupations were omitted which are only very limited in their topographical distribution, and all were omitted in which the total number of persons is very small. Different degrees of minuteness were adopted, according to the nature of the tables. Thus, one table, for the whole of Great Britain, gives all the 1057 occupations in alphabetical order, distinguishing the workers who are above and those who are below 20 years of age, but not distinguishing the sexes. Another table gives the same occupations in classified instead of alphabetical order, distinguishing the ages to still greater minuteness, and also distinguishing the sexes. Another table, going as low down in classification as sub-classes, shows in respect to these the ratio or percentage of males under 20, males over 20, females under 20, and females over 20: this is done with a view of exhibiting, in a broad and general way, the extent of female labour and of juvenile labour in Great Britain. Lastly, a fourth table, or rather group of tables, gives the occupations of the people in all the 13 divisions of Great Britain, in all the counties, in all the 623 Registration Districts, and in 89 of the principal towns.

We proceed now to give some idea of the nature of the classification adopted.

The primary division, it must be understood, is into 17 groups or classes of persons having definite occupations, and these are again divided into 91 sub-classes, rather more than five to a class on an average. Thus:—

Classes and Sub-Classes of Occupation.

I. *Persons engaged in the general or local government of the country.*
  1. National government.
  2. Local government.
  3. East India government.

II. *Persons engaged in the defence of the country.*
  1. Army.
  2. Navy.

III. *Persons in the learned professions.*

1. Clergymen and ministers.
2. Lawyers.
3. Physicians and surgeons.
4. Church officers.
5. Law clerks, court officers.
6. Chemists and surgical instrument makers.

IV. *Persons engaged in literature, fine arts, and science.*
1. Authors.
2. Artists.
3. Scientific persons.
4. Teachers.

V. *Persons returned only as children, or relations and scholars.*
1. Son, nephew, &c.
2. Scholars.

VI. *Persons engaged in entertaining, clothing, and performing personal offices for man.*
1. In boarding and lodging.
2. In attendance.
3. In providing dress.

VII. *Persons who buy or sell, keep, let, or lend money, houses, or goods of various kinds.*

VIII. *Persons engaged in the conveyance of men, animals, goods, and messages.*
1. On railways.
2. On roads.
3. On canals.
4. On seas and rivers.
5. Warehousemen.
6. Messengers.

IX. *Persons possessing or working the land, and engaged in growing grain, fruits, grasses, animals, and other products.*
1. In fields and pastures.
2. In woods.
3. In gardens.

X. *Persons engaged about animals.*

XI. *Persons engaged in art and mechanical productions.*
1. In books.
2. In plays.
3. In music.
4. In pictures.
5. In carving and figures.
6. In shows and games.
7. In plans and designs.
8. In medals and dies.
9. In watches and philosophical instruments.
10. In arms.
11. In machines.
12. In carriages.
13. In harness.
14. In ships.
15. In horses.
16. In implements.
17. In chemicals.

XII. *Persons working and dealing in animal substances.*
1. Animal food.
2. Bones, horns, &c.
3. Skins.
4. Feathers and quills.
5. Hair and fur.
6. Wool.
7. Silk.

XIII. *Persons working and dealing in vegetable substances.*
1. Vegetable food.
2. Drinks and stimulants.
3. Gums and resins.
4. Timber.
5. Bark.
6. Wood.
7. Wood furniture.
8. Wood utensils.
9. Wood tools.
10. Cane, rush, straw.
11. Hemp.
12. Flax, cotton.
13. Paper.

XIV. *Persons working and dealing in minerals.*
1. Coal.
2. Stone and clay.
3. Earthenware.
4. Glass.
5. Salt.
6. Slates.
7. Precious stones.
8. Gold and silver.
9. Copper.
10. Tin.
11. Zinc.
12. Lead.
13. Mixed metals.
14. Iron and steel.

XV. *Labourers and others—branch of labour undefined.*
1. Labourers.
2. Other persons.

XVI. *Persons of rank or property, not returned under an office or occupation.*

XVII. *Persons supported by the community, and of no specified occupation.*
1. Living on charity and rates.
2. Prisoners.
3. Vagrants.

The above, it must be remembered, are the 91 sub-classes of *male* occupations. The sub-classes of *female* occupations are not quite so numerous, and differ a little (but only a little) in designations.

The 17 classes, or 91 sub-classes are further subdivided into no less than 1057 occupations or employments, giving an average of about twelve to each sub-class, or sixty-two to each class. These are occupations for males only; but there is a separate classification for females, amounting to 746 employments. These are, of course, in some cases identical with those of men, in other cases nearly alike but differently named, while in others they are wholly distinct and feminine in their character.

Many of the *classes* cannot be rightly understood until the sub-classes into which they are divided have been examined; and even then, there are two or three against which grave doubts might be urged, as to the principle whereon the aggregation has been determined. Classes 4, 6, and 11 are those here adverted to. This, however, is a matter on which opinions will inevitably clash; for, where offices and employments differ one from another by imperceptible gradations, and where each one may be regarded under many aspects, no one can determine which is *the* classification: we can only adopt *a* classification, convenient according to the views of him who makes it. The commissioners, for instance, made class 6 to comprise "people who are principally engaged in lodging, entertaining, attending, or providing articles of dress, so as to be brought much into personal contact with those whom they serve." This reads well, in so far as it provides a chain of connection among employments which relate especially to the *person;* but the sub-classes give it an unsatisfactory effect; for we should hardly expect inn-keepers, coffee-house keepers, eating-house keepers, lodging-house keepers, domestic servants, inn-servants, undertakers, dress-makers, shoe-makers, umbrella-makers, rag-gatherers, and washer-women, to be all included in one class, as they here are. Again: class 4 comprises "the poet, the historian, the painter, the sculptor, the musician, the architect, and the natural philosopher, as well as the professors and teachers of literature and science;" while class 11 comprises "those engaged in the higher class of mechanical and chemical arts; they are intimately connected with artists and men of science, from whom they frequently, either directly or indirectly, derive materials, direction, or inspiration; they multiply copies of original works." Now this analysis has evidently been much studied and elaborated by the commissioners; but it leads to strange results when worked out in detail; for we find the music-master in one class and the musician in another, the painter in one and the engraver in another, the architect in one and the surveyor in another; while publishers, printers, actors, musicians, engravers, carvers, modellers, showmen, civil engineers, pattern-designers, die-sinkers, watch-makers, gunsmiths, machinists, coach-makers, saddlers, shipwrights, builders, wheelwrights, dyers, scourers, calenderers, and chemical manufacturers, are all thrown together in one class. The showman, the civil engineer, the publisher, the dyer—here is an odd grouping!

Taking the 1057 occupations for males, just as they stand in the classified tables, the highest numbers are the following, comprising those exceeding 40,000 persons in each employment:—

Agricultural labourers	1,006,728
Labourers (undefined)	367,472
Farmers	275,676
Shoemakers	243,052
Farm servants, indoor	235,943
Cotton spinners and weavers	222,612
Coal miners	216,366
Carpenters	182,546
Tailors	135,028
Blacksmiths	112,184
Masons	101,591
Porters and messengers	97,642
Merchant seamen	89,206
Woollen spinners and weavers	86,649
Domestic servants	79,615
Gardeners	78,462
Grocers	68,242
Butchers	65,912
Plumbers, painters, and glaziers	62,421
Carmen and drivers	56,252
Bakers	55,663
Worsted spinners and weavers	51,863
Engineers and machinists	48,050
Silk spinners and weavers	45,169
Clerks (commercial)	43,741

Among females, of 20 years of age and upwards, the highest numbers placed opposite definite occupations are the following:—

Domestic servants (general)	401,950
Milliners	202,437
Cotton spinners and weavers	143,212
Washerwomen and manglers	136,582
Farm servants, in-door	67,538
„ out-door	56,067

These numbers, however, must not be used for any inferential purpose, without taking others belonging to employments collaterally connected with them. Thus, the 401,950 *general* servants do not include about 200,000 others who enter themselves under the more specific designations of housekeeper, housemaid, cook, nurse, and inn servant; the 202,437 milliners are irrespective of 140,000 seamstresses and needlewomen of other kinds; and so in other cases. It must also be borne in mind, in respect both of the male and the female lists, that the highest numbers are attached to designations which are rather degrees of relationship than occupations. For instance, we find

Wives (not otherwise specified)	2,631,380
Children and relations at home, ditto	4,745,217
Children who attend school, ditto	2,752,737

Here we have at once more than a third of the entire population entered under three headings, excluding everything like a business designation.

As a summary of results relating to occupations generally, without regard to age, sex, or topographical distribution, it may be profitable to give the annexed table, containing the Commissioners' own enumeration of the number of persons employed in 108 avocations in Great Britain, comprising all those for or in respect of which the numbers exceed 10,000: mere domestic relationship, such as 'wife,' 'widow,' &c. is not here taken into account; all are 'occupations,' in the usual meaning of that word—male or female, adult or juvenile.

OCCUPATIONS in GREAT BRITAIN, and NUMBER of PERSONS engaged in them (arranged in the order of the Numbers), in 1851:—

Occupations.	*Persons.*
Agricultural labourer, farm-servant, shepherd	1,460,896
Domestic servant	1,038,791
Cotton, calico, manufacture, printing and dyeing	501,465
Labourer (branch undefined)	376,551
Farmer, grazier	306,767
Boot and shoe maker	274,451
Milliner, dressmaker	267,791
Coal-miner	219,015
Carpenter, joiner	182,696
Army and navy	*178,773
Tailor	152,672
Washerwoman, mangler, laundry-keeper	146,091
Woollen cloth manufacture	137,814
Silk manufacture	114,570
Blacksmith	112,776
Worsted manufacture	104,061
Mason, pavior	101,442
Messenger, porter, errand-boy	101,425
Linen, flax manufacture	98,860
Seaman (merchant service) on shore or in British ports	89,206
Grocer	85,913
Gardener	80,946
Iron manufacture, moulder, founder	80,032
Innkeeper, licensed victualler, beershop keeper	75,721
Seamstress, shirtmaker	73,068
Bricklayer	67,989
Butcher, meat-salesman	67,691
Hose (stocking) manufacture	65,499
School-master, mistress	65,376
Lace manufacture	63,660
Plumber, painter, glazier	62,808
Baker	62,472
Carman, carrier, carter, drayman	56,981
Charwoman	55,423
Draper (linen and woollen)	49,184
Engine and machine maker	48,082
Commercial clerk	43,760
Cabinet-maker, upholsterer	40,897
Teacher (various), governess	40,575
Fisher-man, -woman	38,294
Boat, barge, man, woman	37,683
Miller	37,268
Earthenware manufacture	36,512
Sawyer	35,443
Railway labourer	34,306
Straw-plait manufacture	32,062
Brick maker, dealer	31,168
Government civil service	30,963
Hawker, pedlar	30,553
Wheelwright	30,244
Glover	29,882
Shopkeeper (branch undefined)	29,800
Horsekeeper, groom (not domestic), jockey	29,408
Nail manufacture	28,533
Iron miner	28,088
Printer	26,024
Nurse (not domestic servant)	25,518
Shipwright, shipbuilder	25,201
Stone quarrier	23,489
Lodging-house keeper	23,089
Lead miner	22,530
Copper miner	22,386
Straw hat and bonnet maker	21,902
Cooper	20,245
Watch and clock maker	19,159
Brewer	18,620
Clergymen of Established Church	18,587
Protestant Dissenting minister	9,644
Dock labourer, dock and harbour service	18,462
Police	18,348
Plasterer	17,980
Warehouse-man, -woman	17,861
Saddler, harness maker	17,583
Hatter, hat manufacture	16,975
Coachman (not domestic servant), guard, postboy	16,836
Law Clerk	16,626
Coachmaker	16,590
Cow-keeper, milk-seller	16,526
Ropemaker	15,966
Druggist	15,643
Surgeon, apothecary	15,163
Tin miner	15,050
Paper manufacture	14,501
Coalheaver, coal labourer	14,426
Greengrocer, fruiterer	14,320
Muslin manufacture	14,098
Confectioner	13,865
Tinman, tinker, tin plate worker	13,770
Staymaker	13,699
Solicitor, attorney, writer to the signet	13,256
Dyer, scourer, calenderer	12,964
Currier	12,920
Builder	12,818
Farm bailiff	12,805
Hair-dresser, wig-maker	12,173
Coal merchant, dealer	12,092
Glass manufacture	12,005
Carpet and rug manufacture	11,457
Goldsmith, silversmith	11,242
Brass founder, moulder, manufacture	11,230
Maltster	11,150
Bookbinder	10,953
Railway officer, clerk, station master	10,948
Road labourer	10,923
Wine and spirit merchant	10,467
Fishmonger	10,439
Merchant	10,256
Ribbon manufacture	10,074

Leaving these general results, which apply for the most part to the whole of Great Britain, and to the whole circle of occupations, we proceed to notice a few of the results having a somewhat more special character. One of these has relation to the employment of the many by the few, and another relates to farms, farmers, and farm-labourers.

One of the valuable results of the Census of 1851, is the determination, to a certain degree of correctness, of the relative positions of employers and employed; a classification of masters and men in each occupation. Many of the schedules sent by the Commissioners were imperfectly filled up; but the general result approximates on the whole pretty nearly to accuracy. We may solve many interesting questions by means of the tables thus produced. For instance, let the question be this—How many occupations are there in which some of the masters employ 350 hands or more? They are the following:—shoemakers, glovemakers, stocking-weavers, engine and machine makers, builders, carpenters, manufacturing chemists, tanners, woollen manufacturers, worsted manufacturers, flannel manufacturers, woollen dyers, silk manufacturers, ribbon manufacturers, fancy goods' manufacturers, shawl manufacturers, brewers, cotton manufacturers, lace manufacturers, paper makers, stationers, coal-merchants, coal-miners, contractors, earthenware manufacturers, glass manufacturers, silversmiths, tin plate workers, white metal workers, button makers, iron manufacturers. Let the question be,—Which occupations contain the greatest number of firms employing 350 or more persons each? We find, in answer, 113 cotton manufacturers, 21 woollen manufacturers, 13 silk manufacturers, 12 worsted manufacturers, 14 engine and machine makers, 7 earthenware manufacturers, 5 iron manufacturers, 5 builders. Let the question be,—How many masters employ bodies of men not less than 100 in number? The answer, slightly classified, comes out as follows:—

390	masters	employ from	100 to 150	men each.
236	"	"	150 to 200	"
135	"	"	200 to 250	"
88	"	"	250 to 300	"
65	"	"	300 to 350	"
228	"	"	350 and upwards,	"

1142 masters each employ 100 men or upwards.

It is in Lancashire chiefly that the factories are situated in which the largest number of persons are employed. This might be expected, knowing, as we do, on how gigantic a scale the cotton-mills of that county are conducted. No less than 106 of the Lancashire mills employ *more* than 350 hands each; how much more, is not stated in detail. There are also 10 engineers or machine makers, each of whom has at least 350 work-people.

In London the number of work-people employed by the respective masters differs, of course, from that observable in country lists, since the preponderant trades themselves differ. Taking 100 as a minimum, it may be asked,—Which are the London trades comprising the greatest number of masters who employ 100 men or more each? We find that there are altogether 80 of such masters—a smaller number than might at first perhaps have been supposed. Of these, there are 22 builders, 6 engineers, 5 shoemakers, 5 printers, 4 painters and glaziers, 3 pianoforte manufacturers, 2 each of bookbinders, gunsmiths, masons, tanners, silk manufacturers, drapers, tobacco-manufacturers, stationers, silversmiths, iron-manufacturers, mineral-workers, and 1 each of hatters, tailors, omnibus-proprietors, coach-makers, carpenters, dyers, brewers, sugar-refiners, coopers, brickmakers, gas-fitters, and cutlers. But there are several items which are very questionable. For instance, among shipbuilders in the metropolis, there is not one entered with so many as 50 men in his employ; among distillers and rectifiers, not one with so many as 20;—evidently there are great omissions here. Again, when we find that there are only 2 vinegar makers, 2 dye manufacturers, 1 law-stationer, entered as employing any persons at all, it is still more manifest that many of these returns were incomplete. The explanation is doubtless to be found in the statement prefixed to the Tables: "Many employers—in some trades more than one half of the whole number—omitted to attend to this instruction [directing that the master is to be distinguished from journeyman, and that the number of persons in the trade in the employ of the master is always to be inserted]. The present return, therefore," it is added, "is very incomplete; but the facts are sufficiently numerous to enable just deductions to be drawn as to the number of hands employed by masters in particular trades, as carried on in London." This may be so generally, but the instances to which we have directed attention, are sufficient to show that great caution is necessary in drawing deductions, as in some cases they would certainly be by no means just ones.

The small tradesmen in the metropolis are, in many respects, the most important of all, on account of their large number. The small chamber-masters, or small shopkeepers who employ each not more than two journeymen, or two apprentices, or one journeyman and one apprentice, are surprisingly numerous, showing to how great a degree mastership is diffused in the metropolis. We give the following table of chief trades followed by

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* This is the Army and Navy of the United Kingdom, exclusive of the Indian Army and Navy.

Masters who employ 1 or not more than 2 Journeymen or Apprentices.

Bakers	842	Carpenters	360
Tailors	460	Cabinet-makers	255
Butchers	334	Painters and glaziers	251
Shoemakers	368	Grocers	242

The table is to be understood thus: that in the above eight occupations there are 3162 masters in the metropolis, who employ either one or two persons each. Of those, still lower in the social scale, who claim mastership only over their own individual labour, the numbers run in a somewhat different order, beginning with a shoemaker (the 'cobbler who lives in a stall,' perhaps), and going thence to the tailor, the butcher, the baker, the grocer, the carpenter. But these numbers include also those masters who made no definite returns at all.

In respect of agricultural pursuits, the Commissioners sought to obtain a return of the number of farms, the size of the farms, and the number of persons engaged in them. The following is a convenient general outline of the result :—

Size of Farms.	Number of Farms.			
Acres.	Great Britain.	England and Wales.	Scotland.	Islands in British Seas.
Total	283,378	223,271	56,150	3,957
Under 100	190,573	142,358	44,469	3,746
100	52,912	45,752	7,009	151
200	20,603	18,401	2,166	36
300	9,031	8,061	961	9
400	4,063	3,585	471	7
500	2,248	1,971	272	5
600	2,816	2,372	442	2
1,000 and upwards.	1,132	771	360	1

Besides the above, there were 2558 farms of which the sizes were not stated in the returns; making 285,936 farms or farm-holdings altogether. It is found that large farms prevail most in the North, and in Norfolk and Suffolk. The average size of all the farms is 102 acres; and, taken in the aggregate, they occupy just about one-half of the territory of Great Britain. Two-thirds of the farms are less than 100 acres each in extent. About 9000 small farmers seem to have no labourers except the members of their own families; about 170 farmers employ more than 60 labourers each; while all the rest have in their service a number varying from 1 to 60.

Professional avocations, as distinguished from trading and manufacturing, present a few interesting facts, which may be put together in the following form :—

	Males.	Females.
Persons engaged in the general or local government of the country—		
Civil service	38,849	1,487
Local service	29,851	1,113
East India (in England)	3,774	...
Persons engaged in the defence of the country—		
*Army, with pensioners, &c. at home	70,718	...
Navy " "	25,796	...
Persons engaged in religious duties—		
Clergymen of national churches	18,587	...
†Other ministers	9,614	...
Subordinate officers	6,371	879
Persons engaged in law and justice—		
Judges	85	...
Barristers, advocates, &c.	3,111	...
Solicitors, attorneys, &c.	13,582	...
Law students	1,659	...
Law clerks, &c.	19,149	...
Persons engaged in the medical profession—		
Physicians	2,328	...
Surgeons and apothecaries	15,163	...
Chemists and druggists	15,333	...
Students and assistants	3,655	...
Miscellaneous	2,012	571
Persons engaged in literature, the fine arts, and sciences—		
Authors, editors, &c.	2,949	118
Artists, architects, &c.	8,609	536
Scientific persons	496	22
Professors and teachers	34,150	71,957

As before noticed, there is more confusion between Class 4 and Class 11. In the list here given, although artists are included, engravers are not; teachers of singing are, but not singers; dramatists are, but not actors. In order, therefore, to make our enumeration somewhat more complete, we must bring in a few items from Class 11, still comprising them among "persons engaged in literature, fine arts, and sciences."

	Males.	Females.
Actors and actresses, theatre servants	1,485	785
Musicians and vocalists	6.081	798
Engravers	5,507	77
Carvers and modellers	2,293	75
Pattern designers	2,161	43
Draughtsmen	597	...
Medallists and die-sinkers	489	14

Supposing that the above may be fairly reckoned as professional employments, it appears that, on Census-day in 1851, there were 344,464 males and 78.467 females thus occupied. These comprise 1 in 30 of all the males, 1 in 140 of all the females, and 1 in 50 of the whole population. If we omit the sailors and soldiers from the list of professional men, the ratio will become about 1 in 60.

Perhaps it will ultimately be found that the most valuable tables in the Census Reports are those which establish a comparison between different parts of the country. Large generalizations may be made from the tables which relate to the whole of Great Britain; but for comparison and analogy, the sectional tables will have a peculiar value of their own. In reference to a particular department of occupation, or a particular social relation, we may wish to know how far Wales differs from England, and Scotland from both; how far the 10 Divisions into which England is separated differ one from another in characteristics; in what way the 40 English Counties, 12 Welsh Counties, and 32 Scotch Counties exhibit peculiar characteristics; by what peculiarities the 623 registration districts or poor-law unions of England and Wales are distinguished; and so forth. The voluminous Census tables afford a store of information on all these local details.

Of course, when different districts or portions of the kingdom are treated separately, the metropolis comes in for the first notice; the following, then, is a rough outline of employments generally in the metropolis. Confining our attention, at present, to males, and to males only of 20 years and upwards, we find the following facts: That out of the 5,458,815 males of 20 years and upwards in Great Britain, 632,545 live in the metropolis; that the London shoemakers number 26,639, and the London tailors, 20,257; that there are no fewer than 25,708 domestic and inn servants; that the commercial establishments are so numerous and extensive as to employ 15,135 clerks and travellers; that the coachmen, drivers, carriers, waggoners, draymen, and others who drive vehicles through the London streets, number more than 17,000, besides 14,000 messengers and porters, in addition to railway, canal, and river servants; that there are, for housework, 21,174 carpenters, 13,817 painters and glaziers, and 16,038 bricklayers and plasterers; that among those who supply us with food and drink, are 9841 bakers, 7428 butchers, 6843 publicans, 6475 grocers, 3372 milk-sellers, 3325 greengrocers, 2238 fishmongers, and 2156 cheesemongers; that the leather trades, chiefly in Bermondsey, employ 5391; that there are 13,206 persons employed in printing, binding, and selling books; that the wood-furniture makers and sellers number 13,574; and that there are more than 40,000 labourers whose branch of labour is undefined, but who must be distinguished from skilled artizans.

Let us next, still confining our attention to the metropolis, glance at the female occupations in a similar way. Among the 5,998,384 females, aged 20 years and upwards, living in Great Britain, 762,418 are in London. Of this number, 316,517 designate themselves simply as wives, and 26,627 simply as widows, and about 40,000 as daughters, without any other alleged employment. But of those who appear to earn their living by the labour of their own hands or brains, there are no fewer than 118,855 domestic servants of various

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* But the total of the Queen's forces, at home and abroad, naval and military, effectives and non-effectives, was 262,570.

† It is necessary to bear in mind that many dissenting ministers are, in the Census returns, entered under the occupations which they follow during the week.

kinds, 73,620 needlewomen of various kinds, and 45,754 charwomen, washerwomen, and manglers. These, with 25,652 annuitants, and gentlewomen of independent means, comprise all the large items among the female adult population of the metropolis; all the other items are, individually, very small. These facts are not without their instruction; for they show how limited is the range of female employments in London. They show, too, that, after deducting those who are dependent on relations for support, and those of independent means, there were 330,000 adult females in London in 1851 dependent on their own exertions for their daily bread; and they show also how large must be the number of families in comfortable circumstances in London, to give employment to nearly 120,000 female servants, and 45,000 laundry- and char-women.

But now let us compare one of the manufacturing counties of the North with London, to ascertain how far a different principle seems to determine the distribution of occupations. We take the cotton-spinning county of Lancashire. Here we have 539,075 males of 20 years of age or upwards, against 632,545 in the metropolis; that is, in the ratio of about 85 to 100. Different indeed, however, is the ratio in regard to employments. We have seen that the metropolis contains about 26,000 male adult servants, 31,000 drivers and porters, 27,000 shoemakers, 21,000 carpenters, 20,000 tailors, 16,000 bricklayers, 15,000 clerks, 14,000 painters; whereas, in Lancashire, these eight occupations exhibit the numbers, 4708, 9127, 15,443, 12,146, 11,346, 7658, 7643, 6336—all far below the ratio in respect to total inhabitants. In London there are 35,000 persons in the public service, receiving emoluments from the community at large; whereas in Lancashire there are only 11,000. In London there are 34,000 professional men, engaged in divinity, law, physic, science, and fine arts; in Lancashire the number is 11,000. In London there are 14,000 persons employed in writing, printing, binding, and selling books and periodicals; in Lancashire there are 2,000. All these numbers, it is evident at a glance, differ widely; London having far more than its ratio of 100 to 85 in each of these employments. But let us turn the tables, and see what are the employments wherein Lancashire takes precedence of the metropolis. Of course, in a county, farmers, graziers, shepherds, gardeners, agricultural labourers, and so forth, must be relatively more numerous than in a city; and thus we need not be surprised to find 56,000 of these in Lancashire, against 14,000 in the metropolis. And, considering the wonderful shipping activity of Liverpool, and the numerous canals which traverse Lancashire in every direction, we may be prepared to expect that this county and the metropolis are not far from equal in the numbers of persons connected with ships, boats, and barges in various capacities; in the metropolis, this number is about 21,000, in Lancashire 18,000—very nearly, indeed, in the ratio of 100 to 85. But it is in textile manufactures, and in minerals, that Lancashire most decidedly takes the lead before London. In Lancashire there are 104,000 persons (out of about 540,000) engaged in various departments of the cotton manufacture, against a few hundreds in London; 7000 in woollen manufactures, against a few hundreds; 21,000 coal miners and labourers, against 5000; 3000 quarrymen, against 500.

Here it must be borne in mind, that the numbers in the preceding paragraph are of males only, and males too who have reached their 20th year or upwards. A few parallel entries will suffice, relating to certain occupations for adult females: of domestic servants and nurses there are, 125,000 in London, and 55,000 in Lancashire; of silk-workers, 8000 in London, and 12,000 in Lancashire; of cotton-workers, 1000 in London, and 90,000 in Lancashire. Here we find that one-sixth of all the adult females in London are domestic servants or nurses, and that one-sixth of all the adult females in Lancashire are engaged in the cotton manufacture.

There are also striking differences in respect to juvenile labour:—The metropolis contains 474,013 males, and 493,260 females, under 20 years of age; the numbers in Lancashire are 469,749 and 474,735 respectively. Now in the metropolis, after deducting 770,000 young persons who are entered only in their domestic or family relations, without connection with any particular employments, there remain about 200,000 who are considered to have some occupation or other; whereas in Lancashire there are 270,000 having employment; and out of this number about 120,000 are employed in the cotton manufacture alone—that is, 120,000 young persons. In the metropolis, on the other hand, young seamstresses and young domestic servants chiefly fill the list.

We turn now to other phases of metropolitan employment. Of the whole 2,362,236 inhabitants, there are, in round numbers, 630,000 men, 760,000 women, and 970,000 persons of both sexes under 20 years of age. Of this latter number, nearly 300,000 are under 5 years of age, and therefore almost equally removed from schooling and occupation. In order to show, then, how far male employments are to be met with in London for young persons, we give the following table in relation to a few occupations:—

	Under 20.	20 and upwards.
Law clerks	1,530	5,401
Teachers	457	4,285
Messengers and porters . . .	19,743	13,471
Printers, &c.	3,213	13,206
Silk manufacturers . . .	1,435	8,388
Cabinet-makers	2,361	13,963
Gold and silver work . . .	1,145	6,419
Brass work	1,066	5,358
Iron work	2,170	13,604
Building trades	6,981	59,451

It is probable that the greater part of the above young persons are apprentices, although the returns do not specify this fact in words. The 19,743 young messengers and porters are evidently the "errand boys," rather a formidable body in London. Taking female occupations instead of male, and noticing the difference of age in a similar manner, we find the following:—

	Under 20.	20 and upwards.
Teachers	1,314	11,185
Servants	46,524	138,262
Needlewomen	20,288	124,165
Silk-workers	2,373	8,847
Paper-workers	625	1,132

If we were to name the three most characteristic kinds of occupations in London for males under 20 years of age, therefore, they would be apprentices to mechanical trades, errand boys, and junior clerks; and for females under 20 years of age, they would be servants, needlewomen, and teachers.

The 36 districts of London exhibit many remarkable groupings in reference to employments. It is well known that the members of a particular trade are wont, in many cases, to congregate near each other; but the Census tables show this more exactly. Lawyers live in Kensington district in greater relative numbers than in any other district—a fact for which we do not feel very well able to account; but the law clerks, except those who live around Chancery-lane and the inns of court, are found in greater relative numbers at Islington. The authors, editors, artists, and architects, are found in small number south of the Thames, or in the eastern half of the metropolis; Marylebone, St. Pancras, and Kensington, are their chief districts. Domestic servants are found in greatest relative force in the districts of St. George's Hanover Square, St. James's Westminster, Marylebone, and Kensington—indeed overwhelmingly so. The tailors are strong in St. James's, Marylebone, and St. Pancras, but relatively more so in the Whitechapel and neighbouring districts, where much of the slop work is done. The chief districts for shoemakers are St. Pancras and Marylebone in the north, Lambeth and Newington in the south, Whitechapel and Bethnal Green in the east. The gardeners have Kensington and Wandsworth as their chief districts. Beyond all other districts, the City is the locality for publishers and booksellers, for it contains the regions of Paternoster Row, and the numberless courts around Fleet Street. Musical instrument makers congregate in decided preponderance in St. Pancras. There are two districts in which watchmakers appear in surprising force; these are, as may be supposed, Clerkenwell and St. Luke's. Coachmakers in Pancras and Marylebone; shipbuilders in Stepney and Poplar; dyers and calenderers in Shoreditch and Bethnal Green (where the silk manufacture is carried on); leather workers in Bermondsey (nearly as many as in all the other 35 districts combined); sugar refiners, nearly all in Stepney, Whitechapel, and St. George's in the East; cabinet and furniture makers, Pancras, and especially Shoreditch; coopers, in the districts nearest the various docks; rope and sail makers, Stepney and Bethnal Green; workers in gold, silver, and precious stones, Clerkenwell;—these are the chief associations between occupations and districts.

And so, in like manner, are there certain occupations for adult females, which seem to be carried on in some districts rather than others. Domestic servants and governesses are, relatively to the population, most numerous in the districts of Kensington, Marylebone, and St. George's Hanover Square; while schoolmistresses, as distinguished from governesses, are relatively as numerous in other districts. The charwomen are especially numerous in Marylebone, Those who assist in the hat manufacture, binding, and so forth, are in Southwark and Bermondsey, where most of the hat factories are situated. The women tailors, who make waistcoats and cheap goods for the slop shops, are chiefly in the three eastern districts of Stepney, Whitechapel, and St. George's in the East. The milliners, as distinguished from seamstresses, are in greatest number in Marylebone and Pancras; but the seamstresses, who are understood to occupy a lower grade among needlewomen, are in strongest force in Stepney and St. George's in the East. Staymakers are in Marylebone chiefly. The washerwomen and manglers take up their abode chiefly in the genteel districts. The women who work at shoemaking live principally in Shoreditch and Bethnal Green; while the umbrella makers are more generally to be found in Whitechapel and St. George's in the East. The hawkers and pedlars are chiefly in the four districts just named. Artificial flower-makers in St. Pancras; silk workers in Bethnal Green; upholstery workers in Marylebone; lace workers in the same district—these are other examples of predominance.

For reasons already sufficiently indicated, it will be impossible to give abstracts of the county and district tables here; so numerous are they, and to so great a length is the classification carried. But we may be able to select a few examples sufficient to illustrate broad general principles of industrial distribution. For instance, every one knows that certain towns have become celebrated for certain manufactures; Sheffield for cutlery, Birmingham for small metal works, Manchester for cotton, Leicester and Nottingham for hosiery, Leeds for woollens, Bradford for stuffs, and so on; but it may be useful and instructive to know more exactly the extent to which this localization is carried. Again, there may be certain districts containing no very large towns, but in which some particular manufacture is nevertheless carried on to a remarkable extent; such as straw-plait, pillow-lace, needles, and many others.

Passing in review the principal cities, boroughs, and towns, we can readily determine from the tables, even without the aid of any previous knowledge on the subject, the prevailing character of the industry in each town, and to some extent the degree in which female labour and juvenile labour are made use of. Let us take a few of the towns in succession.

Birmingham.—Here the males under 20 years of age are 52,640, and above 20 years 61,276; the females under 20 are 53,380, and above that age 65,545; or, placing the numbers in a compact table, we have the result thus:—

Males. Females. Total.
52,640 + 53,380 = 106,020 under 20 years.
61,276 + 65,545 = 126,821 20 and upwards.

113,916 + 118,925 = 232,841 total population.

Now in respect to their population, we find that out of the various classes of occupations, classes 11 and 14 are those in which the Birmingham inhabitants are chiefly employed—viz., working in metal. 2000 men making guns, 1800 making machines and tools, 2400 working in gold and silver, 3000 brass founders, 1400 button makers, 1200 white and black smiths, 1400 iron manufacturers, 400 nail makers. These are among the men of 20 years and upwards; but of the males under this age there are no less than 7000 employed in the few metal trades above enumerated. In Birmingham, females are largely employed in the smaller kind of metal manufactures; for example—1,300 young females and 1,600 adult females in making buttons; 700 and 1,100 in miscellaneous works in mixed metal; 800 and 1,200 in miscellaneous iron and steel works.

Manchester and Salford.—In these cotton towns are—

Males. Females. Total.
86,551 + 89,043 = 175,594 under 20 years.
104,906 + 120,821 = 225,727 20 and upwards.

191,457 + 209,864 = 401,321 total population.

These are within the Parliamentary limits, which exceed the municipal. Now passing over the tailors and shoemakers, the carpenters and painters, the bakers and butchers, who in all large towns must necessarily form a considerable part of the population, we turn to class 13 as likely to exhibit remarkable characteristics of the workers in Manchester and Salford. Here one single entry, cotton manufacture, comprises *enormous* numbers—13,257 men, 5692 boys, 14,503 women, 9051 girls, making a total of 42,503, in which the females exceed the males by 23,554 against 18,949. Putting the whole of the textile manufactures together—relating to cotton, flax, silk, and wool, they appear to employ about 25,000 men, 8000 boys, 20,000 women, and 12,000 girls, exhibiting the remarkably near equality of 33,000 males to 32,000 females—more than 1 in 7 of the entire population of Manchester and Salford employed in making the textile materials for dress, besides 12,000 tailors and seamstresses employed in making up textile materials into dress. We have in this paragraph, for brevity, applied the terms boys and girls to young persons under 20 years of age; and shall do so in those which follow.

Nottingham.—Here we enter a bobbin-net and cotton stocking town:—

Males. Females. Total.
11,782 + 12,746 = 24,528 under 20 years.
14,805 + 18,074 = 32,879 20 and upwards.

26,587 + 30,820 = 57,407 total population.

Of course the numbers in any particular occupations here will appear much smaller than in Manchester, because the population is only one-seventh as large; but the following entries are well worthy of note:—stocking-makers, 2,469 men, 412 boys, 1,588 women, 474 girls, making nearly 5,000 persons, or more than one-twelfth of the whole of the inhabitants, employed in this one branch alone. The bobbin-net manufacture employs 1,376 men, 517 boys, 3,277 women, 1,902 girls, exhibiting a still more striking total of more than 7,000 persons. Of the aggregate 12,000, more than 7,000 are females. It is worthy of notice that the hose and lace workers bear a larger ratio to the population of Nottingham, than the whole of the textile workers bear to the population of Manchester.

Merthyr Tydvil.—We quit hosiery and lace, to turn to iron and coal:—

Males. Females. Total.
14,357 + 13,628 = 27,985 under 20 years.
19,650 + 15,443 = 35,093 20 and upwards.

34,007 + 29,071 = 63,078 total population.

Now in this remarkable town we glance over the classes of occupation, one after another, without meeting with any numbers so large as to arrest the attention. At last, however, in class 14, we encounter them in surprising force. There are under the heading 'coal miners,' 1,671 boys and 4,302 men; and among iron workers are 2,038 boys and 6,915 men; making a total of about 15,000 workers in these two minerals alone; these, with 700 or 800 females similarly employed, comprise a quarter of the entire population. Considerably more than half the adult male population of Merthyr Tydvil are workers in iron and coal, employed chiefly in the four great establishments of Dowlais, Cyfarthfa, Pen-y-darren, and Plymouth works.

Bradford.—This. busy Yorkshire town introduces us to a wholly different class of manufactures. The parliamentary borough is somewhat extensive, and includes some of the neighbouring villages, comprising a population of—

Males. Females. Total.
22,934 + 24,399 = 47,333 under 20 years.
27,032 + 29,413 = 56,445 20 and upwards.

49,966 + 53,812 = 103,778 total population.

After making allowance for the large number of tailors, shoemakers, carpenters, masons, and similar handicraftsmen for supplying the wants of so large a population, we find that class 12 contains the employments characteristic of Bradford. Here are entered, under worsted and stuff manufacture, 5381 boys, 10,759 men, 7936 girls, and 8780 women—a powerful body of about 33,000 persons (nearly a-third of the whole population) employed in worsted and stuff manufactures alone. The woollen cloth, the silk, and the cotton manufactures, occupy perhaps 1000 altogether, showing how insignificant they are at Bradford.

Leeds.—The borough contains—

Males.		Females.		Total.	
38,468	+	38,987	=	77,455	under 20 years.
45,246	+	49,569	=	94,815	20 and upwards.
83,714	+	88,556	=	172,270	total population.

We devote a short paragraph to Leeds, for the purpose of showing how remarkable a contrast may be presented in the industry of two towns situated only about ten miles apart. Bradford and Leeds both work up wool largely; but Bradford prepares it for stuff or worsted fabrics, while Leeds prepares it for woollen cloth. Leeds has 2920 boys, 7640 men, 1710 girls, and 2624 women employed in making woollen cloth: while the stuff and worsted manufactures barely employ 1000. Leeds, however, is a large manufacturing town in other respects; for it employs about 9000 persons in the flax manufacture, and 3000 in making engines and machines. Relatively to the population, Huddersfield is perhaps more peculiarly associated than Leeds with the woollen cloth manufacture.

Macclesfield.—Having given an idea of the distribution of occupations in the towns which may be regarded as the chief seats of the cotton, woollen, and stuff manufactures, let us do the same in reference to the silk-workers of Macclesfield borough:—

Males.		Females.		Total.	
8,299	+	8,735	=	17,034	under 20 years.
10,242	+	11,772	=	22,014	20 and upwards.
18,541	+	20,507	=	39,048	total population.

There are 2462 boys 4772 men, 2979 girls, and 4339 women employed in the silk manufacture, making an aggregate of about 14,500 persons, considerably more than one-third of the entire population. The males and females are employed in almost exactly equal numbers, 7234 to 7318.

Sheffield.—In this cutlery borough there are—

Males.		Females.		Total.	
31,108	+	31,112	=	62,220	under 20 years.
36,392	+	36,698	=	73,090	20 and upwards.
67,500	+	67,810	=	135,310	total population.

In the classes relating to the supply of food, clothing, and dwellings, Sheffield contains a number fairly proportionate to its population; but it is only in class 14 that the industrial characteristics make their appearance. The works in gold, silver, steel, iron, and mixed metals employ about 20,000 men and boys at Sheffield. Females are very little employed in the metal trades, thereby presenting a striking contrast to the arrangements at Birmingham. No fewer than 2461 boys and 7044 men are employed in making and grinding cutlery and files alone.

Glasgow.—There are two or three Scotch towns which present remarkable characteristics. Glasgow has—

Males.		Females.		Total.	
71,474	+	73,593	=	145,067	under 20 years.
83,455	+	100,574	=	184,029	20 and upwards.
154,929	+	174,167	=	329,096	total population.

This busy city is worthy of note for the degree in which it combines cotton working and iron working, two departments of industry which certainly do not seem to have any very necessary bond of connection. There are 3449 boys, 11,371 men, 9692 girls, and 16,442 women—about 15,000 males and 26,000 females—employed in various branches of the cotton manufacture. Of all the females in Glasgow, in every age and condition, one in seven are employed in this manufacture. There are, in respect to metal trades, 2600 machine and tool makers, 4800 miners and manufacturers, and 5400 other workers in metal—almost wholly males.

Dundee.—This is the great centre of the flax and linen manufacture of Scotland. Dundee contains—

Males.		Females.		Total.	
17,444	+	17,999	=	35,443	under 20 years.
18,420	+	25,068	=	43,488	20 and upwards.
35,864	+	43,067	=	78,931	total population.

Of these numbers there are 2713 boys, 6161 men, 4300 girls, and 6568 women, employed in flax and linen manufactures, being almost exactly one-fourth of the whole population—a ratio which certainly appears surprisingly large. Aberdeen is also engaged in these trades, but in a very much smaller ratio than Dundee.

These few examples would perhaps suffice to illustrate the distribution of particular branches of manufacture in the principal towns; but, adopting a still more compressed form, we will give a few additional instances in the following way:—

At *Portsmouth*, out of about 35,000 men and boys in the borough, about 9000 are in the public service, and receive pay from the community; while there are about 2000 privately employed as seamen or as shipwrights. At *Leicester*, out of 60,000 persons, nearly 9000 are employed in making worsted stockings, and similar articles. At *Northampton*, out of 13,000 men and boys, more than 4000 are employed in making boots and shoes, the staple industry of the place; and at *Stafford* the men and boys similarly employed are in the ratio of one to four of the whole male population. At *Worcester*, out of 15,080 women and girls, 2133 are employed in making gloves. Of the 25,705 men and boys in *Wolverhampton*, about 7500 are employed upon metals or upon coal; no less than 1400 make locks alone. In *Dudley* the ratio is about as high, about 6000 out of 19,093. *Coventry* is remarkable for two trades, about as diverse as any two can be, ribbon-making and watch-making: out of a population of 36,612, nearly 10,000 persons (of whom 6500 are females) are employed upon silks and ribbons; while 1700 men and boys are making watches. At *Stockport*, 17,000 persons are employed in cotton manufactures, out of a total population of 53,835—nearly one in three; at *Blackburn*, 16,000 out of 46,536—more than one in three; at *Bolton*, 14,500 out of 61,171; at *Oldham*, 20,000 out of 72,357; at *Preston*, 18,000 out of 69,542. Thus, in these five cotton spinning and weaving towns, containing an aggregate of about 300,000 inhabitants, about 34,000 males and 42,000 females—considerably more than one-fourth of all the inhabitants—are engaged in this manufacture. Looking at the distribution of workers in reference to age, we find that there are about 33,000 children and young persons under 20, and 43,000 adults of 20 and upwards. In *Paisley*, out of about 31,000 inhabitants, nearly 9000 are employed in various kinds of textile manufacture, of which the principal is shawls.

Hitherto, in the above paragraphs, we have spoken of distinct towns, each with defined limits and defined number of inhabitants. But a few remarkable manufactures are centred rather in districts than in large towns.

In *Staffordshire*, the registration county (which often differs slightly both in limits and in population from the real county), contains 320,903 males and 309,641 females. Now it is plain, on a little examination, that the main departments of industry whereby these are supported have relation to mineral manufactures; and it is further observable, on comparing the several districts in Poor Law Unions, that while the southern exhibit the metallic and colliery operations, the northern are associated with earthenware manufactures. In short, we have the Wolverhampton region of the south, and the pottery region of the north. There are 27,000 males and 1000 females engaged in various departments of the coal trade; 45,000 males and 7000 females in metallic manufactures; 16,000 males and 9000 females in pottery and earthenware manufactures. It is worthy of note that in the two districts or Poor Law Unions of Stoke-upon-Trent and Wolstanton, containing the pottery towns of Stoke, Hanley, Lane End, Delph, Etruria, Shelton, Burslem, &c., out of a population of 51,000 adult males and females, more than 13,000 are engaged in the earthenware manufacture. And in respect to South Staffordshire, it would perhaps scarcely be expected that 5000 women are engaged in nail-making.

Bedfordshire, containing 62,539 males and 67,266 females, is not a county likely to contain large manufacturing establishments of any kind; but there are, nevertheless, two or three entries in the tables which deserve attention. There are, we find, 2300 males and more than 10,000 females engaged in the straw-plait manufacture; together with nearly 6000 females occupied in hand-lace making. One fourth of all the females in the county, of all ages and conditions, are employed in one or other of these two occupations. In *Buckinghamshire*, containing 70,928 males and 72,727 females, the straw-plait trade is smaller, employing only about 3000 females; but the lace-trade is about as extensive as in Bedfordshire, employing nearly 11,000 females. In *Hertford-*

shire we almost entirely lose the lace-trade; but the straw-plait employs about 9000 females out of 87,497. In *Cambridgeshire* there is a little done in these two trades, but only a little; and in *Huntingdonshire* there are about 1000 females out of 30,295 engaged in the lace-trade. In these two departments of cottage industry, the females employed are of all ages from 5 to 90, chiefly between 10 and 20.

Worcestershire, for some reason which it is difficult to explain, is the centre of the needle manufacture. At Redditch in this county nearly all the inhabitants are supported, directly or indirectly, by this manufacture; although the steel for making the needles, and all the coal for heating the steam-engines, must be brought from other quarters.

Cornwall is rich in metals, but has no coals. It has 172,193 males in the (registration) county. Among these are 3000 seamen and 2600 fishermen; but when we come to class 14, mineral working, we find about 16,000 copper-miners, more than 10,000 tin-miners, 2500 lead-miners, and about 6000 employed in other ways on metals and minerals; none, however, in coals. There are also about 6000 females engaged at the 'above-ground' works of the copper and tin mines.

Let us contrast this with a county containing much coal but little metal. *Durham* (registration) county contains 207,088 males, and 204,591 females, a departure from the general rule; for here we find more males than females. Now, here are 10,000 men and boys engaged in sea and river navigation; a very large number out of such a population, and evidently due principally to the navigation of colliery vessels. The number of 4500 ship and boat builders is also large, and points to the busy trade of Sunderland. But a much larger item is that of 29,000 men and boys employed in coal-mining and working, about one-seventh of the male population. In *Northumberland*, as might be expected, a somewhat parallel state of things presents itself. There are here 149,515 males; and, of these, about 6000 are engaged in navigating ships and boats, 1400 in building ships and boats, and 11,000 coal-miners; the parallelism, it will be observed, is in the nature of the prevalent occupation, and not in their extent, for Durham greatly takes the lead in this respect. Five of the coal-miners of Northumberland are entered as being upwards of 90 years of age; but it is satisfactory to find that, consequent on recent legislation, scarcely any boys under 10 years of age, or females of any age, are included among the coal-miners or labourers.

There are two counties in the western part of the kingdom which we may similarly notice, in respect partly to the iron manufacture, but still more decidedly to coal-mining. These are Monmouthshire and Glamorganshire. *Monmouthshire* contains 92,301 males and 82,849 females—another example, in a mining county, of the males outnumbering the females. The iron trades occupy 12,000 males, and the coal trade also 12,000—in round numbers: together more than one-fourth of the entire male population. Females are not much employed in these trades in this county. *Glamorganshire*, containing the remarkable towns of Merthyr and Aberdare and their vicinity, has a population of 125,087 males and 115,000 females. Of these males, no less a number than 15,500 are engaged in the coal trade, and 14,000 in the iron trades. In another Welsh county, *Caermarthen*, copper manufactures are, in respect to the population, if not as remarkable as iron manufactures in Glamorganshire, at least worthy of note as the staple industry of portions of the country. The explanation of this is, that nearly all the copper ores of Cornwall and Devon are sold on the spot to copper-smelters, who have their works at Swansea or Neath, or some other town in Caermarthenshire. But besides the copper workers there are, among the 125,087 males in this county, 14,000 workers in iron, and 15,000 coal-miners.

Something has been said, in former paragraphs, of the remarkable distribution of employments in the cotton and woollen towns of the north; and a comparison, in relation to certain items, has been made between Lancashire and the metropolis. In order, however, to illustrate more definitely the centralisation of certain manufactures in the two great counties of Lancashire and Yorkshire (West Riding), we will present, in the following form certain numbers and ratios. In *Lancashire*, out of 1,008,824 males of all ages, there are 160,000 engaged in the various departments of the cotton manufacture; and out of 1,058,477 females, about 158,000 similarly engaged; and of this large total of 318,000, not less than 118,000 are under 20 years of age. In the West Riding of *Yorkshire*, out of 666,912 males of all ages, there are about 120,000 engaged in various departments of wool and worsted manufactures; and out of 673,139 females, about 80,000 similarly engaged; and of this total of 200,000, about 15,000 are under 20 years of age. In comparing the above numbers, we observe the following results:—that the male workers in wool bear a larger ratio to the whole male population in the West Riding, than the male workers in cotton bear to the whole male population of Lancashire; that in respect of female workers, the ratio lies in the other direction; that the ratio of juvenile workers to adult workers is about the same in both departments of industry; and that while 1 in 6 of the Lancashire population is engaged in cotton manufactures, about 1 in 6½ of the West Riding population is engaged in the wool manufactures.

Such are a few of the most striking results obtained by the Census of 1851, relating to the occupations of the people. The entire Report is worthy of the careful study of every person who desires to know something more of the condition of the people, in this hard-working country, than can be derived from vague generalizations and partial inquiries.

OCEANIA, a name given by Balbi and other French geographers to a fifth division of the earth. They make it extend from about 93° E. to 105° W. long.; the northern boundary being the Indian Ocean, Malacca Strait, the Chinese Sea, and the Pacific along the parallel of 35° N.; the southern boundary being the 56th parallel of south latitude. The name is thus made to comprise the Andaman Isles, all the islands of the Indian Archipelago, Sumatra, Java, Borneo, Celebes, the Moluccas, the Philippines, Formosa, Australia, New Guinea, New Zealand, and the countless groups of islands in the Pacific within the limits above stated to the islets of Sala-y-Gomez, the most eastern of the whole.

O'CONNELL, DANIEL, the eldest son of Morgan O'Connell, was born at his father's residence, near Cahirciveen, Kerry, August 6, 1775. The family of Connell, or O'Connell, is of antiquity in the south of Ireland, but the circumstances of the father of Daniel O'Connell were much straitened. Still he did not neglect the education of his son, according to his means, for he sent him at an early age to a "poor old hedge-schoolmaster," named David Mahoney, who first taught the Irish agitator his letters. At the age of thirteen Daniel O'Connell was removed to a school at Redington, near Cove, county Cork, kept by the Rev. Mr. Harrington, a Roman Catholic priest: this school is said to have been the first publicly opened in Ireland after the repeal of the persecuting laws which made it penal for a Roman Catholic to educate his children. In 1790 Daniel, then just fifteen years of age, was removed from Redington with the intention of being sent to Liège; but on reaching that place he was found to be too old for admission, and accordingly was entered at St. Omer's. There he remained till 1792, when he was transferred for a time to the English college of the Benedictines at Douai. Returning after a few months to St. Omer's, he rose speedily to the head of the college; and so arrested the attention of the then president, Dr. Stapylton, that he prophesied that he would hereafter make a remarkable figure in the world. The first outbreak of the French revolution scattered the scholars of the Roman Catholic colleges at Douai and St. Omer's. Daniel O'Connell succeeded in reaching Calais safely, and, embarking on board the English packet-boat, he landed on the shores of England, "half a Tory at heart"—so deep and keen was the impression left upon his mind by the excesses of the revolution in France.

The legal profession having been recently thrown open to members of his faith, he in 1794 entered himself a student at Lincoln's Inn; and four years afterwards was called to the bar, having taken no ordinary pains to qualify himself. His first public speech was against the proposed union between the English and Irish legislatures. It was delivered at a meeting of the Roman Catholics of Dublin, assembled at the Royal Exchange in that city, for the purpose of petitioning against that measure; but the meeting was broken up by the intervention of the military. In 1802 Mr. O'Connell, while his professional prospects were brighter than its realities, was married privately to his cousin Mary, the daughter of Dr. O'Connell of Tralee. The calamitous occurrences however connected with the Irish outbreak of 1803, known by the name of Emmett's rebellion, found Mr. O'Connell already in possession of a moderate practice. He was now becoming gradually absorbed in the arena of political contention. Emmett's trial was the starting point of a new era in the history of Irish agitation: the cruelty inflicted by the citizen-soldiery made an impression as deep and lasting as it was general, and the 'Catholic Question,' as it was called, rose daily in importance. From this time forward Mr. O'Connell took the leading part in the prosecution of the Roman Catholic claims. "For more than twenty years," he writes to the late Lord Shrewsbury, "before the passing of the Emancipation Bill, the burden of the cause was thrown upon me. I had to arrange the meetings, to prepare resolutions, to furnish replies to the correspondence, to examine the case of each person complaining of practical grievances, to rouse the torpid, to animate the lukewarm, to control the violent and inflammatory, to avoid the shoals and breakers of the law, to guard against multiplied treachery, and at all times to oppose at every peril the powerful and multitudinous enemies of the cause." Day and night he devoted himself with surprising energy to the work, without receiving pay or fee. In 1804 the 'Catholic Board' was dissolved by a proclamation from government, but it was immediately revived under the name of the 'Catholic Committee.' It met in the Exhibition House in William-street, and its debates were reported from January 1808.

In 1815 Mr. O'Connell fought a duel with Mr. d'Esterre, a member of the Dublin corporation, and had the misfortune to inflict upon his adversary a wound which ultimately proved fatal: it is but just to add that for this result he ever afterwards felt and expressed the most painful remorse. Mr. O'Connell's public life henceforth offers very little material for remark, until we come to the very eve of the time at which the Roman Catholic Emancipation Bill was carried. In the summer of 1828, when the fever and excitement on the subject then in suspense was at its height, Mr. O'Connell and his friends judged that the time was come for bringing the question to a final decision. In the June of that year a vacancy occured in the representation of Clare county, and Mr. O'Connell, though a Roman Catholic, was proposed as a candidate against Mr. (afterwards Lord) Fitzgerald. He was returned to Parliament by a large majority, and proceeded to Westminster for the purpose of taking his seat in St. Stephen's. As a Roman Catholic, he of course refused to take the oaths drawn expressly against the doctrines of the Roman Catholic Church. Discussions in the house, and arguments at the bar ensued; and though the session closed without any practical result, yet the agitation in Ireland began to assume a formidable appearance, and to threaten another outbreak. Alarmed at the probable consequences of further opposition to claims which a large majority of educated Protestants had come to regard as just and equitable, the Duke of Wellington and Sir Robert Peel gave way, and early in the following year brought into parliament a bill for the repeal of the last civil disabilities under which the Roman Catholic body laboured. Mr. O'Connell accordingly was re-elected, and took his seat as member of parliament in May 1829. In the following year, at the general election consequent upon the death of George IV., Mr. O'Connell exchanged the representation of Clare for that of his native county of Kerry. He represented Dublin from 1832 to June 1835, when he was unseated on petition, but was immediately afterwards returned for Kilkenny. In 1837 he was once more returned for Dublin, and in 1841 for the county of Cork. To carry on more effectively the agitation, Mr. O'Connell had relinquished his professional practice, and as a compensation for his loss of income, an annual subscription was organised, which afterwards came to be known as the 'Rent.'

The year 1841 witnessed the return of Sir R. Peel and the Conservative party to power, and this was the signal for renewed agitation in Ireland. In the following year, Mr. O'Connell commenced his movement in favour of a repeal of the Union, which met with general sympathy from the violent and the ignorant throughout Ireland.

In 1842 and 1843 monster meetings were collected on the royal hill of Tara, on the Curragh of Kildare, the rath of Mullaghmast, and other localities renowned in tradition and song. A monster meeting announced as to be held at Clontarf on Oct. 8th in the latter year, was forbidden by government authority, and a state prosecution for high treason was commenced against Mr. O'Connell and the other ringleaders. Mr. O'Connell was convicted of sedition, sentenced to be imprisoned for a year, and to pay a fine of 2000*l*. The judgment was reversed on appeal to the House of Lords; but the prosecution answered its intended end; the prestige and magic influence of the great 'Liberator,' as he was called, was destroyed; he himself henceforth spoke in more measured language, and the funds of the Repeal Association were nearly exhausted in the contest.

The return of the Whigs to power in 1846, and the adherence which Mr. O'Connell gave to their party, introduced dissensions and differences among his immediate followers and supporters, over whom for forty years he had exercised an all-powerful influence. His health began to fail, and he became soured by opposition, as well as depressed in spirits by the evident approach of famine in Ireland. Early in 1847 he went abroad with the intention of spending some months in Italy, and of paying a devotional visit to Rome. He had not however proceeded further on his way than Genoa, when he suddenly sunk and expired on the 15th of May. His heart was embalmed and carried to Rome in compliance with his last wishes; and his body was conveyed to Ireland for interment. Besides three daughters, Mr. O'Connell left four sons, all of whom at one time or other have had seats in Parliament. His eldest son Maurice, many years M.P. for Tralee, died in 1853; and his second son, John, after representing several Irish constituencies, was appointed in 1856 to the Clerkship of the Hanaper Office in Dublin.

(*Life and Times of Daniel O'Connell, by his son, John O'Connell.*)

OCTODON. [MURIDÆ.]

OCTOPUS. [PAPER NAUTILUS.]

ODIHAM. [HAMPSHIRE.]

ODONTOPTERIS. [COAL PLANTS.]

OEHLENSCHLÄGER, ADAM GOTTLOB, the greatest poet of Scandinavia and one of the greatest European poets of the 19th century, was born on the 14th of November 1779, at Vesterbro, a suburb of Copenhagen. The whole of his early life was recorded by himself with singular minuteness, first in an autobiography written to be prefixed to a German edition of his works and afterwards in a series of 'Erindringer' or 'Recollections' which were published immediately after his death by his eldest son. The reader is informed in the 'Erindringer' of the boy's first inclination to swear, and how his mother checked it, of his strong propensity to pull off the bed-clothes, and a variety of similar particulars, the whole of which put together supply a varied picture of the life of a Danish boy at the close of the 18th century.

The name of Oehlenschläger is German; his father was from Krusendorf, a village in Sleswig, where the family had produced a long succession of schoolmasters and organists; and his mother Martha Maria Hansen was of German parentage by the father's side, of Danish by the mother's. "Thus," says Oehlenschläger, "I am descended from both Danes and Germans, and it seems as if Fate had determined I should belong to both nations." His father had fallen much below the respectability of his ancestry by becoming a servant to Count Adam Gottlob Moltke, after whom the poet was named; but on his marriage with the countess's lady's-maid he obtained by the count's patronage the post of organist at Frederiksberg, and afterwards of some subordinate position at the castle of that name, where he finally rose to be steward. Frederiksberg, one of the numerous palaces of the king of Denmark, a building which is said by some to have been erected from the plans of Inigo Jones, stands about two English miles from the western gates of Copenhagen, and is a favourite Sunday resort of the inhabitants of the capital. Here the early life of young Adam was passed amid scenes of great variety. In the summer Frederiksberg was often occupied by the court, and he heard the royal band of music play on Sundays, and saw the royal company at dinner. In the autumn the place of the court was supplied by a legion of workpeople, busy with repairs; and in the winter the building was left in charge of the Oehlenschläger family, with, in addition, two watchmen and two watchdogs. "The whole palace," says Oehlenschläger, "then belonged to us, and I went about in the royal rooms, looking at the paintings and building castles in the air."

The chief amusement of Oehlenschläger in the winter was reading novels, which he got from a circulating library in Copenhagen, and of which he tells us that before he was twelve years old he had got through more than three hundred volumes. All that he read was Danish—a circumstance to which he partly attributes the mastery he obtained over his native tongue. His parents, though German was their native language, never used it to their children, and only to each other when they did not wish the children to understand them.

Up to the age of twelve, young Adam had been very unfortunate in the article of schools; he was then taken notice of by Edward Storm, a Norwegian poet, who offered to his father to procure him gratuitous admission to a public school in Copenhagen, if his father would be at the charge of his board. Young Adam soon began to write not only verses but even plays, which were acted by himself, his sister, and some play-fellows, on Sundays, in one of the rooms at Frederiksberg. Storm, who was superintendent of the school to which the boy had been admitted, laughed at his attempts; and Dichmann, another Norwegian, who was one of the masters, told him, to his great mortification, that he was no genius—he would never be another Edward Storm. The education he received was intended to qualify him for a mercantile life; but when he left the school at the age of sixteen, he was glad of an accident which prevented his being placed in a counting-house, and readily persuaded his indulgent father, who was now in much better circumstances than he had been, to allow him to study. In a year however he was tired of Greek and Latin, and having for some months spent all his spare time and money at the theatre, was seized with a desire to appear on the stage. Theatrical matters are generally looked upon in a more serious light in a foreign city than in an English one, and at Copenhagen the management of the drama was treated with unusual solemnity. In Rahbek's Lectures on the Drama, delivered to the actors, the stage is regarded as a moral engine hardly secondary in importance to the pulpit. With the exception of the comedies of Holberg, the Danish Molière [HOLBERG], the plays that were performed were then chiefly translations. "Of English pieces," says Oehlenschläger, "the 'School for Scandal' pleased me much, in which Rosing was an excellent Sir Joseph [Joseph Surface?], and 'She Stoops to Conquer,' in which Gielstrup was an incomparable Tony Lumpkin." He soon found however that he was not likely to rise to a much higher position than that of a walking gentleman, and the acquaintance of two young students, who had taken lodgings with the same landlady as himself, led him into a different line. They were the two brothers Oersted, afterwards so well known. Of the three young men who occupied together for some years those obscure lodgings, one, Oehlenschläger, became the greatest poet of Denmark; another, Hans Oersted, became its greatest natural philosopher, and the discoverer of electro-magnetism; the third, Anders Oersted, who married Oehlenschläger's sister, became its greatest lawyer, and for a time the prime-minister of the kingdom. Oehlenschläger infected the future lawyer with a love of poetry, and the lawyer infected him with a taste for jurisprudence. With the consent of his father he relinquished the stage, and entered himself at the University of Copenhagen as a student of law, his friend promising his assistance to help him on a little more rapidly than usual. Literature however soon won the victory over law. The university offered in 1800 a prize for an essay on the subject 'Would it be an advantage for Northern literature if the Scandinavian mythology were made use of in it, instead of the Grecian?' It was the very idea which was taking possession of Oehlenschläger, and was destined to occupy him for life; but when he drew up an essay he had the mortification to see the prize carried off by another—receiving himself however the honour of being declared the second best.

On the famous 2nd of April 1801 when Nelson attacked the Danish fleet off Copenhagen, Oehlenschläger saw the fight at a short distance, from the balcony of the Sea-Cadets' Academy, and he afterwards held the post of ensign in a volunteer regiment of students. He also published a small dramatic piece, 'The Second of April;' but it was of no great merit. "That battle," he wrote, several years afterwards, "inspired the Danes with a taste for poetry, as the battles of Marathon and Salamis did the Greeks, and the destruction of the Spanish Armada the English in the time of Elizabeth. Some great development of power is requisite to drive the mean, the petty, and parochial out of a nation's mind, and bring it in tune for the great and beautiful." In 1803 he issued a volume of poems, containing among other works, the play of 'The Eve of Saint John,' and at once took rank as a writer of some note. The play, or rather dramatic tale, of 'Aladdin,' which followed, founded on the well-known story in the 'Arabian Nights,' captivated the public, in spite of some very obvious faults, by the general vivacity of its tone, and raised his name very high in the list of the living Danish poets, if it did not place him at their head. He used often to say afterwards that in writing 'Aladdin' he had discovered his own 'wonderful lamp,' the vein of poetry which was to give him fame and fortune. He received in 1805 the usual mark of success for a Danish author—a travelling stipend from the government, procured for him by Count Schimmelmann, and set out on a tour to Germany, to make the acquaintance of the band of literary men who at that time invested Germany with a halo. The second volume of his autobiography is chiefly occupied with an account of his travels, and of his intercourse with Göthe, Wieland, Tieck, Hegel, Voss, and other poets and philosophers. Up to his twenty-fourth year he had never written a line of German, but he was now so anxious to impart to his new and illustrious friends some notion of his poetical capacity that he translated his new compositions into German as fast as he wrote them, and somewhat unnecessarily occupied the time of many of them by availing himself of the permission to read his productions to them in manuscript, and take their opinion not only on the merits or defects of the structure and the poetry, but on the correctness or incorrectness of the language. It is not a little singular that productions so thoroughly Scandinavian in their tone and spirit as the earliest of the long line of Oehlenschläger's northern tragedies should have been written in a foreign land and partly composed in a foreign tongue. 'Hakon Jarl' was written at Halle. It is a tragedy in five acts, on the fortunes of Hakon Jarl, the last pagan sovereign of Norway, and the struggle between the two religions, Christianity and the belief in Odin. Nothing can well be more different than a tragedy of the old French school and such a tragedy as 'Hakon Jarl.' As the reader of 'Ivanhoe' finds himself, before he has arrived at the end of the narrative, not only interested in the fortunes of Wilfrid and Rowena, but also well-informed and perhaps not less interested in the whole framework of the country around them, cognisant of the relative position of the Normans and Saxons, of the enmity between the king and the Templars, of the ceremonies of a tournament and an ordeal, of the condition of serfs and Jews, so the reader of 'Hakon Jarl' sees pass before him the old tyrant superstitiously clinging to the wild religion of Valhalla, the young champion eager for the triumph of the Cross, the rude but independent Norwegian boor, the crouching northern slave, the ambitious serf who carelessly espouses the new faith because it promises him a better career. An unceasing vivacity pervades the whole, and there is not only pathos but humour; nothing can be further removed from the unvarying solemnity and systematic monotony which have by some been thought essential to the character of a tragic drama.

Oehlenschläger, before quitting Germany, was accidentally present at Weimar on the day of the double battle of Auerstadt and Jena, and was in some danger when the victorious French entered the town. From Germany he went to Paris, where he composed what is by some regarded as his finest tragedy, 'Palnatoke,' and also 'Axel and Valborg,' the former a sort of companion picture to 'Hakon Jarl,' in which Odinism is shown in a more favourable point of view, and the latter a love tale of the middle ages. At Paris he was welcomed by Baggesen, who had before his own rise occupied the highest position in the Danish Parnassus; and when Oehlenschläger read to him the 'Palnatoke' the impetuous poet flung himself at his feet in transports of admiration.

From France he went to Italy, and at Rome, while in daily intercourse with Thorvaldsen, composed his 'Correggio,' which, reversing his usual practice of writing his plays first in Danish and then in German, he wrote originally in the German language. This is of a different kind from any of his previous works,—it is the embodiment of the feelings of the great painter who, labouring in obscurity and not conscious of his own value, is subjected to all the emotions of which artistic genius is capable, by a series of ingeniously contrived incidents skilfully grouped on the known facts of Correggio's biography. The introduction of Michel Angelo and Julio Romano, as two of the persons of the drama, affords the dramatist an opportunity of painting more than one variety of the artistic character. Few of Oehlenschläger's works have met with greater variety of judgments than this. Treated with disdain by Göthe, it was afterwards caustically criticised by Tieck, and Cotta the publisher of Tübingen, after purchasing the German copyright, kept the play by him for years unpublished. Meanwhile the writer, after staying some time in Italy, beginning to feel home sickness, returned to Denmark after an absence of nearly five years, and read this production in manuscript to many of the most select circles of the capital, among others to the king and queen of Denmark, in presence of the leading members of the court, in the queen's apartments. The play, when produced in Germany, became one of the most popular on the stage, and had a run of success which caused it to be one of the most frequently acted for thirty years; and it also became a favourite in Denmark. A translation of it into English, by Theodore Martin, published in 1854, has met, we believe, with a general welcome, and all English critics regard 'Correggio' as one of Oehlenschläger's principal titles to fame.

Oehlenschläger had left Denmark in 1805, an eminent rising poet. His reputation had risen higher and higher during every year of his absence, and on his return in 1810 he was without a rival. Before he set out on his travels he had engaged the hand of Christiana Heger, the sister of Camma Rahbek, the wife of Rahbek the theatrical writer, whose house on the hill (Bakkehuus), a short distance outside the city walls, had been since 1800, and continued till 1830, the resort of the choicest literary society of Copenhagen. Rahbek himself had in a fit of vexation just thrown up the post of professor of æsthetics at the university, and Oehlenschläger obtained it, with the privilege from the king of being absent if he pleased during the summer terms, which was a privilege he did not neglect to make use of. Being thus provided with an income, he celebrated his wedding in an unusual way, but precisely in the style that Rogers, the English poet, was accustomed to say would have been his, if he had ever ceased to be a bachelor. "On the 17th of May, 1810," says the Dane's 'Erindringer,' "I dined with Christiana at her father's at Copenhagen, afterwards she and I drove by ourselves to Gientofte, where Pastor Högh, after I had shown him the necessary papers, went with us to the church and married us. We got into the vehicle again, man and wife, and drove off to the beautiful Christiansholm, to Sölyst, which Count Schimmelmann had had the kindness to offer us for a summer residence." The newly married lady had a notion that her husband had lost much by his dealings with the booksellers, and under her advice he began to issue his new plays and poems at his own risk, but soon convinced himself that he understood nothing of the publishing business, and his wife no more; a conviction which he says, however, that his wife could never be persuaded to share.

During the next five years he wrote a number of plays of various merit, but none that were equal to those he had composed abroad, and his peace was disturbed by a singular literary feud. Baggesen, already mentioned as formerly the head of the Danish Parnassus, had left Denmark a little before Oehlenschläger, with the deliberate intention, although in receipt of a poetical pension from the government, of never returning to the country, and of never writing another line of Danish. He now changed his mind, came back, and, unable to see with patience the throne of poetry occupied by another, though one whom he had himself applauded, commenced a series of critical onslaughts on Oehlenschläger, in which the animus was painfully apparent. The public became disgusted, Baggesen found himself in general disfavour, again expatriated himself, and finally died abroad. It must however be owned, that Oehlenschläger stood in need of a little criticism not too indulgent, and that he wrote better after these attacks than he did at the time they commenced. In 1816 he made a second foreign tour to Germany and to France, still using his pen when he halted, but was driven home by severe sickness after a twelvemonth. A long series of plays and poems followed, among which, the most conspicuous was 'Nordens Guder,' the 'Gods of the North' (published in 1819), an attempt to combine into one convenient whole all the scattered legends of the Eddas. The attempt has been pronounced successful; a translation of the work into English verse of very considerable merit by W. E. Frye was published at Paris in 1845, and the poem supplies much of the material for Pigot's 'Manual of Northern Mythology;' a novel, 'The Island in the South Sea,' written originally in German, was, on the contrary, of an unmistakeably inferior character. Oehlenschläger, who at the age of seven-and-thirty took lessons in English from Andersen Feldborg, a Dane long settled in Edinburgh, and well known to Walter Scott, entered into correspondence with Sir Walter to express his warm admiration of his novels; and, on being encouraged, sent the manuscript of his own novel to England to be translated by Mr. Gillies, but in spite of the zealous exertions of Sir Walter, the affair fell through from his inability to find a publisher who would pay 100*l.* to the author and translator for copyright. The failure was a fortunate one for the fame of Oehlenschläger, which would have suffered much in England from a work so unworthy of him.

In 1829, when at the age of fifty, he lost his father. "He was vain of his son," says the poet in the 'Erindringer' "but, like a sensible father, he never allowed me to see it; only sometimes I detected the feeling when he had been reading my poems. It amused him to get into conversation with strangers, and particularly with students on the bench at the hill at Frederiksberg, and lead the conversation to bear on me; when, if they said anything in my praise, it tickled him much, as he used to think he remained incognito. Many good-natured people were aware of this, and often afforded this innocent pleasure to the old man."

The death of his father, and the death of Camma Rahbek and her husband about the same time, threw a gloom over Oehlenschläger's spirits, but they were soon afterwards relieved by a singularly pleasing incident. He took for the first time in his life, in 1829, a trip across the Sound to the coast of Scania, thinking, as the steamer approached the Swedish shore, how strange it was that, though it had always greeted his sight over the waves from his earliest childhood at Frederiksberg, he had lived half a century, and been to Rome, without ever passing the straits. A brilliant reception awaited him from all ranks in Sweden: addresses were presented to him; the students at the University of Lund met him in a body in the high road with a professor at their head. He attended the ceremony of the inauguration of a rector of the university at the cathedral of Lund in company with Tegner, the Bishop of Wexio, who was acknowledged by all as the first poet of Sweden, and was by many considered to have surpassed in his 'Frithiof' any single work of Oehlenschläger's. Tegner, in the course of the delivery of a poetical address in hexameters, suddenly pronounced the lines—

"Skaldernas Adam är här, den Nordiske Sångarekungen
Thronarfvingen i Diktningens verld ty Thronen är Goethes;"

(The Adam of poets is here, the northern monarch of minstrels,
Heir of the sceptre of Song, for now the sceptre is Goethe's;)

and in the presence of the crowd that filled the cathedral, among whom were Oehlenschläger's wife and children, placed a laurel crown on his head, amidst a burst of music and the roar of cannon. The event, from all its circumstances, assumed almost a national significance. Tegner and some other eminent Swedes returned the visit by coming to Copenhagen. A few days after the King of Sweden sent the Order of the North Star to Oehlenschläger.

Honours continued to shower on him after this; one of them, the gift of free lodging by the king, seems however to have been obtained only by a sort of stratagem. "King Christian VIII.," he tells us, "granted me permission to live for one summer in the house of the castle steward at Frederiksberg," (the house which had been the official residence of his father). "I wished very much to get the permission extended to more summers than one. When I thanked the king for his kindness, he asked me if there was not a garden belonging to the house, and if I was not fond of gardening. This gave me an excellent opportunity of bringing in my petition. I answered that I should like very much to garden if I could hope to gather some of the fruit afterwards. The king said that if it was practicable I should have permission to live there; and I then told him, in the lively tone in which he liked to hear me speak, 'For your Majesty a good deal is practicable.' He then gave me permission to keep the house." Soon after, the poet tells us, he changed it for a better.

In 1844, on another visit to Paris, Oehlenschläger was repeatedly invited to court by Louis-Philippe, and presented on one occasion to a gentleman, whom he afterwards found to be King Leopold, who told him he had read all his works in German, and invited him to Brussels. A visit which he paid to Norway, and another in 1847 to Sweden, were like the triumphal progresses of a sovereign in literature. On his sixty-seventh birth day his play of 'Amleth,' on the same story as Shakspere's 'Hamlet,' was produced at Copenhagen. It was completely successful, and the King of Denmark wrote him a letter to congratulate him on his triumph. On his seventieth birthday, the 14th of November, 1849, a grand festival was given in his honour in the great saloon of the Royal Shooting-Gallery. All the leading poets of Denmark were present, and many of them wrote a song for the occasion. Oehlenschläger recited a poetical address of thanks, in which he alluded to his being near the termination of his career, but said—

> "I quaff a goblet with you as a guest;
> The feast I share is not my funeral feast . . .
> Close to us stands the house where I was born,
> And from it to the churchyard's quiet meads
> Beautiful is the avenue that leads."

In little more than two months he was destined to be borne along the avenue to which he had thus symbolically alluded. An illness which did not at first seem serious soon became so, and about eight o'clock in the evening on Sunday the 20th of January 1850 he felt the approach of death. At half past nine he called to his eldest son and told him, "At the theatre on the occasion of my funeral I wish them to act my own tragedy of 'Socrates.' Read to me now that part of the scene in the fifth act between Socrates and Cebes, in which Socrates speaks of death, it is so unspeakably beautiful." The son read the passage—

> "How then can Death affright thee!
> It only can be one of two things, Cebes—
> It must be something or it must be nothing," &c.

ending with

> "Think what a joy then that must be
> E'en with the gods themselves to live,—to speak
> With Hesiod, with Orpheus and with Homer,
> And all the great men who have been before us."

He heard this passage read with the greatest emotion, looking round him with a smile of pleasure. When it was concluded he put an end to the reading and took leave of his family who were standing around the bed. As the clock struck eleven he expired.

The funeral of Oehlenschläger was a national solemnity, like that of Thorvaldsen a few years before. The funeral procession consisted of about 3000 persons, including representatives of the king and queen, the heir of the throne in person, the foreign ambassadors, the professors of the university, the clergy of the capital, and all that was most distinguished. As it emerged from the western gate of Copenhagen it passed the house in which the deceased was born, and halted while the musical societies executed a solemn 'Farewell,' composed for music by Andersen. The procession closed at the church of Frederiksberg, where lies the poet. Grundtvig and Bishop Mynster spoke over the poet's grave. It is the church where his father was organist, and where the boy had first attended divine service.

The estimation in which Oehlenschläger is held by his countrymen is best shown by the commencement of the life of him in Flamand's 'Galleri af berömte Danske Mœnd og Qvinder.' "Small as Denmark is, it must be counted among the great powers in the world of art and poetry, since it has a sculptor to show like Thorvaldsen, whom only the great masters of antiquity can be considered to rival, and a poet like Oehlenschläger, who can worthily take the fourth seat by the side of the three heroes of poetry, Shakspere, Byron, and Göthe." Foersan the translator of Shakspere into Danish sent a copy to Oehlenschläger inscribed "To William Shakspere's Twin-brother." The English writer however to whom Oehlenschläger bears by far the most resemblance is Walter Scott. Though the great Danish writer was unfortunate in pure fiction and the great Scottish writer in the drama, the series of the Scotch novels of the one may be most aptly paralleled by the series of Danish tragedies of the other. In both there is an exuberance of life, a careless felicity, an apparent ease of production, a wonderful 'breadth of effect.'

Oehlenschläger's tragedies are twenty-four in number, and nineteen are on Scandinavian subjects. They are arranged in the last edition in chronological order, and touch upon almost everything of any great interest or importance in Scandinavian history or tradition. Besides those that have been already mentioned there are—'Knud den Store' ('Canute the Great'); 'Væringerne i Miklagord' ('The Varingers in Constantinople'), the hero of which is one of the northern body-guards of the Byzantine monarchs, who were taken as a subject after Oehlenschläger by Sir Walter Scott in 'Count Robert of Paris;' 'Landet fundet og forsvundel' ('Land Found and Lost'), in which are dramatised the incidents of the early discovery of America by the Northmen, latterly brought so prominently before the public by the 'Antiquitates Americanæ;' 'Dina,' a very interesting play founded on the extraordinary story of the Danish Alcibiades, Corfitz Ulfeld; 'Tordenskiold,' the 'Danish Nelson,' on one of whose adventures Oehlenschläger also composed an opera, was published in 1849. These tragedies are the true monument of the fame of Oehlenschläger. If to the ten octavo volumes which contain them, in the fine edition of his works commenced in 1849, be added his 'Aladdin,' his 'Fisherman and his Daughter,' his 'Twin Brothers of Damascus,' and perhaps his 'Robinson Crusoe in England' (a play on the story of Defoe and Alexander Selkirk), his 'Ludlam's Hole,' his 'Garrick in France,' and a few other operas and comedies, a series of dramatic works will be shown which, for extent and value, no other author of the 19th century can rival.

Oehlenschläger's poems, which are sometimes spirited, are for the most part common-place; and his prose works are seldom of a character to claim much attention. His 'Poetical Works,' as they are called, comprising all of his imaginative works, whether in prose or verse, except the tragedies, occupy in the collected edition twenty-seven volumes. If to these be added the 'Erindringer,' four volumes of the same size, the whole series of his Danish works will be found to amount to forty-one volumes. The last edition of his German works reaches to twenty-one. In these sixty-two volumes are not included many translations which flowed from his ever-active pen:—Otway's 'Orphan,' the 'Midsummer Night's Dream,' Beskav's Swedish dramas into Danish, and the whole of Holberg's 'Danish Theatre' into German. In mentioning the 'Midsummer Night's Dream,' it may not be uninteresting to add that Oehlenschläger, though a warm, was not an unconditional admirer of Shakspere. He professed to belong to the old school, who saw great faults as well as great beauties in the bard of Avon. It may be suspected however that his acquaintance with his works was not perfect—his acquaintance with his biography was singularly defective. In a ballad entitled 'William Shakspere,' which is entirely devoid of merit, he speaks of him as being born at Warwick, never apparently having heard of Stratford, and of his gaining his fame at "Drury Lane."

In the general character of Oehlenschläger, as shown in his life, it may be seen that a high estimation of himself was a prominent feature; but this in his case, as in many others, was grounded on real merit. The tone of his 'Autobiography,' not unfrequently reminds the English reader of that of Hogg, the Ettrick Shepherd. Neither of the two was inclined to overlook or undervalue his own claims to attention. It is a more singular circumstance that the merits of the poet were through the course of a long life generously appreciated and rewarded by his countrymen, who by their conduct did no less honour to themselves than to him.

ŒNANTHIC ACID. [Chemistry, *S.* 2.]

ŒNANTHYLE. [Chemistry, *S.* 2.]

OERSTED (ÖRSTED), HANS CHRISTIAN, celebrated as the originator of the science of electro-magnetism, from which sprung the electric telegraph, Professor of Natural Philosophy, and Director of the Polytechnic School of Copenhagen, was born on the 14th of August 1777 at Rudkjöbing, in the Danish island of Langeland, where his father was an apothecary. He studied in the University of Copenhagen, and was made a Doctor of Philosophy in that university in 1800. At this time he studied the subject of galvanism, and discovered that the power of the opposite poles of the galvanic battery to give off acids and alkalies depended on circumstances, and showed that this power was relative. From 1801 to 1803 he studied in Holland and France, returning to Copenhagen, where he was made Professor of Physics in 1806. In 1812 he went to Germany, and whilst there he wrote his essay on the identity of chemical and electrical forces, thus laying the foundation for the subsequent identification of the forces of magnetism, electricity, and galvanism. In 1819 he made the announcement of his great discovery of the intimate relation existing between magnetism and electricity. This announcement was made in an essay entitled, 'Experimenta circa efficaciam conflictus electrici in acum magnetica.' By defining the nature of the influence exerted by the galvanic current on the magnetic needle, he laid the foundations of the science of electro-magnetism, and led the way to its practical application in the production of the electric telegraph. Previous to this time the identity of the forces of magnetism and electricity had only been suspected. He now demonstrated "that there is always a magnetic circulation round the electric conductor, and that the electric current, in accordance with a certain law, always exercises determined and similar impressions on the direction of the magnetic needle, even when it does not pass through the needle, but near it." For this discovery he received the Copley medal of the Royal Society of London, and the French Institute presented him with one of its mathematical class prizes worth 3000 francs.

In 1809 he wrote a 'Manual of Mechanical Physics,' a second edition of which was published in 1844. The rewriting this work led him to make many original researches in many departments of natural philosophy, scarcely any of which have not been enriched by his experiments. He made many important experiments on the compression of water, and invented an instrument by which liquids might be compressed with more certainty. He was the first to demonstrate the existence of the metal aluminium in alumina, and made other chemical discoveries. In 1822-23 he again visited Germany and France, and also visited England. On his return to Denmark he founded the Society for the Distribution of Natural Science, one object of which was to send forth a body of popular lecturers to deliver courses of instruction in the most important towns of the country. He took an active part in the Scandinavian Society of Naturalists, which, like our own British Association for the Advancement of Science, assembles annually in different parts of the country. He again visited England in 1846, during the meeting of the British Association at Southampton.

As he increased in years honours increased upon him. He was made secretary to the Royal Society of Copenhagen; a corresponding member of the Academy of Sciences in the French Institute; and Director of the Polytechnic School at Copenhagen, which he had himself founded. In 1837 he was made Knight of the Legion of Honour, and in 1842 Knight of the Prussian Order for the Reward of Merit in the Arts and Sciences. In early life Oersted was associated with the poet Oehlenschläger, whose sister was married to his younger brother, and although devoted to experimental science he took a deep interest in the progress and development of Danish literature. He was a constant writer for the newspapers and magazines. Acting upon the deep conviction that science should be the handmaid of religion, he did all that lay in his power to make the popular mind of his country acquainted with the facts of natural science. He wrote a lyrical and didactic poem called 'The Balloon,' which was translated into German. He was also one of the most popular lecturers of his day. He not only lectured in the university to young students and senior students, but out of the university to citizens and classes of ladies. A variety of Oersted's papers and lectures of a popular kind have been translated into the English language by the Misses Horner, under the title of 'The Soul in Nature, with Supplementary Contributions.'

On the 9th of November 1850 a jubilee was held in honour of the fiftieth anniversary of his services at the University of Copenhagen. On this occasion people of all ranks and opinions assembled round the noble old philosopher. The king of Denmark presented him on the occasion with a country residence at Frederiksberg, near Copenhagen. He lectured through the winter, but the following March he took a severe cold, which terminated in inflammation of the lungs, of which he died on the 9th of March 1851. A biographical sketch of Oersted, to which we are indebted for some of the materials of this notice, was published by P. L. Möller, a translation of which is published with the English translation mentioned above.

OERSTEDTITE. [Mineralogy, *S.* 1.]

ŒSTRUS. [Bots; Œstridæ.]

OFFENCES AND PUNISHMENTS. The punishments under the criminal law had been greatly mitigated previous to 1840. In consequence of this, and perhaps still more from the establishment of an effective police in the metropolis by Sir R. Peel's Act, the 10 Geo. 4, cap. 44, which has been gradually extended to the whole of Great Britain and Ireland, though the number of executions has declined, the number of commitments and the proportion of convictions has increased. In 1831 the number of commitments had been 19,647, of whom 3047 were females. Of these 13,830 had been convicted, and 1601 sentenced to capital punishments. Of these only 52 were executed, 12 being for murder. Up to 1834 there had been no classification of offences. From that year and subsequently they have been classed under the following heads, from which it will be seen that the increase of offences has been, in England and Scotland, chiefly in offences against property without violence: Class 1, offences against the person; 2, offences against property, committed with violence; 3, offences against property, committed without violence; 4, malicious offences against property; 5, forgery and offences against the currency; 6, other offences, not included in the foregoing classes. In 1835 there were 20,731 commitments, of which 2016 was under class 1, 1354 under class 2, 15,478 under class 3, 156 under class 4, 368 under class 5, and 1359 under class 6. Of the total 14,729 were convicted, of whom 523 were sentenced to capital punishment, and 34 executed, of whom 21 were for murder. In 1840 there were 27,187 commitments, of which 21,484 were under class 3, and 19,927 convictions; of these 77 were sentenced to capital punishments, 9 of whom were executed, all for murder. In 1845 there were 24,303 commitments, of which 19,506 were under class 3, and 17,402 convictions; of these 49 were sentenced to capital punishments, and 12 executed, all for murder. In 1850, in England there were 26,813 commitments, of which 1886 were under class 1, 2014 under class 2, 21,353 under class 3, 236 under class 4, 680 under class 5, and 744 under class 6. Of the total there were 20,539 convicted, of whom 49 were sentenced to capital punishment, and 9 executed. In Ireland there were 31,326 commitments, of which 4202 were under class 1, 2224 under class 2, 16,737 under class 3, 462 under class 4, 250 under class 5, and 7451 under class 6. Of the total only 17,108 were convicted, of whom 17 were sentenced to capital punishment, and 8 executed. In Scotland there were 4468 commitments, of which 1192 were under class 1, 676 under class 2, 2150 under class 3, 49 under class 4, 170 under class 5, and 231 under class 6. Of the total, 3633 were convicted, of whom 3 were sentenced to capital punishment, and 2 executed. In 1856, the latest returns we have, there were in England 19,437 persons committed for trial, of whom 15,425 were males and 4012 females; of these, 4672 were acquitted or discharged and 31 were found insane; of the number convicted, 1264 were for offences against the person, 1787 for offences against property with violence, 10,487 for offences against property without violence, 94 for malicious offences against property, 757 for forgery and offences against the currency, and 345 for offences not included in the preceding classes and including misdemeanors; 69 were sentenced to death, of whom 16 were executed; 57 were transported for life, and 216 for terms exceeding ten years; 2158 were sentenced to penal imprisonment for terms varying from four years to life; 11,865 were sentenced to various imprisonments from one month and under to not exceeding four years; and in this class, in the terms betwixt six months and one month or less, the numbers show a remarkable decrease from previous years; in 1856 the numbers were 7800, against 13,447 in 1855, and 16,509 in 1854; indeed it is by far the smallest amount in any year from 1847; 222 were ordered to be detained in reformatory schools, and 127 were whipped, fined, or discharged on sureties. The great decrease in the number of commitments is probably to be attributed in a considerable degree to the extended provisions of the Summary Convictions Acts. On summary proceedings, the number of cases under the Criminal Justice Act, was 11,272, and under the Juvenile Offenders' Act, 2031. Altogether there were 132,869 persons committed to prison, 99,336 of whom were males and 33,363 females. The commitments were—19,278 for trial, 77,712 on summary convictions, 2794 for want of sureties, 13,952 remanded and discharged, 11,406 debtors on civil process, and 7557 under the Mutiny Act. The total shows an increase of nearly 4000 commitments over those for 1855; but there is a decrease of 7000 in the number of summary convictions. Of the committals, omitting debtors and military prisoners, which reduce the number to 113,736, 1990 were of children under 12 years of age; 11,991 of persons between 12 and 16; 24,868 between 16 and 21; 33,400 between 21 and 30; 20,973 between 30 and 40; 11,343 between 40 and 50; 5519 between 50 and 60; 2732 above 60; and 920 of whom the age was not ascertained. Of the whole, 37,686 could neither read nor write, 61,253 could read or read and write imperfectly, 6108 could read and write well, 318 had received superior instruction, and of 8371 the instruction was not ascertained. The county and borough prisons are stated to be constructed to contain 26,447 prisoners; the daily average of prisoners is 17,754, and the greatest number at one time was 22,035: but, though on the average there may be room enough, some prisons are terribly overcrowded.

In Ireland in 1856 the total number of persons committed or held to bail for trial was 7009, of whom 3075 were either acquitted or discharged. Of the number committed, 2063 were for offences against the person, 556 for offences against property with violence, 2884 for offences against property without violence, 78 for malicious offences against property, 75 for forgery and offences against the currency, and 1143 for other miscellaneous offences. Of those convicted only 8 were sentenced to death, and 3 only executed; 14 sentenced to transportation for life, and 372 to other periods of transportation or penal servitude; 2798 to various terms of imprisonment; and 832 were whipped or fined, or discharged on surety, or pardoned. In the same year there were 25,461 cases heard at petty sessions or before magistrates, and 9526 persons were imprisoned for drunkenness.

In Scotland in 1856 the total number of offenders committed for trial was 3713. Of these 1046 were for offences against the person, 380 for offences against property committed with violence, 1942 for offences against property without violence, 79 for malicious offences against property, 85 for forgery and offences against the currency, and 181 other offences not included in the preceding classes. Of the total number committed, 2723 were convicted, of whom 3 were sentenced to death and executed, 274 sentenced to various periods of transportation and penal servitude, 2170 to various periods of imprisonment, and 276 to be whipped, fined, or discharged on sureties. Of those not convicted, 35 were outlawed, 7 were found insane, 55 were found not guilty, and 179 not proven; the remainder were discharged without trial.

OIDIUM, a genus of Plants belonging to the order of *Fungi*, some of the species of which are found upon the human body and others attack plants. It is known by possessing a simple or branched mycelium, which is very minute and pellucid, aggregated into flocculent masses slightly interwoven and articulated. The sporidia are simple and pellucid, and arise from the joint of the mycelium.

O. albicans, the Thrush-Fungus, is found in the mucous membrane of the mouth, fauces, and œsophagus of sucking children, and also occasionally in grown-up persons in a state of extreme exhaustion. The ulcerations, amidst the discharge of which this fungus is found, are usually called thrush. Although constantly present in this disease the fungus does not appear to produce the disease, but to be the result of the changes produced in the mucous membrane. It has been observed that the mucous membrane in this state constantly affords an acid re-action, and this acidity seems necessary to the growth of the fungus. The best account of this fungus will be found in Robin's 'Histoire des Végétaux Parasites.' Several other species of *Oidium* have been described. The fungus found in connection with the recent grape-vine disease is an *Oidium*. [ENTOPHYTA, *S.* 2; FUNGI.]

OIL-PALM. [ELÆIS.]

OIL-TREE. [BASSIA.]

OILS. The *Fixed Oils* are mostly products of animal organization, in the fat and adipose tissue; but are found also in plants, generally in the seeds, but in some cases in the fruit, as in the olive. They are composed of carbon, hydrogen, and oxygen, and are liquid or solid according to the manner in which these elements are disposed, most of them consisting of two compounds, a liquid called Olein, and a solid called Margarin, or another solid called Stearin. The *Volatile Oils* are mostly products of vegetable organization, and are so called on account of the ready manner in which they are volatilized by heat. Plants owe their peculiar odours to the volatile oils. They are divided by chemists into three groups: those which consist of only carbon and hydrogen, as oil of turpentine; those which contain also oxygen, as oil of cloves; and those which contain sulphur, as oil of garlic. [OILS.]

OKEN, LORENZ, a celebrated Swiss naturalist, was born at Offenberg on the 2nd of August 1779. He studied medicine and natural history at Göttingen, and held the position of privat-docens in that university. In 1807 he became extraordinary professor of medicine in the university of Jena; thence he removed to Zürich, where he held the post of professor of natural history till his death. At the time he began to study natural science, the writings of Kant, Fichte, and Schelling were producing a deep impression on the minds of the students of natural history. Schelling, who had studied medicine, had applied the principles of the transcendental philosophy to the facts of the natural world, and had by a process of thought endeavoured to give an explanation to the phenomena of nature. It was in this school that Oken studied, and the principles of the transcendental philosophy more or less guided his researches as a naturalist throughout his long life. His first work was published in 1802, and was entitled 'Elements of Natural Philosophy, the Theory of the Senses, and the Classification of Animals founded thereon.' This was followed by a work 'On Generation' in 1805. In these works he endeavoured to apply a general theory of nature to the facts presented by the forms and the development of animals. In his classification he took for his basis the presence of the senses, making each class of animals to represent an organ of sense. In his work 'On Generation' he first suggested that all animals are built up of vesicles or cells. In 1806 he published his 'Contributions to Comparative Anatomy and Physiology,' and pointed out the origin of the intestines in the umbilical vesicle. In this year he made an excursion to the Harz Mountains, which resulted in an important thought. This may be described in his own language: "In August 1806," he says, "I made a journey over the Harz. I slid down through the wood on the south side; and straight before me, at my feet, lay a most beautiful bleached skull of a hind. I picked it up, turned it round, regarded it intensely: the thing was done. 'It is a vertebral column!' struck me, as a flash of lightning, to the marrow and bone; and since that time the skull has been regarded as a vertebral column." This discovery was published in an essay on the 'Signification of the Bones of the Skull.' This essay, although it attracted little attention at first, laid the foundation of those inquiries which in the hands of Carus, Géoffroy St.-Hilaire, and Owen, have led to the establishment of those laws of homology in the vertebrate skeleton that are now a universally received branch of anatomical science. It was by the persevering use of the idea that flashed across his mind in the Harz, that Oken has earned for himself the title of "the father of morphological science."

Whilst still a young man and deeply convinced of the importance of an ideal philosophy in explaining the phenomena of the external world, he wrote his 'Lehrbuch der Natur-Philosophie.' This work was published in 1809, and having gone through three editions, it was translated into English by Mr. Faulke, and published in 1847, by the Ray Society, with the title 'Elements of Physio-Philosophy.' In this work the author takes the widest possible view of natural science, and classifies the mineral, vegetable, and animal kingdoms according to his philosophical views. The transcendental philosophy has never been popular in England, and its language is entirely foreign to that adopted by the generality of writers on natural history in this country, so that this work has been frequently regarded as the offspring of a diseased imagination rather than the cool decisions of a philosopher. Nevertheless, the author was pleased at its translation, and wrote a preface to the English edition. Of however little value this work may be as an introduction to modern science, it is interesting as a document in the history of a great mental movement, and contains the germs of those principles which are now regarded as the secure generalisation of well-observed facts.

From the date of the publication of this work to the day of his death, Oken unceasingly contributed to the literature of natural history. In the year 1817, he started a natural history journal, named 'Isis,' which he conducted for thirty years, and which contains a large series of his papers on every department of natural history. Though a transcendentalist in philosophy, he was an energetic and acute observer, and has contributed largely to the individual history of the animal kingdom.

He was greatly respected throughout Germany, and it was at his suggestion that the first meeting of natural philosophers took place in 1822. The German Association which thus came into existence, has assembled every year in one of the large towns of Germany, whilst every country in Europe has imitated this example with great and increasing success. Oken died full of years and honour, at Zürich, in August 1847.

OKENITE. [MINERALOGY, *S.* 1.]

OLD RED-SANDSTONE. The following table and account of the Old Red-Sandstone Formation is given by Professor Ansted in his 'Elementary Geology':—

Old Red-Sandstone Series.

Herefordshire.	Scotland.
Old Red Conglomerate . .	Quartzose Yellow Sandstone. Impure Limestone. Gritty Red-Sandstone.
Cornstone	Grey Fissile Sandstone.
Cornstone and Marl . .	Red and Variagated Sandstone. Bituminous Schist. Coarse Gritty Sandstone. Great Conglomerate.

Devonian Series.

Devonshire.	Belgium.
Calcareous Grit and Impure Limestone . . .	Indurated Shale and Psammite. Calcareous Shale.
Red Flagstone . . .	Lower Limestone of Belgium.
Calcareous Slate and Plymouth Limestone . .	Hard Siliceous Beds' and Conglomerates.

The fossils of this period include many species of corals, encrinites, and shells. There are also a number of remains of fishes, some of very great interest from the remarkable peculiarities of form and structure which they present. Many of these are small, but others of gigantic proportions.

The Old Red-Sandstone of England and Wales consists of various strata of limestone, marl, and sandstone, alternating with great thicknesses of conglomerate, which often pass upwards into overlying sandstones; and the series is expanded over a considerable portion of our island, rising into lofty mountains, occupying extensive plains, and developed to an enormous thickness.

In North Wales, although the Old Red-Sandstone retains its general character, we find it inferior in thickness and importance to its development in Herefordshire and South Wales. It again increases, however, as we advance still farther northward into Westmoreland and Cumberland, where it appears as an irregular conglomerate. In this part of England its largest development is near the foot of Ullswater, and it rises into a succession of round-topped hills several hundred feet high, the beds being of great thickness. No true passage is there discernible into the overlying limestones.

The loftiest points occupied by this deposit are the Vans of Caermarthen and Brecon, the former 2590 and the latter 2500 feet above the level of the sea. These hills are made up of a conglomerate composed of white quartz pebbles embedded in a red matrix; and it is this quartzose conglomerate which gives its name to the uppermost group of the formation.

The highest beds of the series do not however always consist of conglomerates, but are more frequently composed of beds of sandstone, hard and finely grained, and alternating with a few imperfectly exhibited mottled marls. The lower portion capping the escarpment of the Cornstone in Herefordshire furnishes thick beds of valuable building material, and is occasionally quarried for tiles. The upper beds are for the most part less compact, and commencing as a fine conglomerate they afterwards become coarser, and alternate with bands of red and green argillaceous marl. Fine examples of the conglomerate beds (attaining near Abergavenny a thickness of 200 feet) may be seen on the banks of the Wye between Ross and Monmouth, and again on the right bank of that beautiful river to the north of Tintern Abbey.

The Cornstone consists of a number of argillaceous marly beds, sometimes alternating with sandstone and sometimes with impure limestone, affording by decomposition the soil of the richest tracts of Herefordshire and Monmouthshire. The lower part of this rock very often contains flaggy beds, some of which are extensively quarried near Downton Hall, the stone being of a greenish colour and highly micaceous, and usually more or less intermixed with party-coloured marls or soft argillaceous sandstones, not so compact as the rock which incloses them. The surface of the sandstone is frequently worn into irregular holes and patches.

But the subdivisions of the sandstones are too entirely local to allow of any lithological character being given which can apply to more than a very limited district. Generally speaking, the impure concretionary limestone, which is more especially denominated Cornstone, appears at intervals in irregular lenticular masses throughout the district, contracting and expanding in the most capricious manner; sometimes replaced by finer and more crystalline limestone, and sometimes alternating with hard flaggy sandstones. Nearly the whole of the central and northern parts of Herefordshire, and the contiguous parts of Shropshire and Worcestershire, are occupied by this formation; and its vast thickness is well displayed in the hills crossed by the new road from Leominster to Hereford. In the northern portion of the range, and near the mouth of the Towey in Caermarthenshire, the limestones are most fully developed, becoming much thicker and almost more crystalline than in other parts.

In Scotland the uppermost beds are highly arenaceous, and often consist of sandstone conglomerates. The intermediate calcareous band is barren of fossils, and is of somewhat singular composition, yielding unequally to the weather, and exhibiting a brecciated aspect. It contains masses of chert exceedingly hard, and these, from the manner in which they are incorporated with the rock, appear to have been of contemporaneous origin. The bed is several yards in thickness, and is very persistent, being found both in Moray and in Fife, localities 120 miles apart.

The middle group of the Old Red-Sandstone of Scotland, corresponding to the Cornstone of England, is developed in Forfarshire, in Morayshire, and in the Gray-Sandstone of Balruddery, where the lower beds are absent. It is represented as consisting, for the most part, of rocks of a bluish-gray colour, sometimes, as at Balruddery, resembling the silurian mudstones, at others forming a hard fissile flagstone exported as a paving-stone, and occasionally appearing in beds of friable stratified clay, easily washed away by the sea. The colour however throughout is gray, and in this respect differs essentially from the English contemporaneous beds, which are chiefly red and green marls.

The base of the whole system is represented by Mr. Miller as consisting of an extensive and thick conglomerate rising into a lofty mountain-chain in the county of Caithness, and attaining an elevation of 3500 feet in the hill called Morrheim, but a great thickness of arenaceous strata, containing conglomerates of various magnitude, intervenes between these and the middle beds.

The Devonian Beds present a series so distinct that no relations of mineral or mechanical condition can be traced between them and the Old Red-Sandstones. The upper beds on which the culms of Devonshire repose, consist of coarse red flags and slates, sometimes alternating with or overlaid by other slates and limestones, while the lower beds are to be sought for among the calcareous slates of Cornwall and South Devon. The calcareous slates are occasionally fossiliferous, and are based upon an impure limestone. The Plymouth limestone in the south, and a group of coarse arenaceous beds in the north of Devon, together with the general series of Cornish rocks, are all included among these calcareous slates. Throughout the whole series fossils occur, but they are very unequally distributed, being locally abundant, although owing to the metamorphic character of many of the beds they are sometimes much altered, and frequently obliterated. (Ansted.)

The Old Red-Sandstone is largely developed in Ireland, and is peculiarly interesting as presenting all those parts of the series which are found in different parts of England.

This formation is well represented in Belgium by a series of beds consisting of 1500 feet of strata. They are principally composed of a yellowish-sandstone alternating with shale and calcareous beds.

The Devonian or Old Red-Sandstones of Russia occupy a tract nearly as large as the whole of the British Islands. They rest conformably upon low plateaux of silurian rocks, and attain a height of from 500 to 900 feet above the sea level.

This formation is repeated with nearly the same mineral characters and organic remains in America. It is found in both North and South America.

The following are the genera of the Invertebrate Fossils found in the Devonian Group, as given by Mr. Tennant in his 'Stratigraphical List of British Fossils':—

Amorphozoa.

Manon cribrosum, Goldf.
Scyphia turbinata, Goldf.

Zoophyta.

Amplexus tortuosus, Phil.
Astrèa, Blainv., 3 species.
Aulopora conglomerata, Goldf.
Caunopora ramosa, Phil.
Coscinopora placenta, Goldf.
Cyathophyllum, 2 species.
Cystiphyllum, 2 species.
Favosites, 4 species.
Fenestella, 5 species.
Glauconome bipinnata, Phil.
Gorgonia ripisteria, Goldf.
Hemitrypa oculata, Phil.
Millepora gracilis, Phil.
Millepora similis, Phil.
Petraia, 4 species.
Porites pyriformis, Ehrenb.
Stromatopora, 2 species.
Strombodes, 2 species.
Syringopora catenata, Mart.

Echinodermata.

Adelocrinus hystrix, Phil.
Cyathocrinus, 8 species.
Pentatrematites ovalis, Goldf.
Platycrinus, 2 species.
Taxocrinus macrodactylus, Phil.

Crustacea.

Brontes flabellifer, Goldf.
Calymene Sternbergii, Munst.
Harpes macrocephalus, Goldf.
Olenus punctatus, Stein.
Phacops, 3 species.

Conchifera Dimyaria.

Corbula Hennahii, Sow.
Cucullæa, 7 species.
Cypricardia, 2 species.
Megalodon, 2 species.
Modiola, 3 species.
Mytilus Damnoniensis, Phil.
Nucula, 3 species.
Pleurorhyncus, 2 species.
Pullastra, 3 species.
Sanguinolaria, 3 species.

Conchifera Monomyaria.

Avicula, 9 species.
Pecten, 8 species.
Posidonomya, 2 species.
Pterinea, 3 species.

Brachiopoda.

Atrypa, 19 species.
Calceola sandalina, Lam.
Chonetes, 3 species.
Leptæna, 7 species.
Orthis, 16 species.
Productus, 6 species.
Spirifer, 33 species.
Strigocephalus, 3 species.
Terebratula, 31 species.

Gasteropoda.

Acroculia sigmoidalis, Phil.
Buccinum, 4 species.
Euomphalus, 3 species.
Loxonema, 8 species.
Macrocheilus, 3 species.
Murchisonia, 6 species.
Murex harpula, Sow.
Natica, 2 species.
Nerita, 2 species.
Platyceras vetustum, Sow.
Pleurotomaria, 8 species.
Schizostoma, 2 species.
Trochus Boueii, Stein.
Turbo, 3 species.

Heteropoda.

Bellerophon, 8 species.
Porcellia Woodwardii, Sow.

Pteropoda.

Creseis dimidiatum (*Orthoceras*, *sp.* Sow.)

Cephalopoda.

Clymenia, 7 species.
Cyrtoceras, 12 species.
Goniatites, 11 species.
Nautilus, 2 species.
Orthoceras, 12 species.

OLDBURY, Worcestershire, a town in the parish of Hales Owen, is situated near the junction of Staffordshire, Shropshire, and Worcestershire, in 52° 30′ N. lat., 2° W. long., distant 29 miles N.N.E. from Worcester, and 120 miles N.W. from London. The population of the town of Oldbury is given in the Returns of the Census of 1851 as 5114, but this does not include the whole of the town. The entire population in 1851 was 11,641.

The town of Oldbury has very much increased of late years, owing to the extension of the iron trade. The parochial chapel of Christchurch is a commodious brick edifice with a square tower. There are chapels for Wesleyan, Primitive, and New Connexion Methodists, Baptists, Independents, Christian Brethren, Roman Catholics, and Unitarians; and National, Free, and other schools. Besides numerous iron and coal mines in the vicinity, there are manufactures of iron and steel, of locomotive engines, malt-mills, edge-tools, hollow iron ware, bricks, earthen draining tubes, and of alkali. Boat-building is carried on, and there are corn-mills and breweries. Oldbury is nearly surrounded by the Birmingham Canal; the river Tame runs through the town, turning several mills in its course; and the Stour Valley railway passes close to it. A customary market is held weekly on Saturday. A county court is held in the town.

OLDCASTLE. [Meath.]

OLEANDER. [Nerium, *S.* 1.]

OLEGON SPAR. [Mineralogy, *S.* 1.]

OLEIN. [Tissues, Organic, *S.* 1.]

OLIGOCLASE. [Mineralogy, *S.* 1.]

OLIVENITE. [Mineralogy, *S.* 1.]

OLLERTON. [Nottinghamshire.]

OLNEY. [Buckinghamshire.]

OMAGH. [Tyrone.]

OMALISUS. [Lampyridæ.]

OMMASTREPHES, a genus of Cuttle-Fishes belonging to the family *Teuthidæ*. Body fleshy, firm, cylindrical, elongated, flanked near its posterior extremity by two triangular fins. Locomotive apparatus formed of "conical perpendicular pits, each communicating by a narrow groove with a small horizontal pit, surrounded by a prominent margin, the whole describing a rather prominent triangle, placed at the base of the locomotive tube; and, besides, of a tubercle prolonged into its upper part into a decreasing nose-shaped crest; and lastly, of little horizontal inferior crests placed on the inner margin of the body." Eyes very large, opening widely exteriorly, and provided with a lachrymal sinus; arms 10, like those of *Loligo*; pen corneous, flexible, elongated, as long as the body, terminating at its lower extremity in a hollow simple cup.

The Cuttle-Fishes of this genus closely resemble those belonging to *Loligo*. Besides the character just given, they may generally be distinguished by the short rhomboidal termination of the body, formed by the fins, combined with the hinder extremity.

The species are mostly pelagic, and some of them are gregarious. They seem to be distributed all over the world. They are called Flying Squids by Fishermen. (Forbes and Hanley.)

The following species have been taken on the British coasts:—

O. sagittatus (*Sepia Loligo*, Linnæus), with an elongated body; peduncles of tentacular arms without suckers; extremities of their clubs covered with closely set rows of numerous minute suckers. This species is very rare on the British coast, but Messrs. Forbes and Hanley record two instances of its recent capture. M. d'Orbigny regards the *Loligo Piscatorum*, *L. Harpago*, *L. illecebrosa*, and *L. Coindetii* as founded on this species.

O. todarus (*Loligo sagittata*, Lam.), Delle Chiaje. It has an elongated body, and the peduncles of the tentacula provided with suckers throughout their length. This squid is often called in British catalogues *Loligo sagittata*. It is frequently found on the coasts of Great Britain. It has been made the subject of an elaborate memoir on the anatomy of its nervous system by Mr. Albany Hancock.

O. Eblana (Ball), has a short body; suckers confined to the clubs of the tentacles, minute, and 4-ranked at their extremities. It has been found in Dublin Bay, and was first described by Dr. R. Ball of Dublin.

(Forbes and Hanley, *History of British Mollusca.*)

OMPHALEA, a genus of Plants belonging to the natural order *Euphorbiaceæ*. The seeds of one of the species are said to be eatable when the embryo is extracted, but if this is not done, they are too cathartic for food. On the authority of Mr. W. M'Leay, Dr. Lindley says this nut is most delicious and wholesome, and that it is known by the name of Cob-Nut or Hog-Nut in Jamaica. Other euphorbiaceous seeds have the same properties.

O. triandra is a Guyana plant with a white juice, which turns black on drying, and is then used as ink.

ONYX. [Agate.]

OOLITE. [Geology; Oolite.] At one time it was supposed that the little round masses which are so characteristic of the Oolitic Formation were portions of limestone which had gathered round various forms of minute fossil animals. It was suggested that these organisms were probably *Foraminifera*. Recent microscopic investigations have however shown that these little round bodies are purely inorganic, and that they are formed in the same manner as the larger nodules of the magnesian limestone.

The oolitic deposits are divided naturally in England into three parts, the Upper Oolite resting on the Kimmeridge Clay, the Middle Oolite representing the Oxford Clay covered by the Coral Rag, while the Lower Oolite is more varied, being composed of numerous bands of clay, sand, and limestone.

The *Upper Oolites*, called on the Continent the Portlandian Group, are, so far as the British Islands are concerned, almost entirely confined in their development to the south of England, only that stratum of clay which usually forms the base of the group being exhibited in Yorkshire, in the vale of Pickering.

The group of strata containing the Portland stone, and exhibited in Portland Island, includes several layers of coarse earthy limestone, which rest on a bed of siliceous sand, mixed with green particles. This is called the Portland Sand, and sometimes attains a thickness of as much as 80 feet in the west of the island, and forms a complete passage into the underlying clay.

Above the coarse limestones of the lower part, which usually consist of alternate hard and soft layers to a thickness of 50 or 60 feet, there are three beds of serviceable stone, interstratified with clayey or siliceous bands. Fossils occur in all these strata; but they are rare in those beds of the stone which are worked to advantage for economical purposes.

In the upper part of the Portland series there occurs a very interesting bed, about a foot in thickness, of a dark-brown substance, containing much earthy lignite. This bed, called the Dirt-Bed, seems to be made up of black loam, which at some distant period nourished the roots of trees, fragments of whose stems are now found fossilised around it. Wherever the dirt-bed is laid open to extract the subjacent building-stone these remains of trees occur, and they are placed at such distances from one another as trees growing in a modern forest.

It results from the circumstances of this deposit, that the surface of the Portland stone, at the termination of the Oolitic period, must have been for some time dry land, and covered with a forest; and we have a kind of measure even of the duration of this period in the thickness of the dirt-bed, which has accumulated more than a foot of black earth, loaded with the wreck of its former vegetation. "The regular and uniform preservation also of this thin bed over a distance of so many miles, shows that the change from dry land to the state of a fresh-water lake or æstuary (which the nature of the overlying rock proves to have succeeded the period of dry land) was not accompanied by any violent denudation or rush of water, since the loose earth, together with the trees which lay prostrate on its surface, must inevitably have been swept away had any such violent catastrophe then taken place."

The *Kimmeridge Clay* is of a blue, slaty, or grayish-yellow colour. It frequently contains a considerable quantity of silenite, or crystallised sulphate of lime. It usually effervesces with acids, and exhibits in tolerable abundance both vegetable and animal impressions, although its fossils are rarely in such good condition as to be preservable in a collection. It is a bed of great thickness; horizontal, or nearly so, in its stratification; extremely persistent in its peculiar mineral and fossil characters, but not very extensively developed either in England or on the Continent. The name, Kimmeridge Clay, has been applied to it because it is well exhibited at Kimmeridge Bay, and near the village bearing the same name in the Isle of Purbeck.

At this spot there are also found, alternating with the clay, certain beds of highly bituminous shale, occasionally used for fuel, and locally known as the Kimmeridge Coal. There are many beds of lignite found in the Oolites, but these are perhaps the most remarkable, next to those of the lowest Oolitic deposits of Yorkshire and North America.

Among the foreign rocks of this part of the oolitic period are—1st, the Calcaire de Blangy, on the coast of Normandy; 2nd, the upper beds of the Jura, in Switzerland; and 3rd, the Solenhofen beds.

On the banks of the Donetz, in Southern Russia, there are beds of Oolitic Limestone of light-yellow colour, which appear to belong to this division of the secondary series.

The *Middle Oolites* consist for the most part of a thick bed of clay, called the *Oxford Clay*, widely expanded throughout England, and met with also in the same form on the Continent, and a series of overlying limestones, chiefly remarkable for the abundant remains of coral found in them.

The upper beds of the middle Oolitic Series are partly calcareous and partly sandy, the former consisting chiefly of a very interesting group of corals known under the name of Coral-Rag, and the latter, the sandy beds, or calcareous grits, often more or less intermixed with calcareous matter, and containing thin laminæ of clay sometimes passing into irregular bands of hard and tough marly rock. This calcareous matter seems entirely due to the presence of crushed and decomposed organic remains.

It is chiefly in Wiltshire, near the towns of Calne and Steeple Ashton, and in the surrounding neighbourhood, that the corals of the Coral-Rag are found in greater abundance and perfection; and this part of our island, at the time of the deposit, has clearly existed in the condition of a coral island in an open sea. The thickness of the bed is about 40 feet; large portions of it are frequently made up of the remains of a single species, and an earthy calcareous freestone, sometimes used as a building-stone, and full of fragments of shells, rests immediately upon it, and is surmounted by a fine-grained ferruginous sandstone, slightly oolitic in structure, and containing a few fossils, marking the close of the Middle Oolitic period.

In the north of England the contemporaneous bed is a calcareous deposit, also containing corals, but (as at Malton, in Yorkshire), including a considerable proportion of the fossil remains of shells, both bivalves and univalves. The bed never loses its coralline character, and may perhaps represent an imperfect coral reef, once extending from the south-west of England to what is now the right bank of the Humber.

The *Oxford Clay* is a very important member of the oolitic series, attaining a thickness of not less than 500 feet, and spreading over a great part of England—more especially occupying the fen-districts in the counties of Cambridge and Lincoln, which appear to be partly caused by the union of this bed with the Kimmeridge Clay, producing a wide expanse of flat and undrained country. The same deposits are well seen at Weymouth; and they cover an important part of the East Riding of Yorkshire. The stratification throughout is nearly horizontal and undisturbed, being conformable with that of the formations immediately above and below it.

The appearance of the Oxford Clay is that of a stiff pale-blue argillaceous bed, containing a large proportion of calcareous matter, and a more or less abundant mixture of iron pyrites. Numerous organic remains are found in it, which are sometimes preserved in the clay itself, but more frequently form a nucleus, about which iron pyrites have aggregated. Those preserved in the clay have been generally found in a very rotten condition.

The *Lower Oolites* admit of considerable subdivision in the British Islands, but the details seem to be rather of local than general interest; and though partially extending to Normandy, are by no means universal in other parts of Europe.

1. The Cornbrash (the uppermost bed) consists of a variable thickness of clays and sandstones, which ultimately pass into a thin rubbly stone, tough and occasionally crystalline.

2. The Forest Marble, which consists of carbonate of lime.

3. The Great Oolite, consisting of a variable series of coarse shelly limestones.

4. The Bradford Clay, consisting of a pale-greenish clay, containing a small proportion of calcareous matter, and inclosing thin slabs of tough brownish limestone.

5. The Great Oolite is separated from the next bed, containing amongst them the clay used in the manufacture of cloth under the name of Fuller's Earth, and also a thin calcareous flag-stone known as the Stonesfield Slate. The latter is remarkable for containing the remains of Marsupiate Animals. [MARSUPIALIA.]

6. The Inferior Oolite is the last of the series of oolitic limestones. It is employed to a great extent as a building material. Its representative in France is the Caen Limestone.

The oolitic system embraces also the formation called Lias. In England it consists of a series of strata in which an argillaceous character predominates throughout; it also contains limestone mixed with clay. It seems to form four principal members, which are thus described by Professor Ansted.

"The Upper Lias, or Alum-Shale, is best seen at Whitby, and on the Yorkshire coast, and it attains there a considerable thickness. It consists of three distinct parts: the lowest division including soft shales, extremely fossiliferous, which are separated from the uppermost series, also composed of incoherent slaty beds, by an intermediate stratum of hard shale, about 30 feet thick, containing a quantity of the mineral called jet, and also occasionally large fragments of the bituminised wood of coniferous trees. The jet itself is but a peculiar form of carbon, and there can be little doubt that it is of organic origin. It is in the upper shales of the lias, both on the coast of Yorkshire and at Lyme Regis, that there have been found the most remarkable and interesting of those fossil remains of extinct animals, for which the formation is so celebrated. The presence of alternate bands of tolerably hard limestone and soft shale is usually characteristic of the lias in the different parts of England where it is most developed. The dark bluish-gray colour, united with the singular riband-like structure, is more particularly remarkable in the upper beds of the formation, and is well seen at Lyme Regis, Whitby, and Barrow-upon-Soar, in Leicestershire.

"The principal locality of the middle beds of the lias is the neighbourhood of Cheltenham, where the marlstone of Dumbleton Hill is crowded with interesting organic remains. It is made up of alternating layers of coloured clays and sands, which are occasionally calcareous, and of beds of impure limestone.

"This part of the series is also represented in the north of England, where it has an average thickness of about 130 feet, and consists of sandy shales, of which the upper portions are distinguished by the presence of several bands of argillaceous irony nodules.

"Lower Lias Shale.—The great mass of the lower division of the Lias is found in the middle of England, and consists of thick beds of dark-coloured and finely laminated shale, in which are calcareous bands and concretions. These form the base of the series, and graduate downwards into a whitish sandstone, belonging to the uppermost beds of the New Red-Sandstone system. The transition is different again in the south of England; and at Lyme Regis marls of a light-bluish colour represent the upper beds of the New Red-Sandstone and pass into the Lias Limestone by a succession of dark slaty marls, which are overlaid by a number of gray calcareous beds, and these again by other slaty marls of the upper series. The Marlstone and Upper Lias Shales are not present in this part of the deposit in their ordinary form.

"The lowest portion of the Liassic System occasionally consists of a very thin bed, in some places entirely made up of the fragments of fossil bodies (chiefly the remains of fish), but sometimes passing into a white micaceous sandstone, still recognisable as the same bed. This bed was first observed underlying a small patch of Lias, near the town of Aust (situated on the left bank of the Severn, nearly opposite the mouth of the Wye); but it has since been recognised at Axmouth, in Devonshire, and in other parts of England farther north, having a total range of upwards of 100 miles. It is rarely more than 2 or 3 inches in thickness, but invariably occupies the same geological position, and is for the most part so exclusively composed of organic remains, that a long period must have been required for its formation. In some parts of the country, and especially in Gloucestershire and Worcestershire, the passage of the Lias into the underlying beds of New Red-Sandstone is marked by the presence of calcareous flagstones, called Lower Lias Limestones; and these usually alternate with laminated shales, the whole in that case forming together the lowest deposits of Lias.

"On the Continent the Lias is frequently found, and the upper beds resemble those developed in England; the middle however are usually more calcareous, and the lower more sandy, and these latter sometimes, as in Belgium, pass insensibly into the upper New Red-Sandstone. The town of Luxemburg is built upon a hard sandstone of this kind, and these beds pass into the rock called Arkose, a peculiar and often metalliferous metamorphosed deposit, occurring where the Lias sands come in contact with crystalline rocks. Fossils have been found in South America, and also in Northern India, attributed to the period we are now considering.

"The Lias is a formation exceedingly rich in fossils; and amongst them are representatives of all the principal natural groups. Corals however are exceedingly rare, and of small size. Encrinites are numerous and abundant, especially the Pentacrinite, which attached itself to floating wood. Radiated animals of other kinds characterise parts of the deposits, and of these the *Diadema* is an example. Insects and Crustaceans have been frequently found. Star-Fishes are common in the marlstone.

"Both univalve and bivalve shells of various kinds are characteristic either of the whole deposit or of different beds. The *Spirifer* is one of the latter species of a genus represented far more abundantly in more ancient deposits, while the *Plicatula* and *Plagiostoma* are among the ancient representatives of more recent forms. The *Pecten* is an example of a similar kind; and the *Ammonite* and *Belemnite*, are eminently characteristic cephalopodous shells, infinitely abundant during the Lias, and scarcely less so for a great part of the oolitic period. Above 170 species of *Mollusca* have been described from the British localities only, of which as many as 70 are Ammonites.

"Fishes' remains are common in some parts of the Lias, and as many as 60 species in all have been described; of these many resemble the shark, but none seem to have attained very gigantic proportions. This however was not the case with the Reptiles, which during the period in question were equally remarkable for their large size, voracious habits, and incredible abundance. Many species belonging to natural orders of these animals long since lost, were then widely dispersed; and many other species existed of genera now common in distant parts of the world. The Flying Reptile is a striking instance of anomalous structure. The swimming and indeed strictly marine monsters named *Ichthyosaurus* and *Plesiosaurus*, are other examples." [Pterodactyle; Ichthyosaurus; Plesiosaurus.]

The following is a list of the Fossil Genera found in the Oolitic Beds:—

Plantæ.

Alethopteris, 2 species.
Araucarites peregrinus, Presl.
Bensonia ovata, Buck.
Brachyphyllum mammillare, Lindl.
Bucklandia squamosa, Brong.
Carpolithes, 3 species.
Cyclopteris, 2 species.
Dictyophyllum rugosum, Lindl.
Equisetites, 2 species.
Lilia lanceolata, Buckm.
Lycopodites, 2 species.
Naiadea, 2 species.
Neuropteris recentior, Lindl.
Otopteris, 2 species.
Pachypteris, 2 species.
Pecopteris, 11 species.
Peuce, 2 species.
Phlebopteris, 2 species.
Polypodites, 2 species.
Polystichites Murrayana, Presl.
Pterophyllum, 4 species.
Salicites longifolius, Buckm.
Solenites, 2 species.
Sphæreda paradoxa, Lindl.
Sphænopteris, 6 species.
Spherococcites, 2 species.
Stricklandia acuminata, Buckm.
Strobilites elongata, Lindl.
Tæniopteris, 3 species.
Thuytes, 4 species.
Tympanophora, 2 species.
Zamites, 6 species.

Amorphozoa.

Spongia, 7 species.

Zoophyta.

Alecto dichotoma, Lamx.
Aspendesia cristata, Lamx.
Agaricia lobata, Goldf.
Astrea, 5 species.
Caryophyllia, 2 species.
Ceriopora clavata, Goldf.
Chrysaora, 2 species.
Cricopora, 2 species.
Diastopora, 3 species.
Eunomia radiata, Lamx.
Fungia orbulites, Lamx.
Heteropora, 2 species.
Idmonea triquetra, Lamx.
Intricaria Bajocensis, Bronn.
Lithodendron elegans, Goldf.
Madrepora limbata, Goldf.
Meandrina Soemmeringii, Goldf.
Millepora, 2 species.
Montlivaltia caryophyllata, Lam.
Terebellaria ramosissima, Lamx.
Theonoa clathrata, Lamx.
Turbinolia dispar, Phil.

Echinodermata. [Echinodermata.]

Annelida.

Serpula, 17 species.
Vermilia sulcata, Sow.
Vermicularia, 5 species.

Cirripedia.

Pollicipes, 3 species.

Insecta. [Insecta, Fossil, *S.* 1.]

Crustacea.

Astacus, 4 species.

Conchifera Monomyaria.

Amphidesma, 3 species.
Anatina undulata, Sow. sp.
Arca, 9 species.
Astarte, 16 species.
Cardinia, 12 species.
Cardium, 12 species.
Corbis, 3 species.
Corbula, 4 species.
Cucullæa, 14 species.
Cypricardia solida, Lycett.
Cytherea, 2 species.
Gastrochæna tortuosa, Sow.
Gresslya Anglica, Ag.
Hippopodium ponderosum,
Lutraria, 5 species.
Sow.
Isocardia, 11 species.
Lysianassa, 4 species.
Lucina, 4 species.
Mactromya Cardioides, Phil. sp.
Modiola, 17 species.
Mya, 3 species.
Myoconcha crassa, Sow.
Mytilus, 4 species.
Nucula, 11 species.
Opis, 2 species.
Panopæa, 3 species.
Pectunculus, 2 species.
Pholadomya, 19 species.
Pholas, 2 species.
Pinna, 8 species.
Psammobia lævigata, Phil.
Pullastra (?) 4 species.
Sanguinolaria, 8 species.
Sphæra Madridi (*Cardium*), Arch.
Tellina ampliata, Phil.
Thracia depressa, Sow. sp.

Thetis varicosa (*Venus*), Sow.
Thracia depressa, Sow. sp.
Trigonia, 13 species.
Unio distortus, Bean.
Venus Nuculæformis, Roemer.

Monomyaria.

Anomia, 2 species.
Avicula, 16 species.
Crenatula, 2 species.
Gervillia, 10 species.
Gryphæa, 14 species.
Inoceramus, 3 species.
Lima, 6 species.
Limea duplicata, Goldf.
Monotis decussata, Munst.
Ostrea, 19 species.
Pecten, 31 species.
Perna, 2 species.
Plagiostoma, 16 species.
Plicatula, 3 species.
Spondylus comptus, Goldf.

Brachiopoda.

Crania antiquior, Jelly.
Lingula Beani, Phil.
Orbicula, 4 species.
Spirifer, 5 species.
Terebratula, 43 species.

Gasteropoda.

Actæon, 2 species.
Buccinum, 4 species.
Bulla (?), 3 species.
Cirrus, 5 species.
Dentalium, 3 species.
Delphinula coronata, Flem.
Emarginula, 2 species.
Littorina, 4 species.
Murex Haccanensis, Phil.
Natica, 10 species.
Nerinæa, 6 species.
Nerita, 5 species.
Patella, 5 species.
Phasianella cincta, Phil.
Pileolus, 2 species.
Pleurotomaria, 11 species.
Rimula clathrata, Sow. sp.
Rissoa, 4 species.
Rostellaria, 3 species.
Rotella, 4 species.
Solarium calyx, Phil.
Terebra, 8 species.
Trochotoma sulcata, Lycett.
Trochus, 10 species.
Turbo, 4 species.
Turritella, 2 species.

Cephalopoda.

The Fossil Cephalopoda are multitudinous, and in the bygone ages of the world appear to have been powerful instruments for keeping down the other tribes of ancient Testaceans, Crustaceans, and even Fishes; for many of them—certain *Orthocerata* and *Ammonites* for example—afford evidence of gigantic dimensions. In the periods prior to the Chalk Formation, and at the time of its deposit, they were the agents employed for this purpose, and were succeeded in the Tertiary period by the Fossil Trachelipods, which are either entirely absent or very scarce in the Secondary and Transition series, while the Fossil Cephalopods occur but rarely in the Tertiary beds. The extinct Ammonite, Baculite, Belemnite, Hamite, Orthoceratite, Turrilite, and Scaphite, will readily occur to the fossil zoologist as some of the ancient class. The *Foraminifera*, formerly placed by D'Orbigny in this class, are now no longer regarded even as *Mollusca*. [Foraminifera, *S.* 2.]

Pisces. [Fishes, Fossil, *S.* 1.]

(Ansted, *Elementary Geology*; Tennant, *Stratigraphical List of British Fossils*.)

OPHIOCE'PHALUS (from ὄφις, a snake, and κεφαλὴ, head), a genus of Fishes belonging to the division of *Acanthopterygii*, characterised by having labyrinthiform pharyngeals, and capable of living for a long time out of the water. The species inhabit India and China. [Anabas, *S.* 1.]

OPHIOCOMA, a genus of Animals belonging to the order *Echinodermata*, to the family *Ophiuridæ*, and to the tribe *Ophiuræ*. The rays are simple, squamose, not prolonged into the disc superiorly, and separated at their origins beneath by small pentangular plates. The species are called Brittle-Stars on account of their fragility. They are very difficult to preserve. Professor E. Forbes recommends their being placed in fresh-water as soon as caught, which quickly destroys them; and after they have been in it an hour or so, to dip them rapidly in boiling water. They are then to be dried in the sun, or in a current of air. The following are the British species of this genus recorded by Mr. Forbes in his 'History of British Star-Fishes:'—

O. neglecta, Gray Brittle-Star. Disc round, flat, imbricated with small smooth scales; two oblong parallel touching plates opposite the origin of each ray; upper ray-scales square; lateral ray-plates bearing four or five spines each, which are equal in length to the breadth of the ray. This species is not uncommon on all parts of the British coast.

O. Ballii, Ball's Brittle-Star, was first discovered in Ireland by Dr. Ball.

O. punctata (Forbes), Dotted Brittle-Star. This species, first described by Edward Forbes, was found by Henry Goodsir in the stomach of a cod.

O. filiformis, Thread-Rayed Brittle-Star. The rays are very long and filiform. It is a rare species in Great Britain.

O. brachiata, the Long-Armed Brittle-Star. This also is a rare species.

O. granulata, Granulated Brittle-Star. The rays are covered over with minute spines.

O. Bellis, Daisy Brittle-Star. It is not uncommon on many parts of our coast, and is to be found under stones at low tide.

O. Goodsiri, named after Dr. Goodsir, who took it from a cod's stomach taken off Anstruther in Fifeshire.

O. rosula, Common Brittle-Star. Disc rounded, convex, covered with spines of various lengths; two large triangular parallel plates opposite the origin of each ray; upper ray-scales triangular, carinated, imbricated; lateral ray-plates bearing five spines each, which are much longer than the breadth of the ray. This is the most common of our British Brittle-Stars.

O. minuta, Sand Brittle-Star. This is smaller than the last, and is found buried in the sand.

(E. Forbes, *A History of British Star-Fishes*.)

OPHIOGLOSSACEÆ, *Adders' Tongues*, a natural order of Acrogenous Plants, belonging to the alliance Filicales. They have an erect or pendulous stem, with a cavity in the middle instead of pith, and two or three woody bundles placed round it in a ring; the stalks of the leaves and the stem become blended together below; the leaves have netted veins; the spore-cases are collected into a spike formed out of the sides of a contracted leaf, 2-valved, without any trace of an elastic ring; spores resembling fine powder.

These plants are a transition from Ferns to *Lycopodiaceæ*. The species are most abundant in the islands of tropical Asia. They occur however in the West Indies and in the tropical parts of Africa, at the Cape, and in Tasmania. They are of little or no known use. The following genera with about 25 species belong to this order:—*Ophioglossum*, *Ophiodema*, *Helminthostachys*, *Botrychium*.

OPIAMMON. [Chemistry, *S.* 1.]

OPIANIC ACID. [Chemistry, *S.* 1.]

OPIANINE. [Chemistry, *S.* 2.]

OPIANYLE. [Chemistry, *S.* 2.]

OPIE, AMELIA, the wife of John Opie, was the daughter and only child of Dr. James Alderson, a physician of Norwich, where she was born on November 12, 1769. Her mother, a woman of considerable talent, attended to the care of her daughter's education, but she died in 1784, and the daughter assumed the position of mistress in her father's house, and became his companion. Handsome and lively, possessing musical talents, her company was much sought, and she enjoyed society thoroughly, but it did not tend to solidify her mind. Very early in life also she took a fancy to attend the trials in the assize courts, which she continued to frequent even at an advanced age. Her father was an admirer of the principles advocated in the early stages of the French revolution. These principles his daughter adopted, and she was present at the trial of Horne Tooke and his associates for high treason, of which she wrote home an account. In this whirl of social life, law, and politics, she had the judgment to form her friendships among persons distinguished for their virtues and talents, and she gave some of her leisure to literature, writing one or two tragedies, which however were never published, some poetry, and a novel, called 'The Dangers of Coquetry,' which was published anonymously, and attracted no attention. In 1798 she married Mr. Opie, and, encouraged by her husband, in 1801 appeared before the world as an author, with "a simple moral tale," as she herself styled it, entitled 'Father and Daughter.' It was very popular at the time, and furnished the plot of the opera of 'Agnese,' by Paer; yet it has little power, even of pathos, but is told in an easy unpretending style, while its chief merit is now that it details, though with no conviction of its impropriety, the harshness with which lunatics were then treated, and the instinctive kindness which led her to show by the fictitious example the possibility of governing them by kindness. In 1802 she published 'Poems,' a volume in which, without striking poetic genius, there is much natural grace and sweetness. In the autumn of 1802 she and her husband visited France, and of this, her first journey, she published an account in

'Tait's Magazine' in 1831. In 1804 she published the novel of 'Adeline Mowbray; or Mother and Daughter,' in 3 vols., which added considerably to her reputation, and some passages of which are highly pathetic; but still she wanted art in grouping and developing her characters, and in combining her incidents. In 1805 'Simple Tales,' in 4 vols. were issued. With virtuous principles and good feelings, an artlessness that steals into the heart, and language easy and simple though not always strictly accurate, there is still the same want of logical coherence; the tales want reality. The characters are ill-defined and often extravagant, yet the 'Ruffian Boy' and 'Murder will out' will always produce an interest. In 1807 after the death of her husband, she returned to the home of her father. In 1808 she published 'The Warrior's Return and other Poems,' and in the following year her husband's 'Lectures on Painting,' to which she prefixed a memoir. In 1812 appeared 'Temper,' a tale in which she introduced many of her impressions of France; and in 1813 'Tales of Real Life,' which however are not more real than her former tales. In 1816 'Valentine's Eve,' a novel in 3 vols. was published, developing some of her religious views, now becoming more decided. In 1818 'Tales of the Heart,' and in 1822 'Madeline,' neither of them rising above the average of the preceding. Her next work, 'Illustrations of Lying,' appeared in 1825, and was dedicated to her father; they consist of short tales, made for her avowed purpose, with dissertations, and show more decidedly than any the great defect in her reasoning powers, though all evince the most praiseworthy intentions.

Early in life Mrs. Opie had been intimate with the Quaker family of the Frys, particularly with Mrs. Fry, and through them with the Gurneys. In 1814 a letter from J. J. Gurney appears to have made much impression on her mind, she commenced attending the Quaker meetings, and in 1825, with her father's consent, she formally joined their society. In 1825 her father died, but she continued to make Norwich her abiding place, varied by frequent visits to her friends, to Scotland, and the Continent. She had adopted the style and dress of the society she had joined, but did not give up her literary pursuits. She still wrote occasional poems, and in 1828 'Detraction Displayed' was published. In 1829 she visited Paris, and her old political feelings seem to have revived. She wrote some verses on the tricolor, addressed to Lafayette, in which she says that at the sight of it, "I seem to feel youth's hours return." In 1830, on the expulsion of Charles X., she again went to Paris, and has given a lively account of what she saw. In 1833, 'Lays for the Dead,' a volume of poems, was published. In 1835 she made a tour to Belgium and Switzerland, of which she gave an account in 'Tait's Magazine,' in 1840. She continued active and beneficent for some years, contributing occasionally, as she had done through previous years, to various periodical works, and after an illness of some duration, she died at Norwich, Dec. 2, 1853. Her Life has been written with much care by an attached friend, Miss C. L. Brightwell, and was published in 1854.

ORANGE, the Principality of, included the town and neighbourhood of Orange in the south of France. Réné de Nassau, nephew and successor of Philibert de Challon, prince of Orange, was killed at the siege of St.-Dizier in 1544, and left his heritage to his cousin William of Nassau, the founder of the republic of the Dutch United Provinces. After the death of William III., king of England, the principality passed to Frederick, king of Prussia, William's eldest sister's son, whose successor, Frederick-William, ceded it to Louis XIV. at the peace of Utrecht. [NASSAU, HOUSE OF.] The principality then merged in the province of Dauphiné, and is now included in the Department of Vaucluse.

ORANGE TRIBE. [AURANTIACEÆ; CITRUS.]

ORCHIS, a genus of Plants the type of the natural order *Orchidaceæ*, and belonging to the tribe *Ophrydineæ*. The old Linnæan genus *Orchis* is now divided into many genera [ORCHIDACEÆ], but a large number of species are still retained under this designation. The tribe *Ophrydineæ* is distinguished by the pollen masses being divisible into lobes, which are waxy and definite in number. The anthers are wholly adnate. The genus *Orchis* belongs to a section of this tribe, in which the cells of the anther have a rostellate process between their bases. In *Orchis* the perianth is ringent and hooded; the lip 3-lobed, spurred; the glands of the stalks of the pollen-masses are in a common pouch. The following is an arrangement of the British species according to Babington:—

* Glands of the pollen-masses separate; lip erect in æstivation.

† Bracts mostly 1-nerved; root-knobs undivided.

‡ Lip, 3-lobed; lobes broad and short.

Orchis Morio, Green-Winged Meadow-Orchis. ***O. mascula***, Early Purple Orchis.

‡‡ Lip 3-lobed; middle lobe dilated, bifid, and often with an intermediate tooth.

O. fusca. ***O. militaris***. *O. Simia*. ***O. ustulata***.

†† Bracts with three or more nerves; root-knobs undivided.

O. laxiflora.

††† Bracts with three or more nerves; root-knobs palmate.

O. maculata, Spotted Palmate-Orchis. ***O. latifolia***, Marsh-Orchis.

** Glands of the pollen-masses united; root-knobs undivided.

† Lip erect in æstivation.

O. pyramidalis, Pyramidal-Orchis.

†† Lip spiral in æstivation.

O. hircina, Lizard-Orchis.

(Babington, *Manual of British Botany*.)

ORDERS, a group of objects in natural history classifications, subordinate to a Class, or sub-Class. It is, however, like many other general terms, used very loosely, especially by zoologists. In botany it is more definitely applied, and is used synonymously with Family and Tribe. In zoology Family and Tribe are frequently employed to denote groups subordinate to Orders. [FAMILIES OF PLANTS, *S.* 1.]

OREGON, a Territory of the United States of North America, lies between 42° and 46° N. lat., 110° and 125° W. long. It is bounded E. by the Rocky Mountains, which separate it from the Territory of Nebraska; N. by the Territory of Washington; W. by the Pacific Ocean; and S. by the State of California and the Territory of Utah. At the census of 1850 the Territory of Oregon included the country since separated from it and formed into the Territory of Washington, and comprised altogether an area of 341,463 square miles. The area of Oregon Territory is 185,030 square miles. The estimated population, in 1857, was 43,000.

Surface and Hydrography.—The Territory of Oregon is traversed from south to north by the ranges of the Cascade and Blue Mountains, while a third range, that of the Rocky Mountains, forms its eastern boundary. The Cascade, or Coast, or as it is sometimes called President's Range, is a continuous and very lofty range rising at a distance of 100 to 150 miles from the coast; and almost entirely cutting off direct communication between those portions of the Territory which lie east and west of it. Except where the Columbia, which forms here the northern boundary of the state, breaks through the range, the few passes which exist are so difficult as to be of little use to the traveller. The high peaks are from 12,000 to 14,000 feet above the level of the sea. The country west of this range is a good deal broken by spurs from the main chain. The greater part of this broken country is thickly timbered, in many parts there being dense forests of fir, pine, spruce, oak, ash, and other valuable trees, with close undergrowths of hazel, &c. The valleys and plains afford much excellent farming land, the soil consisting in some places of a black vegetable loam, in others of clays and gravel. The uplands form good pastures. The harbours along the coast are, with the exception of that formed by the mouth of the Columbia, of little value; most of the other rivers have bars at their mouths, over which only vessels of little draught can pass. The coast itself is formed by steep sandy cliffs and beaches and is broken by projecting headlands which rise precipitously from the sea; the principal of these are named Cape Orford, Cape Gregory, Cape Perpetua, and Cape Look-Out, but they afford little shelter, and have mostly numerous rocks scattered about them, while everywhere a heavy surf sets in upon the beach.

The Blue Mountains, which traverse the middle of the Territory, are more broken and irregular than the Cascade and Rocky ranges. On the south-west the Blue Mountains are united with the Cascade Mountains by offsets which form the valleys of the Clamet and Umqua rivers, while the main chain forms the valley of the Willamette. Other offsets, diverging eastward, connect this range with the Rocky Mountains. This middle section of the state differs considerably from that west of the Cascade range. The hills are barren, but in the valleys of the Columbia, Willamette, and Saptin rivers the soil is generally fertile, and in some places extremely rich. Much of the country in the vicinity of the Columbia and Saptin rivers consists of rolling prairie land, and affords good pasturage. The southern portion of this middle section is for the most part broken and desert, with scarcely a tree or vegetable. The general elevation of the section is about 1000 feet above the sea.

The Rocky Mountains have been noticed elsewhere. [ROCKY MOUNTAINS.] They are of great altitude, and only one practicable pass has been discovered over them along this Territory. This, known as the Great South Pass, occurs at the south-eastern extremity of Oregon, and is that crossed by the great stream of overland emigration to Utah and California. The country immediately west of the Rocky Mountains is everywhere broken by great spurs from the main chain, and though in some places partially timbered, is for by far the greater part rocky, barren, extremely variable in climate, and incapable of permanent settlement

The principal river of Oregon is the Columbia, which forms for a considerable distance the boundary between this Territory and Washington, and is not only common to both Territories, but receives all the rivers of both which rise east of the Cascade Mountains. [COLUMBIA RIVER.] The Saptin, Snake, or Lewis River, sometimes called the Southern Fork of the Columbia, is formed by the union of many small branches which rise in the Rocky Mountains between 42° and 43° N. lat., and flows first west and then south through Oregon, passing into Washington near 117° W. long., after a very serpentine course of nearly 800 miles. The Saptin in its course through Oregon receives numerous affluents, all or nearly all of which belong entirely to this Territory. Of these the principal are the Waptiacoos, Fayette, and Sickly, on the right, and the Malheur on the left. Most of these rivers are very rapid, and run in deep channels, but are of little value for navigation. The Willamette, which rises on the west side of the Blue Mountains near 43° 30′ N. lat., is one of the most important tributaries of the Columbia; it has a generally northern course and enters that river nearly opposite to Fort Vancouver, considerably below where it becomes navigable; is itself navigable by small vessels for a considerable distance; and drains one of the most fertile valleys in the Territory. The rivers which rise west of the Cascade Mountains have mostly a short course and are of little service for navigation. The principal are the Umqua and the Clamet. The Umqua, which after the union of its two head branches, flows nearly west to the Pacific, into which it falls by Cape Gregory, about 43° 54′ N. lat., is in its lower course a wide but comparatively shallow stream, and like all the other rivers of Oregon which fall into the Pacific, has its mouth obstructed by a sand bar. The Clamet, the most southern river of Oregon, is also the longest south of the Columbia; but there are few settlements along its banks, and its navigable capabilities are very limited.

Geology.—Of the geological features of Oregon only very partial examinations have been made. The mountain ranges belong generally to the igneous and palæozoic formations. Granite, trap, basalt, hornblende, and other eruptive and metamorphic rocks occur very widely, with slates, limestone, sandstone, &c. Gold is found in the sands of several of the rivers which flow from the Cascade Mountains to the Pacific; and it is said to have been also found in various places east of that range. Other minerals, especially iron, lead, and tin are also said to occur, but none of them have, we believe, been worked. We have not heard that coal has been found, though it is known to exist in Washington. Saline springs occur in the middle section of the Territory, and near its south-eastern corner occur several soda and magnesia springs.

Climate, Productions, &c.—The climate is very varied in the different sections of the Territory. Along the Pacific, and generally west of the Cascade range, it is mild and genial during the entire year. The winter is very short and far from severe, and snow seldom lies long on the ground. In the middle section the changes of temperature are much greater, and the winter much colder; but the air is more bracing, and the climate appears to be generally healthy. It is said that no dew falls in this section. In the vicinity of the Rocky Mountains the changes of temperature are extremely great and rapid. In the south-eastern part of the territory along the line of the great emigration route, the climate is very variable, but rain seldom falls, and there is little snow.

Wheat is the principal grain crop; but a considerable quantity of oats is also grown. Maize is cultivated, but not to any great extent. The other grains are scarcely cultivated at all. Peas and beans, potatoes, and a few other vegetables are raised. Small quantities of tobacco, flax, &c., are grown. Most of the European fruits flourish in the valleys of the Columbia, Willamette, &c. At present however the chief dependence of the settlers is perhaps upon the rearing of stock, which with scarce any attention thrive abundantly on the excellent pasture. Horses, horned cattle, sheep, and swine are already very numerous; and butter, cheese, and wool receive much attention from the agriculturists.

Oregon was formerly exceedingly rich in fur-bearing animals, but their numbers are rapidly diminishing; beavers, musk-rats, and martins are the chief which are left. Their collection is still carried on almost exclusively by the officers of the Hudson's Bay company. In the forests bears, wolves, foxes, deer, elks, antelopes, and other game are still very abundant. Vast quantities of aquatic birds frequent the rivers in the spring and autumn. Along the coast whales are found; and edible fish are extremely abundant both along the coast and in the rivers: the Columbia especially swarms with fish, which form the chief food of the Indians. The principal fish taken are salmon, sturgeon, cod, ray, carp, smelt, and innumerable other small fish, with crabs, oysters, mussels, and other shell-fish.

At present manufacturing industry is chiefly confined to the production of the articles required in a very thinly peopled agricultural country, and those connected with the shipping trade. The commerce of Oregon is not unimportant, a considerable coasting trade being carried on with California; the exports consist of large quantities of lumber, boards, flour, and provisions generally. There is also a good deal of trade carried on with New York, Boston, &c. The direct foreign trade is of little consequence.

Divisions, Towns, &c.—The Territory of Oregon is divided into ten counties. Salem is the political capital. All the towns are as yet but small: we notice some of the principal places; the population is that of 1850:—

Salem, the capital, stands on the right bank of the Willamette; it has a small population, and little trade, but contains the state buildings, &c.

Astoria, on the Columbia, 8 miles from its mouth, population 252, is one of the oldest American trading places in Oregon, having been founded by Mr. J. Astor in 1811, but its present increase is very slow. *Milton City*, Washington county, population 692, is one of the rising towns of Oregon. *Oregon City*, on the right bank of the Willamette River, 35 miles N.E. from Salem, population 692, is the chief town of the Willamette Valley, the best settled and most flourishing district in Oregon. The city possesses a great amount of water power, and appears likely to become a place of considerable importance. *Portland*, on the left bank of the Willamette, above its confluence with the Columbia, 47 miles N. by E. from Salem, population 821, is also a busy and flourishing place, being the port of entry of an extensive and rich country.

The constitution was enacted by Congress in 1848; by it the right of voting is vested in every white male inhabitant of Oregon, 21 years of age, and a citizen of the United States, or who shall in the usual manner declare his desire to become one. The legislature consists of a council of 9 members, elected for three years; and a house of representatives of not less than 18 nor more than 30 members elected for one year. All laws passed by this legislature must be submitted to Congress for approval. The governor is appointed for four years.

The coast of Oregon was visited both by the English and Spaniards in the 16th century, and it has been much disputed to the mariners of which country the honour of the discovery is to be ascribed. Spanish writers claim its discovery for Ferrelo, the pilot of Cabrillo, who they assert reached 43° N. lat. in 1543; while those who claim for England the honour of the discovery, show that Drake in 1579 attained to 48° N. lat. The mouth of the Columbia, although Heceta in 1775 and Vancouver early in 1792, suspected the existence of an important river from the general appearance of the bay into which it empties itself, was not actually discovered until later in 1792, when a Captain Baker of the English merchant service and a Captain Gray, the master of an American merchant vessel, entered the æstuary of the river. On the priority of Gray's entry the United States government some years later founded its claim to the territory drained by the river and its tributaries; but the river was actually ascended for the first time by Lieutenant Broughton, R.N., who a few months after Captain Gray had entered its mouth went up it for above 100 miles, and formally took possession of the country in the name of his sovereign George III. The sovereignty of Oregon was in 1789-90 a matter of grave dispute between the governments of England and Spain, but the question was terminated in 1790 by the Convention of Madrid, by which the right of exclusive possession was relinquished by both countries. The Americans subsequently formed a trading settlement at Astoria, which, during the war in 1814, was taken possession of by the English, but given up at the close of the war. After the treaty with Spain in 1819 the United States government first set up a claim, founded on the right of discovery, and also on their having by the treaty succeeded to the Spanish right of occupancy, to the exclusive possession of Oregon; and the claim involved the English and American governments on more than one occasion in very serious disputes. The question was not finally settled till 1846, when a treaty was concluded between the two powers, giving to the United States the entire country up to the parallel of 49° N. lat., including therefore the whole tract since formed into the territories of Oregon and Washington, but reserving to England the free navigation of the Columbia River as a line of communication with the Hudson's Bay Territory. Oregon was constituted a Territory by Act of Congress, August 14th, 1848.

(*Statistical Gazetteer of the United States; American Almanac; Seventh Census of the United States;* Wilkes, *Narrative of the United States Exploring Expedition;* Greenhow; Falconer; Wallace; Twiss; Nicolay, &c.)

ORFILA, P., an eminent French physician and toxicologist, was born at Mahon, in the island of Minorca, on the 24th of April, 1787. He was sent to Paris to study medicine, and was naturalised in France in the year 1815. He early displayed a love for the science of chemistry, and in the application of this science to the investigation of poisons and their treatment became the most distinguished man in Europe. He was professor of medical chemistry in the Faculty of Medicine at Paris, and was subsequently for many years dean of that faculty. He was a correspondent of the Institute and a member of the Council of Hospitals. He wrote many works on the subject of toxicology, as well as on medical jurisprudence generally. His first published work was produced in 1817, and was entitled 'Elements of Chemistry applied to Medicine and the Arts.' This work was many times republished. From time to time he published lectures on various departments of legal medicine. In 1821 he commenced the publication of a course of 'Lectures on Legal Medicine,' which was completed in 1823. Another series of lectures on the treatment of persons poisoned or asphyxiated, was published in 1818. In 1830, conjointly with M. Leseur, he published a work 'On the Appearances presented by Dead Bodies after Exhumation, Drowning, Suffocation in Cesspools, or by Gases.' He was also one of the editors of the 'Nouveau Dictionnaire des Termes de Médecine, Chirurgie, Pharmacie, Physique, Chimie, Histoire Naturelle,' &c.

His greatest work on medical jurisprudence was his 'Traité de Médecine Légale,' in 4 vols., and published from 1835 to 1847. His special papers on poisoning are very numerous, and those on the absorption of lead, corrosive sublimate, silver, arsenic, and other metals, are most valuable contributions to toxicology. He devoted much attention to the subject of public health, and wrote a little work entitled 'Hygienic Precepts for the Use of Children in Primary Schools' (1845). One of his last papers was 'On the Pernicious Effects of Tobacco, and the Danger of Smoking Havannah Cigars." He died in the month of March 1853.

ORO CITY. [California, *S.* 2.]

ORONTIACEÆ, a natural order of Endogenous Plants, under which Lindley, in his 'Vegetable Kingdom,' includes the *Acorinæ* of Link and other authors. This order embraces the genera *Calla*, *Orontium*, and *Acorus*, which are the types of three separate tribes. They are related to *Juncaceæ*, *Liliaceæ*, *Piperaceæ*, and *Araceæ*. It contains 13 genera and 70 species. Some of the species are used by man. *Symplocarpus fœtidus*, the Skunk Cabbage, yields a fœtid volatile oil. The Rootstocks of *Calla palustris* are eatable.

ORTHAGORISCUS, a genus of Plectognathous Fishes, belonging to the family *Gymnodontidæ*. On account of their round form the species are called Sun-Fishes. The genus has the following characters:—Jaws undivided, forming a cutting edge; body compressed, deep for its length, short, truncated, without spines; tail short and very high vertically; rays of the dorsal and anal fins long and pointed, both united at the caudal fin at the base. Two species of this curious genus have been taken on the British coasts.

O. mola, the Short Sun-Fish, the Molebut, although only occasionally seen, has been taken around all the shores of Great Britain. When observed in our seas they have generally appeared as though they were dead or dying, and floating along on one side, presenting the broad surface of the other side to view. This seems to be a natural position.

O. oblongus, the Oblong Sun-Fish, Oblong Tetrodon, Truncated Sun-Fish. This fish is larger, longer, and rarer than the last.

(Yarrell, *British Fishes.*)

OSCILLATORIA. [Algæ.]

OSMERUS. [Salmonidæ.]

OSSEOUS TISSUE. [Tissues, Organic, *S.* 1.]

OSSOLI, MARCHIONESS. [Fuller, S. M., *S.* 2.]

OTAGO. [Zealand, New, *S.* 2.]

OTLEY. [Yorkshire.]

OTTAWA, a city of Canada, previously called Bytown. [Bytown, *S.* 2, to which the present notice, founded on more recent information, is subsidiary.] The original name was derived from Colonel By, an officer of the Royal Engineers, whom the British government in 1827 commissioned to superintend the construction of the Rideau Canal. Bytown in 1854 was constituted a city, and the name was changed to Ottawa. A disagreement having arisen between the inhabitants of Canada West and Canada East respecting the seat of the Provincial Government, the matter was referred to the decision of Queen Victoria, who is stated to have chosen Ottawa as the future capital of the United Provinces of Canada. The situation is central for the whole of Canada, and has communication by river, canal, or railway, eastwards with Montreal and Quebec, and westwards with the Detroit River, through Kingston, Toronto, Hamilton, and Chatham. [Canada, *S.* 2.]

Ottawa is situated at the entrance of the Rideau River into the Ottawa, 87 miles W. from the confluence of the Ottawa with the St. Lawrence. At the western extremity of the city are the celebrated Chaudière Falls, unsurpassed in America except by the Falls of Niagara. The city is in Canada West, but a suspension bridge erected by the Provincial Government just below the Chaudière Falls spans the foaming mass of water, and unites Canada West with Canada East: it is called the Union Bridge. The Rideau Canal divides the city into Upper Town and Lower Town, entering the Ottawa by eight magnificent stone locks: and a massive bridge of cut stone, erected by the Royal Sappers and Miners, crosses the Rideau Canal. At the north-east end of the city are two other falls, by which the Rideau River pours itself into the Ottawa. The water-power for driving mills or machinery is immense on both sides of the Ottawa, and manufactories of various kinds have already been established.

The city is well laid out, the streets wide and regular, the houses mostly of stone, and the principal quarters are lighted with gas. There are already several good hotels. The population now exceeds 10,000. The principal commerce consists of lumber (timber in logs and squared), of which from 16 to 18 millions of cubic feet are annually brought down the Ottawa and its tributary rivers. The Hull iron-mines, about seven miles from the city, are worked successfully. The value of assessed property in 1856 was 3,300,000 dollars. Ottawa returns one member to the Legislative Assembly. It has communication daily by steamers with Montreal and Kingston, and by railway twice a day with Prescott, on the left bank of St. Lawrence (54 miles), where a connection is formed with the Grand Trunk Railway. Ottawa is distant 296 miles W.S.W. from Quebec, 126 miles W. from Montreal, 95 miles N.N.E. from Kingston, and 233 miles N.E. from Toronto.

OTTRELITE. [Mineralogy, *S.* 1.]

OUDE, a kingdom of Hindustan, is bounded S. by Allahabad, N. by Nepaul, E. by Bahar, and W. by Delhi. Its greatest length south-south-east to north-north-west is about 200 miles; its greatest breadth east by north to west by south is about 130 miles. The area is estimated at 25,000 square miles. The population is estimated at 5,000,000.

Oude was formerly a soubah, or subordinate government, of the Mogul's dominions. By various treaties between successive viziers and the East India Company, Oude became one of those dependent states over which the British government have supreme political control. In 1819 the reigning prince renounced his nominal allegiance to the Mogul, and assumed the title of King. On the 7th of February, 1856, the Marquis of Dalhousie, governor-general, announced by proclamation the deposition of the King of Oude, and the annexation of the kingdom of Oude to the British possessions in India. The King of Oude was granted an annual pension of twelve lacks of rupees (120,000*l*.). Oude forms a portion of the plain of the Ganges. The general character of the country, and the capital city, Lucknow, are noticed under HINDUSTAN.

OUDINOT, CHARLES NICOLAS, DUKE OF REGGIO, Marshal of France, and Grand Officer of the Legion of Honour, was born on the 2nd (some biographers state the 25th) of April, 1767, at Bar-sur-Ornain. Having chosen the career of a soldier, in opposition to his father's wishes, he joined the regiment of Medoc in 1783; but parental influence induced him to withdraw from the army four years after. The general call to arms at the outbreak of the revolution revived his martial spirit, and on offering himself as a volunteer in 1791, his former service at once procured him a battalion. In September 1792 Oudinot defended the fort of Bitsch against the Prussians, whom he repulsed with great loss. After this, the government of the Girondists promoted him to the command of the regiment of Picardy, left vacant by its former colonel, whom the Jacobin excesses of the day had induced to emigrate. At daybreak on the 2nd of June, 1794, being stationed at a distant outpost, the Austrians fell in great numbers upon his regiment; but he held his ground for ten hours against a corps estimated at 10,000 strong. Surrounded by the enemy's entire cavalry, he formed his men into a square, repulsed every charge of their cuirassiers, till at length, having opened a passage through them with fixed bayonets, he effected his junction with the main army, his lines never once having been broken. Instantly raised to a brigade for this intrepid conduct, he was sent to besiege Trèves, and on the 7th of August 1794 captured the town by a skilful manœuvre. He next received orders to join the army of the Rhin-et-Moselle, which he did on the 14th of September. During a desperate night-attack, October 14, 1795, he was disabled by five sabre-cuts; and having fainted from the loss of blood, was taken prisoner by the Austrians. Released by exchange a few months later, he joined Moreau's army in 1796, distinguished himself at the battles of Nordlingen and Donauwerth, captured several fortresses on the Danube, and was again most severely wounded at Ingolstadt. On the 19th of March, 1797, he attacked the emigrant army of Condé before Constance, and penetrated into the town, in spite of a second corps of Austrians by which it was defended.

Oudinot was created a general of division, April 12, 1799; and on the 4th of June contributed effectually to the great victory of Zurich. Being subsequently appointed head of the staff in Massena's army, he shared with that commander the dangers and sufferings of the seige of Genoa. Twice during the siege he succeeded in passing through the English blockading fleet, bearing with him Massena's despatches to Suchet. In 1800, as head of the staff under Brune, he obtained fresh honours at the battle of Pozzolo and the passage of the Mincio. The First Consul was so highly satisfied with Oudinot's conduct on these occasions that he presented him with a sword of honour, to which he added one of the pieces of cannon captured from the enemy by Oudinot himself. At the opening of the campaign of 1805 Napoleon formed a picked corps of grenadiers, the command of which he intrusted to Oudinot, presenting him at the same time with the grand cordon of the Legion of Honour. At the head of his grenadiers he was the first to enter Vienna; he crossed the bridge over the Danube, though undermined and defended with 180 pieces of cannon. General Oudinot was likewise present at Austerlitz.

The following year he took possession of the counties of Neufchâtel and Valengen, relinquished by Prussia; and during his government conciliated the inhabitants by his liberality and disinterestedness. Before he left his office, the burghers of Neufchâtel evinced their esteem by a public address and the present of a sword. After the battle of Jena, October 14, 1806, he marched into Poland, and gained the victory of Ostrolenka, February 6, 1807. The Emperor Napoleon now made him a count, to which he annexed a dotation of a million of francs. But the 14th of June 1807, the morning of Friedland, was the most signal of his life. On that famous ground, with his single corps, he checked for many hours the advance of the whole Russian army; and after the sacrifice of half his men, enabled Napoleon to come up in time to win one of his greatest battles. Meeting the general after the action, Napoleon said to him, with unusual emotion, "General, you have done wonders; but wherever you are my only fear is for yourself." This incident has since afforded a subject for one of Horace Vernet's best pictures.

In the memorable campaign of 1809 the reputation of Oudinot was fully sustained; for after the death of Marshal Lannes, at Essling, the second corps, formerly commanded by him, was conferred upon Oudinot in these flattering terms:—"Given to you, as a general, tried in a hundred fights, in which equal skill and intrepidity have been displayed." After the battle of Wagram, Oudinot received the marshal's bâton, with the title of Duke of Reggio, and a pension of 100,000 francs. In 1810, Louis Bonaparte, tired of submitting to the dictation of his imperial brother, threw off the ensigns of royalty, and clandestinely left Holland. Upon this defection Marshal Oudinot was ordered to take military possession of the country; he fixed his headquarters accordingly at Amsterdam. In this government he continued nearly two years, exhibiting great capacity and justice, and winning the good report of the Dutch people by his integrity and conciliatory behaviour.

Throughout the whole of the subsequent campaigns of 1812, 1813, and 1814, the name of Marshal Oudinot reappears with undiminished honour, as one of the best-trained and most efficient of the imperial band of generals. After the first abdication he submitted to the restored Bourbons, stedfastly adhered to their cause during the Hundred Days, and was loaded with favours by Louis XVIII. and Charles X. In 1823 he accompanied the Duke of Angoulême in his expedition for the re-establishment of the King of Spain. He was appointed governor of the Invalides in 1842, and died at Paris, September 27, 1847, in his eighty-first year, having been upwards of sixty-four years in the French army.

The marshal's eldest son, Nicholas-Charles-Victor, the present Duke of Reggio, commanded the French army sent in 1849 to support the authority of the present pope in the Roman states. His younger son, an officer of great promise, fell into an ambush in the late wars in Africa, and was killed by the Arabs, June 26, 1835.

OUTLAWRY. Outlawry, in civil suits, was of two kinds, that on *mesne* process, and that on *final* process. The object of the former was to compel the appearance of a defendant who could not be served with a writ, and it was consequently always reversed on application to the Court, and the defendant appearing to the action. A simple method of proceeding against a defendant, or rather of enabling a plaintiff to obtain judgment by default when the defendant does not appear, having been provided by the Common Law Procedure Act, 1852, outlawry on *mesne* process is by that statute abolished. Outlawry on *final* process may still be obtained against a judgment debtor, but there are so many other means of stripping him of all his property, that this mode of proceeding is rarely resorted to in practice.

OVEÆ (Gray), a sub-tribe of the tribe *Bovina* and family *Bovidæ*. It includes the common Sheep and allied species. The following is Dr. J. E. Gray's definition of this family:—Forehead flat or concave. The horns are more or less spiral, wider than deep at the base, and slightly annulated in front. The females are often hornless. The skull has a more or less deep rounded suborbital pit, without any fissure; the masseteric ridge ascending high before the orbit; the auditory bulla small; the basioccipital flat, more or less expanded anteriorily by the extension of the anterior pair of tubercles, the posterior ones small; the cutting-teeth are nearly equal-sized and shelving; and there are no supplemental lobes to the grinders. The hoofs are triangular, and being shallow behind, they have distinct interdigital fossæ. Males emitting no stench.

The genera included in this family are—

1. OVIS. Crumen distinct. Tail elongated. Skin covered with wool or adpressed hair.

2. Caprovis. Crumen distinct. Tail very short. Skin covered with thick hair, covering the wool.
3. Pseudovis. Crumen none. Tail rather elongated. Forehead convex. Skin covered with thick hair.
4. Ammotragus. Crumen none. Tail rather elongated. Forehead concave. Skin covered with short hair, and elongated tuft of hair.

Ovis Aries, the Common Sheep, is subject to great variety, and many of its forms have been raised to the rank of species. Dr. Gray, in the 'British Museum Catalogue,' enumerates no less than 33 varieties of this species.

In the article Sheep the subject is treated chiefly with reference to farming and grazing. We here present a few of the varieties which are more interesting to the zoologist. The Sheep is one of those animals which man has domesticated, and which, like the horse, dog, cat, pig, and ox, is subject to the greatest possible variety. These varieties have been often described as species; but the most distinguished zoologists of the present day regard all the forms of *Ovis* as belonging to the species *O. Aries*.

The following is a list of the varieties from the 'British Museum Catalogue':—

1. The Spanish Sheep. It is the *Ovis Hispanicus* of Linn.; called also the Merino Sheep and the British Middle-Wooled Sheep.

2. The Common Sheep (*Ovis rusticus*, Linn.; *O. Gallica*, Desm.; *O. brachyurus*, Pallas; *O. leptura*, Schreb.): the Hornless Sheep (*O. Anglicana*, Linn.). Of this variety there are numerous forms, such as the Muggs Sheep and Shetland Sheep, the Southdown Sheep, the Old Lincoln Sheep, the Romney Marsh Sheep, the Cobwold Sheep, the New Leicester Sheep, the Cheviot Sheep, the Old Teeswater Sheep, the Improved Teeswater Sheep, the Dunky Sheep, the Zetland and Orkney Sheep, the Welsh Mountain Sheep, the Soft-Wooled Sheep of Wales, the Wicklow Mountain Sheep, the Kerry Sheep, the Exmoor Sheep, the Black-Faced Sheep, the Black-Faced Heath-Sheep, and the Rass or Roosh (*Ovis Polii*, Blyth).

3. The Barwall Sheep, *Ovis* (*Aries*) *Bârwâl*, Hodgson; *Ovis Barual*, Hodgson; *O. Ammonoides*, var. 1, Gray. It inhabits Nepaul.

4. The Huniah Sheep (*Ovis Hunia*, Hodgs.); The Hoonia, or Black-Faced Sheep of Tibet. Also a native of Nepaul.

5. The Cago (*Ovis Cagia*, Hodgs.); the Kago, or Tame Sheep of Cabul region; the Cago Sheep of Gray. A native of Nepaul.

6. The Seling. A native of Nepaul.
7. The Curumbar Sheep of Mysore.
8. The Sheep called Gārār in India.
9. The Dukhun (Deccan) Sheep.
10. The West-Indian Sheep.
11. The Brazilian Sheep.
12. The Demerara Sheep.
13. The South American Sheep (*Ovis Aries*, Renger).
14. The Smooth-Haired Sheep (*O. Africanus*, Ray; *O. Æthiopica*, Charlet; *O. Africana*, Sloane).
15. The African Sheep, (*O. Guineensis; A. longipes*, Desm.; *Caper Mambrinus*); the Sheep of Sahara.
16. The Guinea Sheep (Belier et Brebis des Indes, Buffon; *O. A. Guineensis*, Schreb.).
17. The Morvant de la Chine, Buffon.
18. The Shaymbliar Sheep of Mysore.
19. The Sheep of Zeyla, of Buckingham.
20. The Fezzan Sheep, of Bennett, from Tripoli.
21. The St. Helena Sheep.
22. The Marocco Sheep (*O. A. Numidæ*, H. Smith).
23. The Congo Sheep (*O. A. Congensis*, H. Smith).
24. The Angola Sheep (*O. A. Angolensis*, H. Smith).
25. The Zenu or Goitred Sheep (*O. A. Steatinion*, H. Smith).
26. The Ixalus (*Ixalus probaton*, Ogilby; *O. Ixalon*, Sundevall).
27. The Cretan Sheep (*O. Strepsiceros*, Ray; *O. A. Strepsiceros*, Schreb.; *O. Cretensis*, Jonst.; *Capra Cretensis*, Brisson; *Strepsiceros Cretica*, Besch.; Belier et Brebis de Valachie, Buffon; Zackl of the Austrians; Wallachian Sheep of Bewick).
28. The Long-Tailed Sheep of Russia (*O. longicaudatus*, Brisson; *O. Dolichura seu Tscherkessica*, Pallas).
29. The Broad-Tailed Sheep (*O laticaudatus*, Erxl., Geoff., 'Mem. Egypt,'; Lesson, 'Comp. Buffon,' x. 312; *O. laticauda platyceros s. Arabica*, Linn.; *O. Turcica*, Charlet; *O. cauda obesa*, Ludolf). It is a native of Barbary. There are several forms of this variety, of which the following are most prominent:—The Fat-Rumped Sheep (*O. Steatopyga*, Pallas; the Tartarian Sheep of Bewick); the Persian Sheep (*O. A. ecaudatus*, Geoff.); the Fat-Tailed Sheep (*O. A. macrocercus*, Schreb.); the Aora Fiyel, or Abyssinian Sheep; the Bucharian Sheep (*O. Bucharica*, Pallas); the Tibetan Sheep (*O. Thibetanus*, Fischer); the Cape Sheep (*O. Capensis*, Erxleb.); the Sheep of Belkah.

Fat-Tailed Sheep *Ovis Aries macrocercus.*

30. The Many-Horned Sheep (*O. polyceratus*, Linn.). It is also called the Four-Horned Ram, and the Dumba Sheep. It is a native of Nepaul.
31. The Puchia, or Hindustan Dumba (*O. puchia*, Hodgson).
32. The Short-Tailed Sheep (*O. brachyura borealis*, Pallas). It is a native of Northern Russia.
33. The Sheep of Tartary. They are said to eat bones like a dog.

The genus *Caprovis* embraces the following species:—

C. Vignei, the Sha, or Koch. It is the Mountain Sheep of the north of India, and is found in Tibet.

C. orientalis, the Armenian Sheep. It is the *Ægoceros Musimon* of Pallas; the *Ovis Musimon* of Brandt. It is a native of Armenia.

C. Musimon, the Mouflon. This animal has a multitude of synonyms. It is the *Capra Ammon* of Linnæus, and the *Ovis Musimon* and *O. Musmon* of other authors. It is the Wild Sheep and Siberian Goat of Pennant. It is found in Cyprus, Candia, and Corsica. For figure of Mouflon, see Sheep, p. 355.

C. Ammotragus, *A. Tragelaphus*, the Aoudad of the Moors of Barbary and the Kebsch of the Arabians, is a native of North Africa. For figure, see Goat, where it is named Jaal Goat.

C. Canadensis, the Taye or Big Horn. It is the *Ovis montanus* of Geoffroy; and a variety, the *O. Californiana* of Douglas. Dr. Gray says it is probably the same as the Ammon of Northern Siberia.

There is only one species of ***Pseudois***, the ***P. Nahoor***, the Nahoor Nervate or Sna. It is a native of Nepaul.

C. Argalis, the Argali. It is the *Ægocerus Argali* of Pallas, and often confounded with the former. It is a native of Siberia. Dr. Gray says of this species—

"The Nyens or Bambheras, or Wild Sheep, seldom or never cross the Hemachal, the Indian side of which range is the special habitat of the Nahoors, while to the north and west beyond Thibet our animal is replaced by other species, so that Thibet may be considered as the special habitat of one species (*Ovis Ammonides*), and the plateaux north of Thibet as far as the Altai of another (*Ovis Ammon*), cited as types of the true ovine form; and it may be added, that the six sorts of tame sheep of Thibet and the Sub-Himalayas all without exception exhibit the essential characters of that form.

"There are several species that may be confounded under this head: the Siberian Argali is found in the most northern part of that country, and it is probably different from the Himalayan animal; but I have not been able to discover any difference between the specimen received from Mr. Hodgson and those which were sent from Siberia by the Russian naturalist."

OVER. [Cheshire.]

OVERSEER. The duties of overseers have by recent statutes been extended and modified in various matters of detail; but the outline of their duties given under Overseer, vol. xvii., p. 70, is still sufficiently accurate, no alterations being of sufficient moment to call for comment.

OVERTON. [Flintshire.]

OVERWEG, DR. ADOLF, was born July 24, 1822, in the city of Hamburg. He was educated at the University of Bonn, and afterwards at the University of Berlin, where he took his degree. His favourite study was geology, which he pursued for some years. In 1849, when Mr. Richardson, at the expense of the British government, was preparing to undertake a journey to Lake Tchad, in Central Africa, Dr. Overweg and Dr. Heinrich Barth were selected to accompany him, in order to make scientific observations. An account of this expedition is given under Africa, *S.* 2. Dr. Overweg died of an attack of fever, Sept. 20, 1852, at Maduari, about ten miles east from Kuka, and near the western shore of Lake Tchad.

OVIS. [Ovidæ.]

OX-LIP. [Primula, *S.* 1.]

OX-TONGUE. [Helminthia, *S.* 2.]

OXAMIC ACID. [Chemistry, *S.* 2.]

OXYCOCCUS, a genus of Plants belonging to the natural order *Ericaceæ.*

O. palustris, the English Cranberry, is found wild abundantly in the fens of Norfolk, Lincolnshire, and many other parts of England, always by the side of little rills, and not among stagnant water; it has slender trailing thread-like shrubby shoots, clothed with tiny linear leaves, and has a 5-parted pink corolla with the segments sharp-pointed and turned back. The fruit is a round austere red berry, which makes excellent tarts and one of the many kinds of marmalade. The Russian cranberries of the shops are borne by this species. They are not gathered till after the disappearance of winter. Near St. Petersburg the cranberry plant is so common, that the snow is stained crimson by the berries crushed to pieces by the passage of sledges over them.

O. macrocarpus, the American Cranberry, is very like the other, but its leaves, flowers, and fruit are larger; and the latter has a more medicinal taste. It is imported from the United States in hogsheads, in considerable quantity, and used for the same purposes as the other; but it is considered of inferior quality.

OXYGEN. [Chemistry, *S.* 1.]

OZOKERITE. [Mineralogy, *S.* 1.]

P

PACINIAN CORPUSCULES. [Tissues, Organic, *S.* 1.]

PAGRUS. [Pagellus.]

PAIGNTON. [Devonshire.]

PAINSHAW. [Durham.]

PAIXHANS, HENRI-JOSEPH, General of Artillery in the French army, was born January 22, 1783, at Metz, in the French department of Moselle. He received instruction in the Ecole Polytechnique, and having entered the artillery, rose by successive gradations to the rank of Colonel, and ultimately of General. He was also elected a member of the French Chamber of Deputies, and spoke occasionally on subjects connected with the army and navy. Several of his speeches in the chamber have been published, as well as the valuable works quoted hereafter. General Paixhans died August 19, 1854, on his domain of Jouy-aux-Arches, near Metz.

General Paixhans made important improvements in the construction of heavy ordnance, and also in the projectiles, in the carriages, and in the mode of working the guns. The Paixhans-guns are especially adapted for the projection of shells and hollow shot, and were first adopted in France about the year 1824. Similar pieces of ordnance have since been introduced into the British service. They are suitable either for ships of war, or for fortresses which defend coasts. The original Paixhans-gun was 9 feet 4 inches long, and weighed nearly 74 cwts. The bore was 22 centimètres (8⅝ inches nearly). By judicious distribution of the metal it was so much strengthened about the chamber, or place of charge, that it could bear firing with solid shot weighing from 86 to 88 lbs., or with hollow shot weighing about 60 lbs. The charge varied from 10 lbs. 12 oz. to 18 lbs. of powder. General Paixhans was one of the first to recommend cylindro-conical projectiles, as having the advantage of encountering less resistance from the air than round balls, having a more direct flight, and striking the object aimed at with much greater force, when discharged from a piece of equal calibre, whether musket or great gun. As large ships of war, particularly three-decked ships, offer a mark which can hardly be missed, even at considerable distances, and as their wooden walls are so thick and strong that a shell projected horizontally could not pass through them, an explosion taking place would produce the destructive effects of springing a mine, and far exceeding those of a shell projected vertically, and acting by concussion or percussion. In accordance with these views, General Paixhans recommended the use of smaller ships carrying heavier guns suitable for projecting shells and hollow shot; and advised his government to avoid the construction of large ships, and the equipment of any ship for shell-firing to such an extent as to expose her to the great risk of being blown up by her own masses of ammunition. Paixhans-guns were used in the Russian ships of war which attacked the Turkish fleet in the roadstead of Sinope, and their powerful effects were made manifest by the utter destruction of the Turkish forts as well as the ships.

General Paixhans suggested several other improvements in the French army as well as in the navy, as is shown by the following list of his principal works:—Considérations sur l'État Actuel de l'Artillerie des Places, et sur les Améliorations dont elle parait susceptible,' 4to, 1815; 'Nouvelle Force Maritime, ou Exposé des Moyens d'annuler la Force des Marines Actuelles de Haut-Bord, et de donner à des Navires très petits assez de Puissance pour détruire les plus grands Vaisseaux de Guerre,' 8vo, Paris, 1821, forming the First Book of the next work, 'Nouvelle Force Maritime, ou Application de cette Force à quelques Parties du Service de l'Armée de Terre: ou, Essai sur l'État Actuel des Moyens de la Force Maritime; sur une Espèce Nouvelle d'Artillerie de Mer qui détruirait promptement les Vaisseaux de Haut-Bord; sur la construction des Navires à Voile à Vapeur de Grandeur moderée, qui, armés de cette Artillerie, donneraient une Marine moins coûteuse et plus puissante que celles existantes; et sur la Force que la Système de Bouches à Feu proposé offrirait à Terre, pour les Batteries de Siège, de Côtes, et de Campagne,' 8vo, Paris, 1822; 'Expériences faites par le Marine Française sur une Arme Nouvelle; Changemens qui paraissent devoir résulter dans le Système Naval, et Examen des Questions relatives à la Marine, à l'Artillerie, à l'Attaque, et à la Défense des Côtes et des Places,' 8vo, Paris, 1828; 'Force et Faiblesse Militaire de la France: Essai sur la Question Générale de la Défense des Etats, et sur la Guerre Défensive, en prenant pour Example les Frontères Actuelles et l'Armée de la France,' 8vo, Paris, 1830; 'Fortifications de Paris, ou Examen de ces Questions —Paris, doit-il être fortifié? les Systèmes presentés peuvent-ils être admis?' &c., 8vo, Paris, 1834; 'Constitution Militaire de la France: Etude sur les Modifications à apporter au Système de nos Forces de Terre et de Mer, tant pour opérer les Progrès devenus nécessaires que pour diminuer les Défenses, sans que la Puissance Nationale en soit altérée,' 8vo, Paris, 1849.

PALACE COURT. This Court [Courts, vol. viii. p. 114] was abolished by the statute 12 & 13 Vict. c. 101.

PALARUS. [Larridæ.]

PALEA. [Calathidium.]

PALEMON, PALEMONIANS. [Shrimps.]

PALM-TREE WINE. [Borassus.]

PALMBLAD, VILHELM FREDRIK, a Swedish writer of considerable note, was born on the 16th of December 1788, at Liljestad, near Söderköping, the 11th child of a military commissary, who had procured the situation of Kronofogde, or collector of taxes. The property of the family must have been considerable, as young Palmblad, when a student at Upsal, and before attaining his majority, bought, in conjunction with another student, the university printing-office, and forthwith commenced a series of publications, which had for their object to effect a revolution in Swedish literature. The first number of 'Phosphoros,' a new periodical by Atterbom and Palmblad, appeared in July 1810, within a month of his taking possession of the printing-office; at Christmas of the next year appeared the first number of the 'Poetisk Kalender,' the earliest Swedish annual, and in the beginning of 1813 the first of the 'Svensk Litteratur Tidning,' or 'Swedish Literary Gazette.'

The 'Tidning,' which lasted for eleven years—up to 1824—was the most long-lived Swedish literary periodical on record; while the Danes could, in 1824, boast of one that had outlived a century. Its circulation, we are told by Palmblad, was never upwards of 200, and averaged about 150: yet it had a great influence on the cultivation of Swedish literature. It excited the astonishment of the public by the audacity of its attacks upon the old school in literature, which at that time was entirely French in its models and its opinions; and on one occasion the Rector of the University of Upsal summoned Palmblad, as the university printer, before him to inform him that, if his periodical contained any more unfavourable criticisms upon the Swedish Academy, his privilege would be withdrawn. The Swedish Academy had been founded in imitation of the French Academy by Gustavus III., who was accustomed to declare that there were two things he held in utter abomination—the German language and tobacco. One of the chief objects of the new school—which from the title of its first periodical, the 'Phosphoros,' became known by the name of the 'Phosphorists'—was to introduce the Swedish public to some knowledge of the masterpieces of Göthe and Schiller; and in spite of the efforts of the Academy, which in the first instance looked upon the Phosphorists as a body of contumacious rebels, the result was general though not local success. Atterbom, the chief leader of the party, was indeed too fantastic in the character of his own writings to become unconditionally popular; but before the close of his career he was elected a member of the Academy of which he had been the assailant. Tegnér and Geijer, who had censured some of the proceedings of the new party as violent and intolerant, were themselves much more averse to the principles of the old; and, finally, an almost complete revolution took place in the aspect of Swedish literature.

Palmblad, who was active both with the pen and the press, continued to contribute to the periodicals that successively arose on the ruins of each other, the 'Journal of the Swedish Literary Union,' 'Svea,' 'Skandia,' 'Mimer Frey,' &c., and also pursued an academical career. In 1822 he became 'Docent' or tutor of Swedish history at the university, in 1827 assistant professor of geography and history, and in 1835 professor of Greek. Many of his numerous works are on the subjects which occupied him as professor: his 'Handbook of Physical and Political Geography' (5 vols., Upsal 1826-37) is of high reputation, and has been translated from Swedish into German. His poetical translations of Sophocles (1841) and of Æschylus (1845) are of some note. When professor of Greek however he often felt an inclination to return to an early amusement of writing novels, and his 'Falkensvärd Family,' (2 vols., Örebro, 1844-45), and 'Aurora Königsmark' (6 vols., Örebro, 1846-51), met with much success, and were translated into German. The work however which is certain to perpetuate his name is the great 'Biographical Dictionary of Celebrated Swedes,' which he left incomplete at his death, on the 2nd of September 1852.

This dictionary, 'Biographiskt Lexicon öfver namnkunnige Svenska Män,' commenced in 1835, was interrupted at Professor Palmblad's death, but is now again in progress. The last volume we have seen is the twenty-second, which brings it as far in the alphabet as the end of the letter W. It embraces the names of the living as well as the dead, and a considerable portion of the information it contains is derived from private communications or from personal observation, and embodied for the first time in its pages. It aspires to give an account of every Swedish name of note, and a list of the works of every Swedish author. The only other biographical dictionary of the same kind that the Swedes possess, is that of Gezelius in three volumes, and a supplement commenced in 1778. But the new work is on a much larger scale in every way than the somewhat meagre compilation of Gezelius. Many of the lives are given at considerable length, several are autobiographies, as the account of Palmblad himself. On the other hand, some of the lives of living persons are little more than a string of dates, with a record of promotions; but such inequalities are of course unavoidable in a work of the kind. The book is generally known as 'Palmblad's Biographical Dictionary,' but does not bear his name in the title, and in his life he speaks of himself as only one of the editors, and the author of a considerable number of the lives. It is one of the most indispensable books in a Swedish library, and will, as it comes to be more generally known, do much to spread abroad the knowledge of the illustrious names of Sweden.

PALMIPES, a genus of Star-Fishes belonging to the tribe *Goniasteriæ* and the family *Asteriadeæ*. The body is thin, flat, and pentagonal, and covered above and beneath with fasciculated spines; avenues bordered by longitudinal fasciculi of spines; suckers visceral. The species of this genus are not numerous.

P. membranaceus, the Bird's-Foot-Sea-Star, is a British species. It has broad ample sub-acute lobes. Colour white, with red rays and border. It is the thinnest and flattest of all its class. It ranges from the Arctic seas to the Mediterranean.

(Forbes, *History of British Star-Fishes.*)

PANARIA. [Lipari Islands.]

PANGIACEÆ, a natural order of Diclinous Exogenous Plants. This order embraces three genera, the species of which are trees with alternate stalked entire leaves, polypetalous axillary monœcious flowers, with scales in the throat of those bearing pistils. The stamens are five, the seeds large and oily. Dr. Lindley says, "What the distinction is between these plants and Papayads, except that the last are monopetalous, and have no faucial side scales in the ♀ flowers, it is hard to say.

The species are found in the hotter parts of India. They are all poisonous. The natives of India employ extensively in medicine the seeds of *Gynocardia odorata*, which are known by the name of Chaulmoogra and Petarkura. The genus *Hydnocarpus*, formerly referred to *Flacourtiaceæ*, belongs to this order.

PANIAS. [Banias.]

PANOPEÆ. [Pyloridians.]

PANORPA. [Planipennes.]

PANORPES. [Chrysididæ.]

PAPAL STATES. The area and population of the Papal States are distributed as follows over 20 provinces, 6 of which, called Legations, are governed by a Cardinal legate, and 14, called Delegations, are administered by dignitaries of lower degree:—

Legations.	Square Miles.	Population in 1850.
Roma-e-Comarca	1,699	304,266
Bologna	1,292	367,340
Ferrara	1,053	229,862
Forli	683	208,007
Ravenna	674	175,338
Urbina-e-Pesaro	1,358	241,612
Velletri	629	59,356
Delegations.		
Ancona	424	172,393
Macerata	861	239,943
Camerino	311	38,055
Fermo	317	111,751
Ascoli	460	87,619
Perugia	1,447	222,926
Spoleto	1,130	123,765
Rieti	513	77,212
Viterbo	1,083	129,074
Orvieto	301	26,450
Frosinone	720	148,378
Civita Vecchia	373	20,385
Benevento	53	23,040
Total	15,381	3,006,771

PAPAVERINE. [CHEMISTRY, *S.* 2.]

PARADISE, GRAINS OF. [AMOMUM.]

PARAMICIPPA. [MAIIDÆ.]

PARAMIDE. [CHEMISTRY, *S.* 2.]

PARAMITHRAX. [MAIIDÆ.]

PARANA (TOWN). [ENTRE-RIOS, *S.* 2.]

PARANAPHTHALINE. [CHEMISTRY, *S.* 2.]

PARELLIC ACID. [CHEMISTRY, *S.* 2.]

PARENT AND CHILD. The statute 11 and 12 Will. III. c. 4, which empowers the Chancellor to order an allowance to the protestant child of a popish parent, and the statute 1 Anne, c. 30, which granted similar powers of coercing a Jewish parent, are both repealed by the statute 9 and 10 Vict., c. 59. A much more recent statute has imposed on the parents of children convicted of crime, the burden of contributing to their support during a course of reformatory training; the law rightly judging that the crimes of children are the result of the negligence of the parent. See 20 and 21 Vict., c. 55.

PARGASITE. [HORNBLENDE, *S.* 2.]

PARIDÆ. [TITMICE.]

PARIETINE. [CHEMISTRY, *S.* 2.]

PARIS, JOHN AYRTON, a distinguished physician, was born at Cambridge, on the 7th of August, 1785. He received his early education at the Grammar school at Linton. At the age of fourteen he commenced the study of medicine, and for this purpose became a pupil of Dr. Bradley of London, who was physician to Westminster Hospital. Here he made great progress in his classical studies, and made acquaintance with the sciences of chemistry and botany. In 1803 he matriculated at Caius College, Cambridge, where he became distinguished for the extent and elegance of his classical knowledge, and pursued the natural sciences as far as the university studies permitted him. He subsequently graduated as M.D. at Cambridge, after having previously studied at Edinburgh. He obtained the Tancred studentship in physic at Cambridge in 1804, and made the Tancred speech in 1808. He first commenced the practice of his profession in London, where he made the acquaintance and gained the patronage of Dr. Maton, whom he succeeded when only in his twenty-third year as physician to the Westminster Hospital. He had not, however, been long in London when he was induced to settle at Penzance in Cornwall, as successor to Dr. Borlase. Here he met with great success in practice, and turned his attention to the study of natural history. He founded the Royal Geological Society of Cornwall, one of the earliest geological societies in the kingdom. He wrote a 'Guide to Mount's Bay and Land's End,' which contained an account of the geology and objects of natural interest in that part of Cornwall. He also studied agriculture in relation to chemistry, and wrote a paper 'On the Soils of Cornwall, with a View to form a Rational System of Improvement by the Judicious Application of Mineral Manure.' He anticipated here the discoveries of modern times, and suggested a practice which is but now beginning to bear its fruits. Whilst at Penzance he also wrote 'Memoirs of the Life and Scientific Labours of the late Rev. W. Gregor.' In the Preface to this work, which was published in 1817, he took leave of his friends in Cornwall, and once more returned to London.

He now commenced a course of lectures on the materia medica, at the Windmill-street School of Medicine. He also gave a course of lectures on the philosophy of medicine, at the Royal College of Physicians. The matter of these lectures he afterwards worked into the Introduction to his celebrated 'Pharmacologia.' This work, which was originally published in 1819, went through many editions, and is at the present day regarded as one of the useful text-books on the subject of materia medica. He also published a 'Treatise on Diet,' which comprehended all that was known on the subject at the time he wrote. It was a work much needed in the profession, and brought Dr. Paris more than any of his other publications as a practical physician before the public.

As a Cambridge graduate all the positions at the London College of Physicians became opened to him. He was made a censor in 1817, an elect in 1839, and delivered the Harveian oration in 1843. On the death of Sir Henry Halford in 1844, as one of the elects, of whom there are seven, he was eligible for the post of president of the College, and was selected by the fraternity of elects to that position. During his presidency he was opposed to all reform in the College, whose charter, granted in the time of Henry VIII., is ill adapted to the requirements of the profession in the present century. He retained his position as president till his death, on the 24th of December, 1856, and was succeeded by Dr. Thomas Mayo.

Dr. Paris devoted much attention to the study of the physical sciences, especially chemistry. When in Cornwall he conferred a great benefit on the mining population by suggesting that the bar used for moving portions of rock, should be covered with copper, which prevented the iron of which it was composed from striking fire against the rock, and which by igniting the gunpowder used in blasting, often produced the most serious ill consequences. In London he became an early member of the Royal Institution, and was the friend and biographer of Sir Humphry Davy. His 'Life' of the great chemist is an unusually elegant piece of biography. He wrote anonymously a little work of great merit, and which has gone through many editions, entitled 'Philosophy in Sport made Science in Earnest.' He was a Fellow of the Royal Society, and a Doctor of Civil Law of the University of Oxford.

PARLIAMENT, IMPERIAL. The alterations which have been made in the law relating to the election of members of Parliament, and the constitution and powers of election committees, have been mentioned under ELECTIONS, *S.* 2.

PARONYCHIACEÆ, Meisner's name for the family of Plants called by Lindley *Knotworts*. Brown named this tribe, after *Illecebrum*, *Illecebreæ*, which is now most commonly adopted. [ILLECEBRACEÆ.]

PARRY, SIR WILLIAM EDWARD, KNIGHT., Rear-Admiral of the White, was born December 19, 1790, at Bath, in Somersetshire. His father was Caleb Hillier Parry, M.D., a physician of some celebrity. His mother was the daughter of John Rigby, Esq., of Lancaster.

Edward Parry, as he was always called when a boy (and generally known afterwards as Sir Edward Parry), was educated in the grammar-school of the city of Bath, where he attained a knowledge by no means contemptible of the Latin and Greek languages. His parents intended him for the medical profession, but in 1803 Miss Cornwallis, a near relative of Admiral the Hon. William Cornwallis, then in command of the Channel fleet off Brest, induced them to change their purpose. She thought he had the qualities suitable for a naval officer, and that her influence would suffice to float him off comfortably. As he had no objection to make trial of a sailor's life, in June 1803, through the kindness of Admiral Cornwallis, he was appointed a first-class volunteer on board the Ville-de-Paris, 110 guns, then about to go out as flag-ship to the Channel fleet. Young Parry took a liking to his profession, and studied French and mathematics under the chaplain of the Ville-de-Paris, which continued to cruise in the Channel, off Brest and Ushant. In the early part of 1806 he left the Ville-de-Paris to go on board the Tribune frigate, as a midshipman. The Tribune was employed about two years in cruising off the French coast; but in the spring of 1808 Captain Baker was promoted from the Tribune to the Vanguard, 74, which belonged to the Baltic fleet, and Parry went with him. The Vanguard returned to the Downs in December 1809, and Parry obtained his commission as lieutenant, January 6, 1810. Early in February the same year he proceeded to Sheerness to join the Alexandria frigate, which was about to sail on service in the Baltic, and was afterwards employed in the northern seas in protecting the Spitzbergen whale-fishery. During that period Lieutenant Parry was a good deal employed in making astronomical observations, and in improving the Admiralty charts of those seas. In January 1813 he left the Alexandria, and proceeded to Halifax in Nova Scotia, to join the La Hogue, 74. Great Britain was then at war with the United States, and Lieutenant Parry having joined the La Hogue in the summer of 1813, in the spring of 1814 was engaged in a successful boat-expedition, which ascended the river Connecticut as far as Pettipague Point, and destroyed several privateers and other vessels, in all 27, valued at 50,000*l.*, with the loss of only two men killed.

After the peace of 1814 the La Hogue returned to England, but Lieutenant Parry, in hopes of preferment, remained on the North American station in the Maidstone frigate, and afterwards in the Ardent, 64, the Carron, 20, and the Niger, 36. He continued on the North American station without preferment till March 1817, when he was summoned home in consequence of his father having suffered a severe attack of paralysis. While on the North American station in the La Hogue he drew up a little work for the use of the junior officers of the fleet on that station, and distributed it in manuscript. It was afterwards printed, under the title of 'Nautical Astronomy by Night, comprehending Practical Directions for knowing and observing the Principal Fixed Stars of the Northern Hemisphere; to which is prefixed a Short Account of the most interesting Phenomena in the Science of Astronomy; the whole illustrated by several Engravings,' 4to.

Lieutenant Parry was desirous of joining the expedition to the river Congo in Africa, but owing to his having been detained at the Bermudas, he did not reach England till the end of 1817, when it was too late. Meantime, in consequence of a report that the Arctic seas were then much less encumbered with ice than usual, the Admiralty had fitted out two expeditions for those seas, one under Captain Buchan and Lieutenant Franklin, to proceed by Spitzbergen to the North Pole; the other under Commander John Ross for the purpose of exploring Baffin's Bay, and ascertaining the probabilities of a North-West Passage from the Atlantic to the Pacific. Parry having heard of these expeditions, wrote to request employment, observing that he was "ready for hot or cold, Africa or the Arctic regions." When he arrived in London, he was introduced to Mr. Barrow, secretary to the Admiralty, who soon afterwards appointed him to the command of the Alexander, under the orders of Captain Ross in the Isabella. The Isabella, followed by the Alexander, left the Thames at the end of April 1818. On the 19th of August the two ships were off Smith's Sound at the northern extremity of Baffin's Bay. They then turned southwards, sailing along the western coast, passed the mouth of Jones's Sound, and on the 30th reached the wide opening of Lancaster Sound. The water was deep and free from ice, and on the following day both ships under a press of sail were steering westwards up Lancaster Sound. Parry was full of expectation, as were all the crew on board the Alexander, when suddenly the Isabella tacked, turned her head eastwards, and rejoined the Alexander. Both vessels then retraced their course, and Lancaster Sound was left behind. Commander Ross had imagined that he saw high land, which he named the Croker Mountains, barring the passage to the westward. The two vessels entered the Thames on their return in November of the same year.

Lieutenant Parry's opinion that there was an open passage up Lancaster Sound, and that the Croker Mountains were a mistake, though privately expressed, was soon known at the Admiralty. He had interviews with Mr. Barrow, and was introduced to Lord Melville; and a second expedition for the discovery of a North-West Passage having been resolved upon, the Hecla and Griper were taken into dock at Deptford to be repaired and strengthened for service in the Arctic seas. Parry was appointed to the command of the Hecla and of the expedition, Lieutenant Liddon being placed under his orders in the Griper. The expedition left the Thames on the 11th of May 1819, and having sailed up the eastern side of Davis's Strait and Baffin's Bay, on the 21st of July they were in 73° N. lat., nearly opposite to the entrance of Lancaster Sound, but with extensive masses of ice to the west interrupting their passage to it. Through these masses however, with excessive labour and frequently exposed to great danger of being crushed, the ships forced their way; and on the 29th of July reached open water on the western side of the ice, having passed through eighty miles of it. They entered Lancaster Sound, and sailing westward through the imaginary Croker Mountains, on the 4th of September crossed the meridian of 110° W. long. in 74° 44′ 20″ N. lat., by which they became entitled to a reward of 5000*l.*, offered by an order in council to such of his Majesty's subjects as might succeed in penetrating thus far to the westward, within the Arctic Circle. Parry gave the name of Barrow's Strait to the continuation of Lancaster Sound; discovered Melville island, on its northern side, and from its vicinity descried the high coast on the southern side, which he named Banks' Land, but which Sir Robert M'Clure has since ascertained to be the northern side of Baring Island. Parry also discovered Prince Regent's Inlet and the Wellington Channel, and penetrated as far as 113° 54′ 43″ W. long. On the 26th of September, after three days of arduous labour in cutting a channel, with the thermometer nearly at zero, both ships were got safely into their station at Winter Harbour, on the south shore of Melville Island. There the ships remained frozen up, with the sun entirely below the horizon from the 11th of November to the 7th of February, and were not released from the ice till the beginning of August 1820. After making several attempts to advance farther westward, they were compelled to return to England, and entered the Thames in November 1820. On the 4th of the same month Lieutenant Parry was promoted to the rank of commander; and several other rewards and honours, F.R.S., &c., were bestowed upon him. His 'Journal of a Voyage for the Discovery of a North-West Passage,' 4to, 1821, with maps and engravings, was published by authority of the Lords Commissioners of the Admiralty.

Arrangements were soon afterwards made for another expedition. Captain Parry received a commission, dated December 30, 1820, for the Fury, with Captain G. F. Lyon under his orders in command of the Hecla. This expedition was much less fortunate than the former. It sailed from the Nore on the 8th of May 1821, and having entered Hudson's Strait, on the 8th of October the ships were frozen in at Winter Island, where they remained till the 2nd of July 1822. They were then released, and sailed northward up Fox Channel. Having discovered the Fury and Hecla Strait, the ships were again frozen in on the 31st of October at the island of Igloolik, at the eastern end of Fury and Hecla Strait. There they remained till the middle of August 1823, when they commenced their voyage homewards, and entered the Thames in October. During his absence Captain Parry had been promoted to the rank of post-captain, November 8, 1821. His 'Journal of a Second Voyage for the Discovery of a North-West Passage, from the Atlantic to the Pacific, performed in the Years 1821-22-23,' 4to, 1824, was published by authority of the Lords of the Admiralty. On the 1st of December 1823 Captain Parry was appointed Acting Hydrographer to the Admiralty.

The Hecla and Fury were soon afterwards refitted for another Arctic voyage, the Hecla commanded by Captain Parry and the Fury by Captain H. P. Hoppner. They sailed from the Thames on the 8th of May 1824, passed the following winter at Port Bowen in Prince Regent's Inlet, and remained there frozen up from the 28th of September till the 20th of July, 1825. The Fury was shortly afterwards wrecked, and the Hecla reached England, with a double ship's company, in the following October. Parry's 'Journal of a Third Voyage for the Discovery of a North-West Passage' was similarly published, in 4to, in 1826.

After his return Captain Parry was appointed Hydrographer to the Admiralty, and continued to perform the duties of the office till the 10th of November 1826. Having then proposed a plan for reaching the North Pole, and obtained sanction for it, he was again appointed to the command of the Hecla for that purpose, and sailed from the Thames on the 3rd of April 1827. The Hecla was secured in Treurenberg Bay, on the north coast of Spitzbergen, on the 21st of June; and on the 22nd two flat-bottomed boats, which had been prepared for the enterprise, left the ship, and proceeded northward. One boat, with twelve men, was commanded by Captain Parry; the other, with the same number of men, by Lieutenant James C. Ross. The remainder of the crew, under Lieutenant Foster, remained in charge of the Hecla. With excessive labour the boats were paddled through the water and dragged over the ice till they attained the latitude of 82° 45′, which is the nearest point to the North Pole ever yet reached. Finding then that a current was taking them southward as fast or faster than they could advance northward, they commenced their return, and reached the Hecla on the 21st of August, after an absence of sixty-one days. The Hecla began her return voyage on the 28th of August, and Captain Parry reached London at the end of September. This expedition terminated Parry's arduous labours in the Arctic regions. His 'Narrative of an Attempt to reach the North Pole in Boats fitted for the Purpose, and attached to his Majesty's Ship Hecla, in the Year 1827,' 4to, was published by authority of the Duke of Clarence, then Lord High Admiral.

Captain Parry resumed his situation as hydrographer; but, as his health suffered considerably from close attention to the duties of his sedentary occupation, he accepted the office of Commissioner of the Australian Agricultural Company in New South Wales. Previously however to his departure from England, he received the honour of knighthood from George IV., together with Sir John Franklin, April 29, 1829; and he and Franklin had, also together, the degree of D.C.L. conferred on them by the University of Oxford. Sir Edward Parry sailed from the Thames for Australia on the 20th of July, and reached Sydney on the 13th of December. His residence as commissioner was at Port Stephens, about 90 miles north from Sydney. He entered the Thames on his return, with his wife and family, in November 1834.

In March 1835 Sir Edward Parry was appointed an Assistant Poor-Law Commissioner in the county of Norfolk; but his health giving way under the pressure of work, he resigned the office within a year. In 1837 he was appointed to organise the packet-service between Liverpool and Ireland. From the 19th of April 1837 to the 2nd of December 1846 he was Comptroller of Steam Machinery for the Royal Navy. He then retired from active service, receiving the appointment of Captain-Superintendent of the Royal Clarence Yard and of the Naval Hospital at Haslar, near Portsmouth. On the 4th of June 1852 he attained the rank of Rear-Admiral of the White. At the end of 1853 he received the appointment of Lieutenant-Governor of Greenwich Hospital, a situation which he retained till his death, which took place on the 7th of July 1855, at Ems in Germany, where he had been residing for the benefit of his health. His body was brought to England, and interred in the cemetery at Greenwich.

Sir Edward Parry married, October 23, 1826, Isabella Louisa, fourth daughter of the first Lord Stanley of Alderley. She died May 13, 1839. On the 29th of June 1841 he married the daughter of the Rev. Robert Hankinson, of Walpole in Norfolk, and widow of Samuel Hoare, jun., Esq. By his first wife he had two sons and two daughters, and by his second wife, who survives him, two daughters.

A life of Sir Edward Parry, has been published recently, 'Memoirs of Rear-Admiral Sir W. Edward Parry, Knt., F.R.S., &c., late Lieutenant-Governor of Greenwich Hospital, by his Son, the Rev. Edward Parry, M.A., of Balliol College, Oxford, and late Tutor in the University of Durham,' cr. 8vo, London, 1857.

PARSONSTOWN. [Birr.]

PARTNERSHIP. [Joint-Stock Companies, *S.* 2.]

PASENG. [Goat.]

PASKEVICH, IVAN FEDOROVICH, a Russian field-marshal, Prince of Warsaw, and Viceroy of Poland, was descended from a family of the Greek religion, bearing the name of Paskiewicz, which was driven from Poland in the 17th century by the persecution of the Jesuits. He was born on the 19th of May (new style) 1782, at Pultowa or Pultava, famous for the battle which decided the ascendancy of Russia over Sweden. After receiving his education at St. Petersburg, he held the appointment first of page and afterwards of aide-de-camp to the Emperor Paul, and subsequently to the Emperor Alexander. He first saw service at the great battle of Austerlitz in 1805. In 1806 he was sent with the Russian ultimatum to the Porte, and in those days of Turkish barbarism owed to his own determination and activity his escape from Constantinople with his life. Not long afterwards he was taken up for dead from the ditch of Brailov, where he had mounted to the assault: he was promoted as a reward to the rank of colonel, and from that time his advancement was rapid. In the great campaign against the French in 1812 he fought at Borodino, and afterwards being put in command of a division, which at first amounted to only 4000 men, but subsequently rose to 30,000, took an active share in the triumphant campaign in Germany, and was one of the captors of Paris. After the peace he accompanied the Grand Duke Michael on a three years' tour through Europe. On the accession of the Emperor Nicolas in 1825 he was named successor to Yermolov, in command on the Persian frontier, at the time of the outbreak of the war with Persia. So high had the name of Yermolov risen, that it was doubted by the Russians, probably for the first time in Russian history, if a subject would yield obedience to the emperor's orders, and it even occasioned some surprise that 'the King of the Caucasus' allowed himself to be dethroned so easily. Paskevich, on the 25th of September 1826, defeated the Persians under Abbas-Mirza at Elizavethpol; later in the same year he crossed the Araxes; early in the next he conquered all Persian Armenia, and on the 13th of October he took by assault Erivan, and thenceforth by the emperor's order bore the name of Paskevich-Erivansky to commemorate the exploit. The peace with Persia, established by the treaty of Turkmanchai (22nd of February 1828), was almost immediately followed by war with Turkey. In 1828 Paskevich took Kars, and in the following year Erzerum, receiving in reward the title of field-marshal. A year of desultory warfare against the Circassians in 1830 was followed in 1831 by the campaign against the Poles, to whom the name of Paskevich sounded as that of a countryman. He took the command of the Russian army after the death of Diebitsch, and, more fortunate than his predecessor, was soon able to announce the fall of Warsaw. Raised to the rank of Prince of Warsaw, and made Governor-general of Poland, he promulgated the organic statute of the 26th of February, 1832, which unites Poland to Russia, and for the next sixteen years carried out his plan of subjecting the country, one of the main points of which was the conversion of Warsaw into a strong fortress against its own inhabitants not less than against an invading army. He succeeded so well, that 1848 passed over Russian Poland without a revolt, and in 1849 the Emperor Nicolas could spare him to crush the Hungarians. As on former occasions, his plans did not meet the approbation of military critics, but with his usual good fortune he was enabled to commence a despatch to the emperor in August with the words, "Hungary is at your feet." In 1850 the jubilee of his fiftieth anniversary in the service was celebrated with great rejoicings at Warsaw, and on this occasion the Emperor of Austria and the King of Prussia nominated him a field-marshal in their respective armies. This was the culminating point of Paskevich's long career. When the recent war broke out between Russia and Turkey, the veteran was again summoned to the field, much, it is said, against his will. He planned the campaign against the Turks, which terminated disastrously for the Russians in the repulse of their attack on Silistria, and in that repulse Paskevich himself, then past his seventieth year, received a severe contusion. From this time he seems never to have thoroughly rallied, and after a long and tedious illness he expired at Warsaw on the 29th of January 1856.

Marshal Paskevich was married to a lady who was a relative of the poet Griboyedov, his companion in some of his Persian campaigns, and had by her four children, one of whom, a son, Fedor, is a colonel of the Russian guards, and has also made his appearance as an author. A separate life of the marshal in French was published by Tolstoy at Paris in 1835.

PASSER. [Sparrow.]

PASSIFLORACEÆ, *Passion-Flowers*, a natural order of Hypogynous Exogenous Plants. This order is included by Lindley in his alliance *Violales*. It is characterised by possessing polypetalous or apetalous coronetted flowers; perigynous imbricated petals; stamens on the stalk of the ovary; simple terminal styles; arillated seeds; and stipulate leaves. The species are herbaceous plants or shrubs, usually climbing, very seldom erect.

Considerable difference of opinion exists among botanists as to the real nature of the floral envelopes of this remarkable order. Jussieu and De Candolle, regarding the parts called petals as a second row of sepals, have made the order apetalous; whilst Lindley and others have regarded the second row of floral envelopes as petals, and made it polypetalous. Lindley makes the affinities of this order with *Samydaceæ*, *Capparidaceæ*, *Malesherbiaceæ*, and *Papayaceæ*.

Most of the useful properties of this order are included in the genus *Passiflora*. [Passiflora.] *Murucuja ocellata*, a West Indian Climber, is said to be anthelmintic and diaphoretic. Besides the fruit of several species of *Passiflora*, the fruit of *Tasconia mollissima*, *T. tripartita*, *T. speciosa*, and *Paropsia edulis* are all of them edible. The species are principally found in South America. There are 10 genera and about 216 species.

PASSION-FLOWERS. [Passifloraceæ, *S.* 2.]

PATELEY-BRIDGE. [Yorkshire.]

PATENT. The Law with respect to Patents has been greatly simplified and improved by the statute 15 & 16 Vict. c. 83, the fees payable for a patent have been reduced, and the payment of them spread over several years. One patent now suffices for the United Kingdom; and is no longer void as formerly from trifling inaccuracies in the specification, as these may now be disclaimed. A Register of Patents has likewise been provided, in which disclaimers, assignments, and licences must be recorded.

PATRINGTON. [Yorkshire.]

PAULUS, HEINRICH EBERHARD GOTTLOB, was born on September 1, 1761, at Leonberg, near Stuttgart. He first proposed devoting himself to the study of medicine; but becoming attached to the sect of Pietists, he soon turned his attention to theology, and proceeded to Tübingen, where he pursued his studies. By the liberality of the Baron von Palm he was shortly enabled to travel in Franconia and Saxony, in order to examine the state of education. He afterwards studied the Oriental languages at Göttingen, and then again assisted by Palm, proceeded to London and Oxford to prosecute his studies. On his return to Germany he was appointed in 1789 professor of the Oriental languages in the University of Jena. Here he occupied himself in illustrating and explaining the Old and New Testaments in a philological-historical manner, which he first developed to the world in his 'Clavis über die Psalmen,' 1791, and 'Clavis über den Jésaias,' 1793, with others. To these succeeded his 'Philologisch-kritischer und historischer Commentar über das Neue Testament,' which was given to the world in 4 volumes from 1800 to 1804, which made a great impression, and added much to his reputation. In 1793, on Döderlein's death, he was created professor of theology, but on account of his health, he removed in 1803 to Würzburg in a similar capacity, where he became also a counsellor of the consistory and government. On the abolition of the Protestant theological professorship at Würzburg, he was sent to inspect the state of the schools and churches, in 1808 to Bamberg, in 1809 to Nürnberg, and in 1811 to Ansbach. In this year a call to the chair of exegesis and church history in the University of Heidelberg restored him to his academical life, and to his literary activity. In 1814 the endeavours then being made to give a constitution to his native state of Würtemberg excited his attention, and in 1819 he commenced writing in a periodical work called 'Sophronizon,' in which his essays upon passing important subjects, such as proselytising, upon the influence of the Papist government on the national Roman Catholic Church of Germany, and others, gained great applause. In this he continued to write till 1829. As a theological writer he was anxious to warn his readers equally against a one-sided nationality and a speculative deviation from the original doctrines of Christianity, as from mysticism and Jesuitism. With these ideas he began in 1825 a theological year-book, called 'Der Denkgläubige,' published from 1825 to 1829, and another journal called 'Kirchenbeleuchtungen,' published in 1827. Among his other numerous writings we may mention 'Memorabilien,' published in parts from 1791 to 1796; 'Sammlung der Merkwürdigsten Reisen in dem Orient,' in 7 vols., published from 1792 to 1803; 'Leben Jesu, als Grundlage einer reinen Geschichte des Urchristenthums,' 2 vols. 1828; 'Aufklärende Beiträge zur Dogmen- Kirchen- und Religions-Geschichte,' 1830; 'Exegetisches Handbuch über die drei ersten Evangelien,' 3 vols., 1830 to 1833; 'Skizzen aus seiner Bildungs- und Lebens-Geschichte, zum Andenken an sein fünfzigjahriges Jubiläum,' 1839; and the 'Vorlesungen Schelling's über die Offenbarung,' accompanied with critical remarks. Few men have had a wider influence upon religious opinions in Germany than Paulus, though many of his views have been contested as too rationalistic. In 1844 on account of his great age he was allowed to retire from his situation on a pension, and he died on August 9, 1850, aged ninety.

PAUPERISM. [POOR-LAWS, *S.* 2.]

PECULIAR. The jurisdiction of all Royal and other Peculiars in the probate of Wills and the grant of Administrations has been transferred to the new Court of Probate. [PROBATE, COURT OF, *S*, 2.]

PEDICELLARIA, the name given by Müller to little pincer-shaped bodies found on the surface of many species of star-fishes and sea-urchins. When seen on the surface of the dried specimens they appear like little cleft spines. In *Uraster rubens*, according to Dr. Sharpey, they cover the surface generally, and are more numerous round the spines. Each one of these little bodies consists of a soft stem, which bears on its summit a little forceps of calcareous matter. If anything is introduced between the blades of these forceps when the animal is alive, it is instantly grasped with considerable force. Those on the body and upper spines differ in shape from those on the spines immediately bordering the avenues. When the star-fish is living the blades of the forceps are in continual activity, but when cut off they seem to lose that power. These bodies have been observed by Sars in *Echinus sphæra*, and he describes three species—*P. tridens*, *P. triphylla*, and *P. globifera*.

The question of the nature of these bodies has been often agitated. Whilst Müller and others have considered them to be parasitic animals, Oken, Sharpey, and Sars regard them as organs of the animal. Sars assigns the following reasons for his belief:—

1. The *Pedicellariæ* are found in the same species of *Echinodermata* under all circumstances, which would not be the case if they were parasitical animals.

2. The structure of the calcareous forceps and stems to which they are attached, bear structurally a greater resemblance to the spines of the *Echinodermata* than to other structures.

3. The *Pedicellariæ* have a vital connection with the skin and shell of the *Echinus*. The stem of the *Pedicellaria* is attached to a knob of the shell of the *Echinus*, on which it moves.

4. Sars states that when a single *Pedicellaria* is irritated, the rest are inclined towards it.

Although Professor E. Forbes states that he was not able to confirm Sars's observation on the two last points, he was nevertheless inclined to adopt the opinion that they were peculiar organs of the *Echinodermata*, rather than parasitic animals.

(E. Forbes, *British Star-Fishes.*)

PEDILANTHUS, a genus of Plants belonging to the natural order *Euphorbiaceæ*. It has a common slipper-shaped involucre. The male flowers several in the circumference. Pedicels bracteolate, each articulated with a naked anther. Female flowers one in the centre. Calyx wanting; style 1; stigmas 3; capsules 3-coccus.

P. tithymaloides, Jew-Bush, is found in various parts of the West Indies in stony bushy places, near the coast. It is a shrub throwing out runners, erect, about six feet high, abounding in white bitter milk. The stems are numerous, weak, soft, as thick as the finger; when old cinereous, when young green. The leaves are ovate, obtuse, or acute; coriaceous, entire, alternate, stalked, distichous, when young downy on each side, and wavy at the edges, becoming at last quite smooth and flat. Peduncles 1-flowered, short, clustered about the extremities of the branches. Involucre slipper-shaped, bright-red with a green back. The practitioners of Curaçoa give a decoction of the whole plant, especially of the stem, as the ordinary beverage, and in large doses in some diseases. The root is emetic.

PEEL, SIR ROBERT, the second baronet of the name, was born on the 5th of February, 1788, near Bury in Lancashire, the eldest son and third child of the first Sir Robert Peel. He was educated first at Harrow school, where he had Lord Byron for his class-fellow, and afterwards at Christ Church, Oxford, where he graduated B.A. in 1808. Both at school and at the university he was distinguished by his talents, his studiousness, and the solid perseverance of his character; and, on quitting the university he took what was then (the modern examination system having been but recently introduced) the unprecedented honour of a double first-class—i. e. of paramount excellence both in classics and in mathematics. He had scarcely left college when, in 1809, at the age of twenty-one he was returned to the House of Commons as member for Cashel. His father had destined him for a political career, and from the time of his first entrance into Parliament he was placed in a position of absolute independence by an allowance out of his father's income equal in amount to the fortune of many a nobleman.

On entering Parliament Mr. Peel attached himself to the Tory party, to which his father already belonged. Perceval was then prime minister, and Canning and Castlereagh were his most powerful coadjutors; while on the Whig benches sat Sheridan, Tierney, Whitbread, Horner, Brougham, Romilly, and Sir Frances Burdett. The elder Peel had made no secret of the great expectations he entertained of his son's success in Parliament; and the young man's first steps in the walk of life for which he had been confessedly trained, were looked at with much interest and with some jealousy. But Mr. Peel was prudent, and was in no haste to measure himself against the established orators of the House. His first speech of any length was in January, 1810, when he seconded the address at the opening of the session. His subsequent votes and speeches gained him the reputation of a steady and able young man, from whom much might be expected; and this, coupled with the weight which he possessed as the son of a man of so much commercial influence, led to his appointment, in 1811, to the office of under-secretary for the colonies. It was the time of the Peninsular War, and of the great struggle with Napoleon, of which that war formed a part; and as purely colonial questions were of comparatively small importance in the midst of events of so engrossing a nature, Mr. Peel had not many opportunities of displaying his powers in his first office, whether as an administrator or as a parliamentary speaker. Whatever he did however brought him a clear accession of parliamentary reputation.

The assassination of Mr. Perceval on the 11th of May, 1812, occasioned the formation of a new Tory ministry.

The Earl of Liverpool became premier with Lord Castlereagh as foreign secretary, Lord Sidmouth as home secretary, Lord Eldon as chancellor, and others of the seniors of the same party in other places of the cabinet; while among the ministers out of the cabinet were Viscount Palmerston as secretary at war, the Duke of Richmond as lord-lieutenant of Ireland, and Mr. Peel as chief secretary for Ireland. The post accepted by Mr. Peel in this ministry, stationing him as it did in the midst of the tempestuous sea of Irish politics, was no very enviable one. The Irish agitation connected with the union of 1800 had not yet subsided; the agitation for Catholic emancipation was fiercer than ever; and Mr. O'Connell had just become the leader of the Irish people, and was singling out objects against which to direct the full force of the popular wrath. The young secretary for Ireland was identified with the anti-Catholic policy of the existing ministry; he was nick-named 'Orange-Peel;' and Mr. O'Connell seemed from the first to conceive an implacable hatred to him personally. After various manifestations of this animosity, Mr. O'Connell in May, 1815, attacked him in one of his public speeches in terms so directly insulting that a challenge was the consequence. Some delay however having occurred in settling the preliminaries, the duel was prevented by the interference of the police. It became more evident afterwards than it was at that time that, though Mr. Peel opposed the claims of Roman Catholic emancipation, and backed the ministry with which he was connected in their resistance to those claims, his notions with respect to the government of Ireland were by no means those of the extreme Orange party. "From his first entrance," says one of his biographers, "upon the tumultuous arena of Irish politics to the end of his life, he would, if he could, have quenched the fiercer polemics that consumed the country amid their fires, in the cooler element of practical and secular education; but this was far beyond his power. His encouragement of schools, where the strife of religious proselytism might be merged in the soberer pursuits of ordinary mental culture, was only attributed to lukewarmness by one party and to infidelity by the other; and by the diligence alone with which he sought to remedy the multiform abuses and total want of order which existed in the details of his own office, did he gain credit in Ireland with either party. In all else, for his own party he was too temporising, for the emancipationists too exacting." To all intents and purposes however he acted consistently with his position as Irish secretary under the Liverpool administration. Not only did he oppose Mr. Grattan's motion for a committee to consider the Roman Catholic claims in February, 1813, and again Sir Henry Parnell's motion on the same subject in 1815, but his speeches on both these occasions were the ablest that he had yet delivered, and among the most telling on that side of the debate. They scarcely grappled with the question on the ground of essential principle, but strongly and skilfully laid hold of the points of real practical difficulty. The truth is that a mind so thoroughly cool, English, and moderate as that of Peel, must have felt itself out of its element when charged, in a subordinate capacity, with the management of Irish affairs at a time of such heat and frenzy. Accordingly, as soon as an opportunity offered, he vacated the Irish secretaryship. The war with Napoleon I. was at an end; Waterloo had brought peace; Europe had been re-arranged by the Treaty of Vienna; and the Liverpool-Castlereagh ministry, with gradually increasing unpopularity, was addressing itself to the home-questions the discussion of which forms the chief part of the history of the Regency. Such was the state of affairs when Mr. Abbott, the Speaker of the House of Commons, having retired into the Upper House as Lord Colchester, and a vacancy having in consequence occurred in the representation of the University of Oxford, Mr. Peel was elected his successor (1818). Mr. Canning aspired to the honour; but the influence of Lord Eldon, and the conviction entertained by the university of the orthodoxy of Mr. Peel's views on the Roman Catholic question, determined the choice. Mr. Peel then, greatly to the regret and not a little to the damage of the government, already far from firm, resigned his post without accepting another.

From 1818 till 1822 Mr. Peel had no official connection with the Liverpool-Castlereagh ministry. He continued, however, to give it his extra-official support in all measures of consequence. It was during this period, too, that by the leading part he took in the pressing currency questions of the day, he laid the foundation of his subsequent fame as a financier. He had already shown his sympathy with the views of what was then called the Economist party, of which Mr. Horner during his life had been the head, and to which the House about this time received a powerful accession in Mr. David Ricardo; and on the appointment of a Bank-Committee in February 1819, to consider the question of a resumption of cash payments and other allied questions, rendered necessary by the commercial distresses attending the transition from a state of war to one of peace, Mr. Peel, then only thirty-one years of age, was appointed chairman, having among his colleagues Canning, Castlereagh, Vansittart, Tierney, Huskisson, Frederick Robinson, and Sir James Mackintosh. In the proceedings of this committee and the debates which arose out of them, Mr. Peel displayed his ability both as a speaker and as a man of business; and it was in May 1819 that, in moving resolutions involving a resumption of cash-payments, he constituted himself the champion, to use his own words, of "the old, the vulgar doctrine, as some called it, that the true standard of value consisted in a definite quantity of gold bullion." "Every sound writer on the subject," he said, "came to the same conclusion, that a certain weight of gold bullion, with an impression on it denoting it to be of that certain weight, and of a certain fineness, constituted the only true, intelligible, and adequate standard of value." Though these views were carried into effect by parliament, there were not wanting members who demurred to them; and among these was Mr. Peel's father, Sir Robert. Besides this currency question, the further history of which we need not trace, Mr. Peel in the same year took part with the Liverpool government in their opposition to the then revived agitation for Parliamentary Reform. He approved of the famous 'Six Acts;' and—what was long afterwards remembered by the other party to his discredit—he defended, with a vigour all the more remarkable that he was not called upon to exhibit it by any official connection with government, the conduct of the magistracy in the so-called 'Manchester massacre' of August 1819. He kept aloof however, with studious caution, from the ministerial proceedings in the case of Queen Caroline, which followed the demise of George III. and the accession of George IV. to the throne (January 29, 1820), and which were terminated by the queen's death in August, 1821. It was in the midst of this storm of matrimonial politics that Mr. Peel himself married. His wife was Julia, the youngest daughter of General Sir John Floyd, Bart. The marriage took place on the 8th of June, 1820.

George IV. having retained the Liverpool ministry in office, Mr. Peel was induced again to become a member of it. In January, 1822, he took office as secretary of state for the home department. A further modification of the ministry was caused by the suicide, in August, of Lord Castlereagh, whom Mr. Canning succeeded in the foreign secretaryship. Till the fatal illness of Lord Liverpool (April, 1827) broke up this ministry, Mr. Canning and Mr. Peel continued to be the most prominent and active members of it—agreeing sufficiently to co-operate, but having at the same time certain differences. While Mr. Canning was liberalising the foreign policy of the country, Mr. Peel was busy with new forms of the currency-question peculiar to a time of unusual commercial distress and panic. While Mr. Canning was favourable to a consideration of the Roman Catholic claims, Mr. Peel, as before, opposed them, though with a growing conviction that the opposition could not be long continued. Both remained opposed to parliamentary reform. Prior to the time of Lord Liverpool's resignation his ministry was broken into two parties—the Old Tory or Eldon-Peel party who stood opposed to the Roman Catholic claims, and of whom Mr. Peel was the active leader; and the more liberal party, who, with Canning as their leader, were approximating to the Whigs. The question, on Lord Liverpool's retirement, was whether by the appointment of a nobleman of high rank and influence, such as the Duke of Wellington, to succeed him, the two parties could be held together, or whether a new ministry should be formed of which Canning should be the head. The second was the alternative which actually came to pass. The king, though personally hostile to the Roman Catholic claims, empowered Mr. Canning to form a ministry in which the Roman Catholic question should be an open one, but which should be pledged to resist parliamentary reform or any repeal of the Test and Corporation Act. In this ministry, the formation of which was regarded as a new epoch in the political history of the country, and was accordingly welcomed by many of the leading Whigs, Mr. Canning held the Chancellorship of the Exchequer together with the premier's usual office of First Lord of the Treasury; and the blanks in the administration caused by the secession of Lord Eldon, Mr. Peel, the Duke of Wellington, Lord Melville, and others, were filled up by the selection of men willing to act along with Mr. Canning—among whom was Mr. Robinson (now created Lord Goderich) as Colonial Secretary, and Sir John Copley (now Lord Lyndhurst) as Lord Chancellor (April 1827). [CANNING, GEORGE.]

On Mr. Canning's death (Aug. 8, 1827), his anomalous ministry, so delicately poised between the Tories and the Whigs, was continued for a few months by Lord Goderich; but on his resignation, in January 1828, a new ministry was formed of the old Tory construction, with the important and significant exception, that Lord Eldon was not re-instated in the chancellorship, but Lord Lyndhurst continued in it. The following was the composition of the cabinet of this memorable administration, which, from the names of its two chiefs, is now usually called the Wellington-Peel Administration:—First Lord of the Treasury, the Duke of Wellington; Chancellor of the Exchequer, Mr. Goulburn; Lord Chancellor, Lord Lyndhurst; President of the Council, Earl Bathurst; Lord Privy Seal, Lord Ellenborough; Foreign Secretary, Lord Dudley and Ward; Colonial Secretary, Mr. Huskisson; Home Secretary, Mr. Peel; Master of the Mint, Mr. Herries; President of the India Board, Lord Melville; President of the Board of Trade, Mr. Grant; Secretary at War, Lord Palmerston. The ministry was afterwards modified by the secession of Mr. Huskisson. Its great act was the passing of the Roman Catholic Relief Bill—a measure the eventual necessity of which Mr. Peel had been prepared for; which was now pressed to an issue by the overwhelming influence of the Catholic Association in Ireland, as shown in the election of Mr. O'Connell to the House of Commons for the county of Clare, and which the ministry determined on as soon as the king had given his reluctant consent. On the 5th of March 1829, Mr. Peel—who had in the meantime been rejected by the University of Oxford in favour of Sir Harry Inglis, whose anti-Roman-Catholic principles recommended him—brought forward the Relief Bill in the Commons, as member for the close borough of Westbury. His speech on this occasion was not only powerful at the time, but is interesting now as revealing what may be called the cardinal principle of Mr. Peel's career as a statesman. "We are placed," he said, "in a position in which we cannot remain. We cannot continue stationary. There is an evil in divided cabinets and distracted councils which cannot be longer tolerated. . . . . Supposing this to be established, and supposing it to be conceded that a united government must be formed, in the next place I say that government must choose one of two courses. They must advance or they must recede. They must grant further political privileges to the Roman Catholics, or they must retract those already given. . . . . I am asked what new light has broken in upon me? Why I see a necessity for concession now which was not evident before? The same events, I am told, have happened before, and therefore the same consequences ought to follow! Is this the fact? Are events in politics like equal quantities in numbers or mathematics, always the same? Are they, like the great abstract truths of morality, eternal and invariable in their application? May not the recurrence—the continued recurrence—of the very same event totally alter its character, at least its practical results?" Mr. Peel on this occasion spoke out, as a statesman, the general sense of the nation; and the Emancipation Act, after running the gauntlet of the Upper House, became law. Besides this great measure, Mr. Peel, as Home Secretary, introduced other measures, including the New Metropolitan Police Act, which provided London with its efficient body of 'Peelers,' subject to the Home Office, in lieu of the old 'Charlies.' Questions of currency also occupied him during this administration.

Though the Wellington-Peel government had yielded on the Roman Catholic Relief question, they were not prepared to yield on the great constitutional question of Parliamentary Reform. When in February 1830, Lord John Russell moved the question of disfranchising one or two corrupt small boroughs, and transferring the representation to some of the large commercial towns then unrepresented, Mr. Peel opposed the motion, "because it introduced a principle into the system of representation—that of mere numbers—which he said was the ultra-democratic principle, and with which the aristocratic and monarchical principle could not long coexist." The death of George IV. however (June 26, 1830), and the accession of William IV., followed as it was by an immediate dissolution of Parliament, and a general election (not to speak of the concurrent influence of the French Revolution of July), rendered the continued refusal of Parliamentary Reform impossible. After the re-assembling of Parliament on the 2nd of November 1830, the Duke again repudiated reform absolutely; but Mr. Peel's language, though also negative, was more guarded. Amidst violent excitement, the ministers resigned; and a Reform ministry—the first Whig ministry since 1807—was constituted the same month under the premiership of Earl Grey. Lord Brougham became Lord Chancellor; Lord Palmerston, Foreign Secretary; the Marquis of Lansdowne, President of the Council; Lord John Russell, Paymaster of the Forces; Lord Althorp, Chancellor of the Exchequer; and Mr. Peel was succeeded in the Home secretaryship by Lord Melbourne. It was at this juncture that the death of Mr. Peel's father raised him to the baronetcy and the estates.

For the first time in his life Sir Robert Peel was now in open opposition. He opposed with great determination the Whig schemes of reform, but in such a manner as to indicate his private conviction, from an observation of public opinion, that *some* change in the representative system was inevitable. His conduct in fact, during the whole of the Reform Bill crisis, had an important influence on the result. He declined at the last moment to join with the Duke of Wellington in the attempt to form a ministry to supersede that of Earl Grey. The Duke of Wellington withdrew his opposition: on the 4th of June 1832 the Reform Bill passed the Lords, and three days afterwards it was law. In January 1833 the first reformed Parliament met. Sir Robert Peel was returned for Tamworth, which he continued to represent during the rest of his life.

Acquiescing in the new state of things, and abandoning all idea of abrogating the constitutional change which had occurred, it was now Sir Robert's aim to organise, what he called a 'Conservative' party, as distinct either from that of the Whigs, or that of the inveterate Tories. Supported in this aim by the Duke of Wellington and others, whose views took the same shape, he acted as a vigilant, but not factious, critic of the various important measures introduced by the Whigs into the Reformed Parliament; first, under the premiership of Earl Grey; and, next, under that of Lord Melbourne. He gave his support to the Irish Coercion Bill; he advocated the abolition of negro slavery in the colonies, but advised great caution in the practical steps for carrying it into effect; and he acted a cautious part in the debates on the Poor Law Amendment Act of 1834, but, on the whole, approved of that momentous change. These measures were carried while Earl Grey was still premier; but before the prorogation of Parliament in August, 1834, Lord Grey had been succeeded by Lord Melbourne, with Lord Althorp as his Chancellor of the Exchequer. The death of Lord Althorp's father, Earl Spencer, in November 1834, having raised him to the Upper House, the king, to the surprise of all, availed himself of the ministerial difficulty thus occasioned to dismiss the Whig Ministers altogether, and call the Duke of Wellington to his councils. Sir Robert Peel, who had not expected any such event, was then at Rome with his family. Being sent for, however, he hastened back to London, where he arrived on the 9th of December; the Duke, who had, in the mean time, acted provisionally as minister, immediately consulted with him, and a Conservative Ministry was arranged as follows:—First Lord of the Treasury and Chancellor of the Exchequer, Sir Robert Peel; Lord Chancellor, Lord Lyndhurst; President of the Council, Lord Rosslyn; Privy Seal, Lord Wharncliffe; Foreign Secretary, the Duke of Wellington; Home Secretary, Mr. Goulburn; Colonial Secretary, Lord Aberdeen; First Lord of the Admiralty, Earl de Grey; Master of the Ordnance, Sir George Murray; President of the Board of Trade and Master of the Mint, Mr. Alexander Baring; President of the India Board, Lord Ellenborough; Paymaster of the Forces, Sir E. Knatchbull; Secretary at War, Mr. Herries; Secretary for Ireland, Sir Henry Hardinge.

Sir Robert Peel's first premiership was but short. It began in December, 1834, and in April 1835 it was at an end. On assuming office, Sir Robert, in a letter to the electors of Tamworth, had made a manifesto of the intended policy of his Conservative ministry. "With regard to the Reform Bill," he said, "I will now repeat the declaration which I made when I entered the House of Commons as a member of the Reformed Parliament, that I consider the Reform Bill a final and irrevocable settlement of a great constitutional question—a settlement which no friend to the peace and welfare of this country would attempt to disturb, either by indirect or insidious means." Proceeding on this as a fixed principle, the new ministry was to govern the country in a Conservative spirit, but with a readiness to carry into effect certain minor domestic reforms which were indicated. This policy, however, while perhaps it was not satisfactory to the remnant of the old Tories, was certainly not satisfactory to the country at large. The Reform Bill had not, indeed, produced all the results that the more eager had anticipated; the Whigs had not, in all respects, come up to the mark of popular expectation, and the disappointment had begun to show itself among the Radical party, who criticised the Whigs severely and were bent on carrying farther constitutional changes. Still, the re-action against Whig rule was not such that Sir Robert Peel's "Conservative" ministry could stand its ground. This was shown by the result of the elections which followed the dissolution of Parliament—a dissolution thought necessary by Sir Robert himself. As soon as the new Parliament met, government was defeated by a majority of 316 votes to 306 on the election of a speaker—Mr. Abercromby, the nominee of the Whigs (now Lord Dunfermline), being chosen instead of the former speaker, Sir Charles Sutton. This was on the 19th of February 1835; and on the 25th of the same month government was again beaten in the Commons by a majority of seven, on a motion by Lord Morpeth for an amendment on the address. Sir Robert's speech on this occasion was extremely able. Singling out the fact that the strength of the opposition to him arose from the co-operation of Mr. O'Connell and the Irish members with the Whigs, he animadverted in cutting terms on this conjunction, seeing that in point of fact the Irish party and the Radicals had been far more unfriendly to the defunct Whig ministry than he and the Conservatives had been, and seeing also that even now the Whigs did not pledge themselves, any more than he did, to the Ballot, the exclusion of bishops from the House of Lords, the repeal of the Corn Laws, or any other of those measures upon which the Radicals had split with the Whigs. The gist of his argument was, that a Whig ministry could not really be a whit more innovative than his own would be. The answer to this given at the time, says Mr. Doubleday, was "that the Whigs would be more 'squeezable' than the Conservatives;" and, accordingly, though Sir Robert remained in office, showing wonderful patience and wonderful practical talent, till April, he was then defeated by so considerable a majority, in a skilfully framed series of motions of Lord John Russell's, relative to the temporalities of the Irish Church, that he had no option but to resign (April 8, 1835). Lord Melbourne was again placed at the head of a Whig administration, consisting of nearly the same men who had been in office four months before, the chief exception being that in the interim the famous rupture had taken place between the Whigs and Lord Brougham, so that the chancellorship was given not to him but to Lord Cottenham. Lord John Russell became home secretary.

The second Melbourne administration lasted throughout the rest of the reign of William IV. (who died June 20, 1837) and during nearly four years of the reign of Queen Victoria. During those six years (1835-1841) though many questions were agitated, their chief success was in the Municipal Reform Bill, passed during the first year. From 1836 to 1839 they were able to do little, and, robbed of their strength as they were by the growth of the more extreme party and of the party who desired a repeal of the Corn Laws, they were becoming more and more unpopular. At last Sir Robert Peel, whose popularity had been in proportion increasing, and who had in the meantime been acting as a critic of their measures, and husbanding his own strength, opposed their bill for suspending the constitution of the Colony of Jamaica; and the majority for ministers was so small, the numbers being 294 against 289, that the Whigs resigned on the following day (May 7, 1839), and Sir Robert was called upon to form a new ministry. In this he failed, owing to the refusal of the queen to consent to the removal of some ladies of her household, whose connection with the Whig party Sir Robert deemed inconsistent with their holding official place under a Conservative government. The Whigs accordingly resumed office, and kept it for more than two years longer—weakened, as before, by the pressure upon them of Mr. O'Connell's party, and the Anti-Corn Law League on the one hand, and of Sir Robert Peel and his well-drilled Conservatives on the other. A general election in 1841, instead of giving them fresh strength, so increased the force of the Conservatives, that, immediately on the opening of the new parliament Sir Robert had a majority of 360 against 269 in the Commons on a motion for an amendment to the address so framed as to involve a vote of want of confidence in the policy of ministers, more especially their financial policy and their conduct in reference to the Corn Laws (Aug. 27, 1841). Three days afterwards Lord Melbourne and his colleagues resigned, and Sir Robert Peel was once more premier.

The new Conservative cabinet consisted of the following members:—First Lord of the Treasury, Sir Robert Peel; Lord Chancellor, Lord Lyndhurst; President of the Council, Lord Wharncliffe; First Lord of the Admiralty, Lord Haddington; Lord Privy Seal, the Duke of Buckingham; Home Secretary, Sir James Graham; Foreign Secretary, the Earl of Aberdeen; Colonial Secretary, Lord Stanley; President of the India Board, Lord Ellenborough; Secretary at War, Sir Henry Hardinge; President of the Board of Trade, the Earl of Ripon; Chancellor of the Exchequer, Mr. Goulburn; Paymaster-General, Sir Edward Knatchbull. Among the ministers not in the cabinet, was Mr. W. E. Gladstone, as Vice-President of the Board of Trade. At the head of this ministry, and with the command of a working majority of about a hundred in the House of Commons, Sir Robert entered on the greatest period of his political career. The history of his ministry from August 1841 to July 1846 is full of interest. Having committed himself to no definite line of policy, except in his preference for a sliding-scale of corn duties over a fixed duty, and such other general avowals, the country, on his accession to office, was left to form its own auguries and anticipations. Nor during the remainder of the session of 1841 would he bring forward any explicit statement of intended measures—resolved as he was to mature them during the prorogation. On the re-assembling of parliament in February 1842, he was prepared with his measures. They were of a bold and comprehensive character. First, in the matter of the Corn Laws, he proposed his famous sliding-scale (Feb. 9, 1842), according to which the duty on foreign corn, commencing in the case of wheat at 20*s.* per quarter when wheat was at 50*s.*, should gradually diminish, as the price rose,—becoming, for example, 17*s.* when wheat was at 55*s.*, 12*s.* when wheat was at 60*s.*, 8*s.* when wheat was at 65*s.*, 5*s.* when wheat was at 70*s.*, and only 1*s.* when wheat should be at 73*s.* or upwards. There was a corresponding scale for oats and another for barley. The measure, displeasing as it was on various grounds to various parties—to the Whigs, because they had declared for a fixed duty, to the Anti-Corn Law League, because they desired a total repeal, and to many of the landed proprietors, because they disliked any relaxation of protection—roused much discussion; but after several motions against it on different principles had been rejected, it became law. Next came the important question of the means of repairing the deficit which had been going on in the revenue, at such a rate that the total for the five years ending April 5, 1842, was 7,502,638*l.*, while for the year 1842-43, it was calculated by anticipation at 2,570,000*l.* On this head, says Mr. Doubleday, Sir Robert argued "that the maximum of indirect taxation was then reached, and that to accumulate the already unbearable load of imposts upon the necessaries or even the luxuries of life would be ruinous as well as futile. The conclusion, therefore, was that nothing but a direct tax upon income could be relied upon to fill up the hiatus in the exchequer." Accordingly it was proposed to levy for three years an income-tax of sevenpence in the pound, or nearly three per cent. This also, in spite of opposition, was carried. Then came the reversion of the tariff, by which the premier abandoned the duties on a great variety of minor foreign commodities, such as drugs and dye-woods; and diminished the prohibitory duties on cattle, sheep, pigs, salted meat, butter, eggs, cheese, and lard. Though the new tariff was also carried, it caused dissension between Sir Robert and many of his Protectionist supporters; the more so that, in the course of the debates upon it, it distinctly appeared that he was a convert to the theory of free-trade. "I believe," he said in his speech on the tariff, "that on the general principle of free-trade, there is now no great difference of opinion, and that all agree in the general rule that 'we should purchase in the cheapest market and sell in the dearest.'" This statement drew rapturous cheers from the economists and opposition generally; and though Sir Robert went on to say, that he deemed corn and sugar exceptional cases, the ulterior tendency was evident. With the exception of some debates on the poor-law, and some on foreign policy in reference to France, Spain, America, and China, the foregoing measures of taxation and finance engrossed the parliament of 1842. The most important events of 1843 were extra-parliamentary. The permission of the disruption of the Scottish established Church in May 1843 has been accounted by some a strange oversight of a ministry constructed on the principles of conservatism, and has been attributed to false or insufficient information on the part of government. The contest with Mr. O'Connell, who was then agitating Ireland to the verge of revolution by monster-meetings and the organised action of an association which had 'repeal' for its motto, occupied a greater share of the energies of the government. For a time Sir Robert, confident, as it afterwards appeared, that Mr. O'Connell himself did not mean to go beyond a certain length, allowed him to proceed without check; but at length (October 1844) the government took their measures, the Clontarf meeting was forbidden, and Mr. O'Connell, his son John, and seven of their associates, were arrested on charges of conspiracy and sedition, and, being tried, were sentenced to fine and imprisonment. From that moment, although the sentence was reversed on appeal to the House of Lords, Mr. O'Connell was virtually crushed; he was never able again to be what he had been.

The year 1844, with its Banking Act, and its extraordinary activity in railways, had passed away; and 1845 opened with every outward show of prosperity. The parliamentary session of that year was comparatively easy; the renewal of the income-tax for three years longer, the augmentation of the Maynooth grant, and the proposal for erecting six new Irish colleges, open to all sects, were carried by government; and though the Anti-Corn-Law League, represented in the House by Messrs. Cobden and Bright, were making way, and were gaining over the Whigs, the stability of the existing administration was not materially affected. But the events of the long recess of 1845 were of a kind to disturb all existing arrangements and all ordinary calculations. The potato rot, followed as it was by a dreadful famine in Ireland, rendered it absolutely necessary to come to some conclusion on the great question which the Anti-Corn Law League had been maturing. Lord John Russell announced this in his famous letter of the 22nd of November, written from Edinburgh, to the electors of London. Sir Robert Peel lost no time in declaring to his colleagues that the Corn Laws must be totally repealed. In this Lord Stanley and others would not go along with him; and on the 6th of December, Sir Robert advised the queen to send for Lord John Russell. As Earl Grey refused to join with Lord John in attempting to form a cabinet, Sir Robert was recalled after a few days, and re-accepted office at the head of his ministry (Lord Stanley seceding) with the avowed intention of repealing the Corn Laws. Accordingly, a few days after the meeting of parliament (Jan. 27, 1846), he brought out a new tariff, and with it his proposition to modify the action of the sliding-scale for the next three years, and after that period to abolish all duties on corn, except the nominal one of a shilling per quarter. Vehement debates followed, in which Lord Stanley, Lord George Bentinck, and Mr. Disraeli, as the heads of a new Protectionist party, attacked Sir Robert with every weapon of sarcasm and argument. The Duke of Wellington however, and other Conservatives of great weight, remained firm to their leader; and the repeal was carried. Defeated on the Irish Coercion Bill, only a few hours after the Tariff Bill had passed the Lords, Sir Robert resigned office (June 29, 1846). Before doing so he made a magnanimous declaration to the effect that the merit of the repeal of the Corn Laws was more due to Mr. Cobden than to himself, or to any other man in the House. Never perhaps was a minister followed into his retirement with such general applauses as followed Sir Robert Peel.

Sir Robert's popularity continued unabated during the next four years. During two of these he lent a general and cordial support to the Whig government of Lord John Russell—voting with them on the question of the Navigation Laws, and also for the removal of Jewish disabilities. The European revolutionary movements of 1848-49 however, brought in a new set of questions, and Sir Robert disagreed seriously with the foreign policy of Lord Palmerston. Anticipations were general of his speedy return to power when, riding up Constitution-hill on the 29th of June 1850 he was thrown from his horse, and injured so severely that he died on the 2nd of July.

This is not the place for any attempt to appreciate Sir Robert's character as a man and a statesman. Many reviews of his career, some in the form of elaborate biographies, have been published since his death—among which may be mentioned 'The Political Life of Sir Robert Peel, by Thomas Doubleday,' 2 vols., 1856; and M. Guizot's more recent biographical tribute. Memoirs of Sir Robert from his own papers, referring particularly to his conduct in the Roman Catholic Emancipation movement, and in the Corn Law Repeal movement, have also been published by his literary executors. Almost all who have written about him have agreed in their general estimate of him as a man of high conscientiousness, and of a species of ability peculiarly English and peculiarly fitting him for the work which fell to him—ability not of the speculative or philosophical, but of the practical, deliberate, and considerate order. His political genius consisted in perceiving when the necessity for carrying a great social change arose, and in devising the parliamentary means for carrying it. As the leader of a party, and as a master of the art of parliamentary management, he was probably unrivalled; the House of Commons was his element; and though there have been greater orators there, there have been few speakers combining such dignity, tact and courtesy, with fine powers of eloquence. Apart from his parliamentary duties, his chief pleasure seemed to be in art. He was a noted collector of pictures, and left valuable collections both in his town mansion and at Drayton manor. He was generous in his patronage of artists, and many kind and munificent actions done by him privately have come to light. His tastes in literature, though he did not himself practise authorship except in connection with practical politics, were high and scholarly, and more wide in their range than might have been supposed.

Sir Robert left five sons—the present baronet, Sir Robert (born May 4, 1822), formerly secretary of legation in Switzerland, and in 1857 a junior lord of the Admiralty, and who has represented Tamworth in parliament ever since his father's death; Frederick (born 1823) who also sat in parliament for some years, and was under-secretary of the colonies from 1851 to 1857, with a short interruption; William (born 1824) a captain in the Royal Navy, who has greatly distinguished himself in the Crimean war and in India; John Floyd (born 1827) an officer in the Scots Fusilier Guards; Arthur Wellesley (born 1829). Of two daughters, one married (1841) Viscount Villiers, eldest son of Earl Jersey; the other married (1855) the Honourable Mr. Stonor.

PEERS OF THE REALM. In the case of Lord Wensleydale, to whom a barony had been granted *for the term of his natural life*, it was held (in the Session of 1855-56), that such a grant did not constitute the grantee a lord of Parliament; in other words, that *hereditary* peerage alone entitled the holders to a seat in the House of Lords.

PEGU. This province of the Birman Empire was annexed to the British possessions in India, by proclamation of the Governor-General of India, dated June 20, 1853.

It includes the following districts:—

	Square Miles.	Population.
Rangoon	9,800	137,130
Bassein	8,900	128,189
Prome	5,500	100,600
Henzadu	2,200	103,775
Toungoo	3,950	34,957
Tharawaddy	1,950	66,129
Total	32,300	570,180

PEKTOLITE. [Mineralogy, *S.* 1.]

PELARGONIC ACID. [Chemistry, *S.* 2.]

PELLICO, SILVIO, was born in 1789, at Saluzzo, in Piedmont. His father was Onorato Pellico, of a respectable family, and in good circumstances. His mother was a native of Chambery in Savoy, who, retaining her maiden name in addition to that of her husband, was called La Signora Pellico-Tournier. They had six children. Luigi and Gioseffina were the two eldest; Silvio and Rosina, twins, followed; Francesco and Marietta were next in succession. Luigi and Silvio were educated at home under the care of their parents. Onorato Pellico, while his children were yet young, having established a manufactory for winding silk at Pinerolo, resided there some time; but removed to Turin, where he was appointed to a situation under the government. There Luigi and Silvio were instructed in Latin and Greek, and other branches of education, by Don Manavella, a clergyman. Onorato Pellico, who had a taste for poetry and the drama, wrote scenes and short plays, which were performed by his children and others of a similar age, on a small stage constructed in his house. Luigi afterwards became a dramatic writer as well as Silvio.

Silvio Pellico's twin-sister Rosina, who is described as having been extremely beautiful, was married at the age of eighteen to a cousin by the mother's side, who was prosperously established in business at Lyon in France; and Signora Pellico-Tournier, with her son Silvio, accompanied the bride to the residence of her husband. The mother after a short stay returned home, but Silvio continued to reside with his sister's husband during four years. While at Lyon in 1807 Ugo Foscolo's poem 'I Sepolcri' ('The Tombs') was published, and was sent to him by his brother Luigi. The reading of it excited him greatly, and stimulated him to the prosecution of his poetical studies. Meantime his father had obtained a situation under the minister of war at Milan, and had removed to that city with his family. His brother Luigi was secretary to the Marquis Caprara, grand equerry of the kingdom of Italy.

Silvio Pellico returned from France in 1810, and went to Milan, where he became a teacher of French in the Collegio degli Orfani Militari, an occupation which required two or three hours of the day. The rest of his time was devoted to his poetical studies and to the acquisition of the German and English languages. He became acquainted with Ugo Foscolo and Monti, who were then at Milan, and occasionally saw Pindemonte, who resided at Verona. He was for a time tutor to the son of Count Briche, and afterwards to the two sons of Count Luigi Porro Lambertenghi, in whose mansion he became a resident, and at whose assemblies he associated with the most intellectual men of Italy, and with many distinguished foreigners, among whom he himself mentions Madame de Staël, Schlegel, Davy, Byron, Hobhouse, and Brougham. After the fall of Napoleon I., Onorato Pellico returned with the rest of his family to Turin, where he had again an office under the government. Silvio Pellico continued to reside at Milan with Count Porro.

Silvio Pellico's first dramatic production was the tragedy of 'Laodamia,' which was followed by his tragedy of 'Francesca da Rimini,' founded on a well-known passage in the 5th canto of the 'Inferno' of Dante. This tragedy was much admired, was acted with great applause in the principal cities of Italy, and established his reputation as a dramatic poet. Byron translated it into English verse, but did not publish it, and Pellico translated Byron's 'Manfred' into Italian prose. He was desirous of publishing his next tragedy, 'Eufemio da Messina;' but so many passages were objected to by the censorship that he sent it to Turin, where it was published by his father. It was afterwards published at Milan, but was not allowed to be acted. In 1818 Silvio Pellico was the chief agent in establishing a periodical entitled 'Il Conciliatore,' of which he became the secretary. It was mainly of a literary character, and Silvio Pellico, Manzoni, and similar literary men, were the chief contributors; but it was of too liberal a tendency to be endured by the Austrian government, and was suppressed.

On the 13th of October 1820 Silvio Pellico was arrested, and was confined in the prison of Santa Margherita at Milan. He seems to have become a member of the revolutionary society called Carbonari, but does not say so. He was transferred thence to a prison on the island of San Michele, near Venice; and while there was tried at Venice, found guilty, and condemned to death. That sentence however was commuted to fifteen years of 'carcere duro.' In April 1822 he was removed to the prison of Spielberg, near the city of Brünn, in Moravia. Some of those sent to this prison are condemned to the 'carcere duro' (severe imprisonment), and some to 'carcere durissimo' (very severe imprisonment). Silvio Pellico says:—"Those condemned to 'carcere duro' are obliged to labour, to wear chains on their feet, to sleep on bare boards, and to eat the poorest food. Those condemned to 'carcere durissimo' are chained more heavily, and with a band of iron round the waist, the chain being fastened in the wall, so that they can walk only just by the side of the boards which serve them for a bed. Their food is the same, though the law says only bread and water." In the earlier part of his imprisonment, during about eighteen months, he was treated with indulgence by his jailer, and read the Bible, Homer in Greek, Dante, Petrarch, Shakspere, Byron, Scott, Schiller, Göthe, and other writers, and was allowed some paper, and pen and ink. His friendly jailer having been removed to another situation, during the whole of the years 1824-25-26-27 his imprisonment was excessively severe, and his health was much injured. His imprisonment was afterwards less stringent, and on the 1st of August 1830 he received the announcement that he was to be set at liberty. This promise was soon afterwards performed, and he returned to his parents at Turin. In 1831 he published the account of his imprisonments, entitled 'Le Mie Prigioni,' which has had a very large circulation, and has been translated into the principal languages of Europe. It is written in a style of great simplicity, with much apparent truthfulness, and is very interesting. In 1832 he published at Turin 'Tre Nove Tragedie,' which were 'Gismonda da Mandrisio,' 'Leoniero da Dertona,' and 'Erodiade;' and in the same year his tragedy of 'Tommaso Moro.' His mother died in 1837, his father in 1838, and his brother Luigi in 1841. In 1837 appeared his 'Opere Inedite,' 2 vols. One of his latest works was a treatise in prose, 'Dei Doveri degli Uomini' ('On the Duties of Men'). During his later years Silvio Pellico was secretary to the Marchesa Barola, and he died at her villa of Moncaglieri, near Turin, January 1, 1854.

PENÆACEÆ, a small natural order of Perigynous Exogenous Plants. These plants are shrubs with opposite imbricated exstipulated leaves. The flowers are apetalous, the ovary composed of four carpels, the calyx tubular. Lindley places this order in his Rhamnal alliance, and points out its relations with *Proteaceæ* and *Bruniaceæ*. The species are mostly natives of the Cape of Good Hope. A viscid sweetish nauseous gum-resin, called Sarcocol, is produced by various species. This substance contains a peculiar principle called Sarcocollin, which is converted into oxalic acid by the addition of nitric acid. Although Dr. Lindley has named these plants Sarcocollads, he is inclined to doubt, with Endlicher, if this order really produces Sarcocol at all; and suggests that it is produced, as Sagapenum and Galbanum, by a species of the order *Umbelliferæ*. The genera are *Panæa*, *Sarcocolla*, and *Geisoloma*. There are 21 species.

PENISTONE. [YORKSHIRE.]

PENNINE, a Mineral belonging to the Hydrous Silicate of Magnesia series. It is near Chlorite, and occurs in hexagonal tables. It is found in the Pennine Alps.

PENTACTÆ, a sub-family of *Holothuriadæ*, a family of *Echinodermata*. It includes the genera *Psolinus*, *Cucumaria*, and *Ocnus*.

Psolinus (Forbes) has an irregular ovate body, arcuated with five rows of distant suckers, those below being always bent; tentacula ten; dental apparatus short, truncate; no gizzard.

P. brevis, of Forbes and Goodsir, is the only species. It was discovered in the Shetland seas, adhering to the stems of *Laminariæ*. It links the family of *Psolidæ* with *Pentactæ*. It is about half an inch in length, of an ovate form, with both its extremities bent upwards. The body is pinkish-white, with minute papillæ. The tentacula are long, pedicled, and digitate at the extremity. It is sluggish in its movements, but moves its tentacula freely.

Cucumaria has the body regular, more or less pentangular, with five longitudinal rows of approximate suckers; ten tentacula; dental apparatus composed of nearly square plates.

The species are called Sea-Cucumbers. They are the most typical of the *Holothuriadæ*, and their popular name is very expressive of their usual form. They have all of them the power of changing their shape, so that sometimes they are very long, and others are oval or round. They usually live among sea-weeds or in mud, and are supposed to seize their prey by their large tentacula. They are found very generally throughout the seas of the globe. The following are the British species described by Professor E. Forbes in his 'History of British Star-Fishes':—

C. frondosa (*Holothuria frondosa*, Gunner), the Great Sea-Cucumber. It has been principally found off the coasts of Scotland.

C. pentactes (*Holothuria pentactes*, Müller), the Angular Sea-Cucumber. It has been taken on the coasts of Devonshire and Dorsetshire, and is found in the seas of France and Norway.

C. communis, Common Sea-Cucumber. Great numbers of these animals have been observed off the coast of Fifeshire, and been dredged in the north and south of Ireland, by Mr. W. Thompson and Dr. Ball.

C. fusiformis, the Long Sea-Cucumber. This is the longest of all the species in proportion to its thickness.

C. hyalina, the Glassy Sea-Cucumber. It is remarkable for its hyaline glassy appearance. It inhabits the Shetland seas.

C. Drummondii. This species was named after Dr. Drummond, who discovered it in Belfast Bay.

C. Hyndmanni is named after Mr. Hyndman, who dredged it in Belfast Bay. It has been since taken in large numbers off the western coast of Ireland.

C. fucicola, the Tangle Sea-Cucumber. It has been found in the Shetland seas.

Ocnus (Forbes and Goodsir) has the body regular, cylindrical, pentagonal, with five rows of distant suckers on the angles; tentacula ten; dental apparatus very short.

Professor E. Forbes describes two species of this genus, which he calls, on account of its size as compared with the Sea-Cucumber, the Sea-Girkin. The two British species are *O. branneus* and *O. lactea*, distinguished by their colour, the latter being milk-white, the former brown.

PEPSIN, a substance found in the gastric acid of man and the lower animals. If the glandular portion of the stomach is treated with extremely dilute acids a substance is thrown down from the fluid by corrosive sublimate, which Schwann first called Pepsin. Wasmann afterwards obtained pepsin in a purer form. He proceeded in the following manner:—The glandular layer in the stomach of the pig, which extends chiefly from the greater curvature towards the cardia, was carefully detached and washed, without being cut up, then digested with distilled water at a temperature of from 30° to 35°. After some hours the fluid was poured away, the membrane was again washed in cold water, and then digested in the cold with about six ounces of distilled water, and repeatedly washed, till a putrid odour began to be developed. The filtered fluid was transparent, viscid, and without any reaction; it was now precipitated with acetate of lead or corrosive sublimate; the precipitate was carefully washed and decomposed with sulphuretted hydrogen; the pepsin was then precipitated by alcohol from the watery solution in white flocks.

The pepsin thus obtained, forms, when dry, a yellow, gummy, slightly hygroscopic mass; in its moist state it is white and bulky; it dissolves readily in water, and always retains a little free acid so as to redden litmus; it is precipitated by alcohol from its watery solution; mineral acids induce a turbidity in a solution of neutralised pepsin, which disappears on the addition of a small excess of the acid; but if there be a considerable excess of the acid, there is a flocculent deposit. It is only imperfectly precipitated by metallic salts, and not at all by ferrocyanide of potassium. It has been asserted that pepsin is coagulated by boiling, but Frierichs has shown that the coagulation is merely dependent on its admixture with albumen. This substance possesses the converting power so strong that, according to Wasmann, a solution containing only 1-60,000th part of this substance dissolved albumen in six or eight hours. Similar experiments have been made by Pappenheim, Valentin, and Elsasser.

C. Schmidt has proposed a new view with regard to the nature of the digestive principle. He regards it as a conjugated acid, whose negative constituent is hydrochloric acid, with Wasmann's non-acid or coagulated pepsin, as an adjunct; and assumes that it possesses the property of entering into soluble combinations with albumen, glutin, chondrin, &c. According to him, it more nearly resembles lignosulphuric acid than any other conjugated acid, and as this becomes disintegrated into dextrin and sulphuric acid, so the pepsin-hydrochloric-acid becomes separated at 100° into Wasmann's coagulated pepsin and hydrochloric acid, and in either case it is equally impossible to reproduce the conjugated acid from its proximate elements after their separation. On bringing the complex acid in contact with an alkali, the adjunct—the substance which has been in combination with the hydrochloric acid—is precipitated. Schmidt believes that he has ascertained that an artificial digestive mixture which has expended its solvent and digestive powers, regains them on the addition of free acid; and that when hydrochloric acid is added, the pepsin-hydrochloric-acid is expelled from its combination with albumen, &c., and thus regains its former properties, while the newly added hydrochloric acid enters into its well-known soluble combinations with albumen, &c. By the repeated addition of hydrochloric acid, a digestive fluid or this pepsin-hydrochloric-acid might preserve its digesting power for ever, unless the fluid became saturated with the dissolved substances, or the conjugated acid underwent decomposition.

(Lehmann, *Physiological Chemistry*, translated for the Cavendish Society.)

PEPYS, WILLIAM HASELDINE, F.R.S., was born in the year 1775, in the city of London, where his father conducted in the Poultry a superior business as a cutler and maker of certain classes of surgical instruments. His early history is connected in a remarkable manner with that of the progress of chemistry, and of some other branches of science in this country, as well as with that of the various institutions formed for their advancement. In March 1796 the Askesian Society (from ἄσκησις, exercise), was established by the association of a number of young men for their mutual improvement by the discussion of philosophical subjects. Of these Mr. Pepys was one. He became a member of the Committee for Apparatus appointed by the society, and took an active part in the experimental elucidation to the members of facts generally understood, and in the repetition and examination of new discoveries. Mr. Pepys also contributed papers to the same body, which, from the residence or occupation of its members in the city of London, eventually led to the foundation of the London Institution, and, through the British Mineralogical Society, in part also to the establishment of the Geological Society of London, of all which Mr. Pepys was an early member and office-bearer. His skill and ingenuity in the construction of apparatus proved most important auxiliaries in the progress of chemical and electro-chemical science in England for a period exceeding thirty years. His researches on respiration, prosecuted in conjunction with Mr. Allen [ALLEN, WILLIAM, *S.* 1], and published in the 'Philosophical Transactions,' may be said to have established the foundation of our exact knowledge of the chemical changes produced in air by that process; while their preliminary experiments on carbon and carbonic acid, recorded in papers contained in the same collection, confirmed several points in the chemical history of those bodies, which had remained in doubt or been insufficiently examined. In 1808 Mr. Pepys was elected a Fellow of the Royal Society, in the proceedings of which he took an active part for many years.

As just intimated, he was one of the earliest promoters of the London Institution for the Advancement of Literature and the Diffusion of Useful Knowledge, which was founded in 1805 and 1806, with the intention of supplying for the City of London advantages corresponding to those derived in the west of the metropolis from the establishment of the Royal Institution, a few years before. He is named as one of the managers of the London Institution in the Charter of Incorporation, dated January 21st, 1807, and for many years continued to be an active member of the Board. The arrangements for the laboratory, the collection of chemical and philosophical apparatus, and subsequently for the lectures, were mainly carried out by him, and from 1821 to 1824 he was honorary secretary. After an interval of some years he was again elected a manager, and afterwards a vice-president, which office he continued to hold during the remainder of his life. Under his direction a voltaic battery of 2000 double plates of zinc and copper was constructed for the laboratory, with which many of Sir Humphrey Davy's experiments on the magnetic phenomena produced by electricity were made, with the personal assistance of Mr. Pepys and other friends. In the 'Philosophical Transactions' for 1823 is described another voltaic battery devised by Mr. Pepys, for the performance of electro-magnetic experiments, and constructed for the London Institution, consisting of two plates only, one of copper, the other of zinc, but those each fifty feet in length and two in width, coiled around each other. A remarkable experiment repeated by Sir H. Davy with this apparatus is described in a paper by him in the same volume. A similar apparatus was produced, about the same time, but quite independently, by the late Dr. Seebeck, of Berlin.

For some years prior to his decease, the progress of age and infirmity withdrew Mr. Pepys in a great degree from scientific society, but he retained to the last his interest in the progress of science, together with a vivid recollection of the part which he and his friends and fellow-labourers had taken in the production of the English school of Chemistry, among the contemporaries of Davy and Wollaston. He died at his house in Earl's Terrace, Kensington, London, on the 17th of August 1856, at the age of eighty-one.

PERCH. [Percidæ; Fish.]

PERCOIDES. [Percidæ.]

PEREIRA, JONATHAN, an eminent physician and pharmacologist, was born in the parish of Shoreditch, London, on the 22nd of May 1804. He received his early education in his native parish, and was distinguished at school for his knowledge of classics. At the age of fourteen he was apprenticed to Mr. Latham of the City-road, who practised as a surgeon and apothecary. His master having died, he commenced attending on the practice of the Aldersgate-street Dispensary in 1821. At this time this dispensary was recognised by the Apothecaries' Society as one of the institutions, the attendance on the practice of which qualified medical students as candidates for the Apothecaries' licence. The physicians and surgeons of the dispensary gave lectures, which were also recognised by the Society of Apothecaries. In 1822 Pereira became a pupil of St. Bartholomew's Hospital, and in March 1823 obtained his licence to practise from the examiners of the Society of Apothecaries. He was not nineteen years old, and the facility with which he obtained his licence, indicates very plainly how small an amount of education was required for the medical man at this time. He was shortly after appointed apothecary to the Aldersgate-street Dispensary, and thenceforward his name was connected with the falling fortunes of this at one time somewhat celebrated school of medicine.

On his appointment young Pereira at once established himself as a private tutor or 'grinder' as teachers of this class are technically called. In this capacity he was very efficient, and his early publications all had reference to the wants of medical students about to present themselves for examination. He published an English translation of the Latin Pharmacopœia of the London College of Physicians. He also published a collection of Latin prescriptions entitled 'Selecta e Prescriptis,' a large number of which have been printed. He devoted much time to chemistry and published 'A general Table of Atomic Numbers.' In 1825 he became a member of the Royal College of Surgeons. In 1826 he was appointed lecturer in chemistry in the Aldersgate-street School of Medicine, and subsequently he delivered the course of lectures on Materia Medica. These lectures were the foundation of his great work on Materia Medica and his reputation as a pharmacologist. The lectures were first published in the Medical Gazette, and the matter was subsequently re-arranged and published in two volumes in 1839, under the title 'Elements of Materia Medica and Therapeutics.' Dr. Pereira's mind was eminently discursive. Even while lecturing on Chemistry and Materia Medica in Aldersgate-street he undertook to lecture on chemistry and botany at the London Hospital. This fitted him for working successfully at the Materia Medica, and he produced a work more scientific and practical than any which had before been devoted to the prolific subject of medicines and their actions. Up to this time he had practised as a general practitioner; but his position as lecturer at the London Hospital School of Medicine, prepared the way for his appointment as physician to that institution. He accordingly in 1840 obtained the degree of doctor of medicine from the University of Erlangen, and was appointed in the same year assistant physician to the London Hospital. He subsequently submitted to the examination of the College of Physicians, and became a London licentiate of that body. He was elected a fellow of the College in 1845. In connection with Materia Medica, Dr. Pereira devoted himself to the Materia Dietetica, and in 1842 he published a treatise on 'Food and Diet,' which, like his work on Materia Medica, was by far the best that had been published on that subject.

His works brought Dr. Pereira into considerable note as a physician, and increasing practice compelled him to give up his various lectureships. In 1851 he was appointed full physician to the London Hospital. His great knowledge of Materia Medica pointed him out as the most fitting person to fill the post of examiner at the London University, an office which he held till his death.

Although Dr. Pereira occupied himself more with compiling and arranging the information obtained from others than with original observations, he nevertheless displayed considerable ability in chemical and physiological research. He published a series of 'Lectures on Polarised Light,' and many original papers and observations in the Pharmaceutical and Medical Journals. He took an interest in the formation of the Pharmaceutical Society, and delivered several courses of lectures on Materia Medica in connection with that Society. He was a fellow of the Royal Society and also of the Linnæan Society. His death, which occurred in 1853, was sudden, and was thus described :—"A few weeks previous to this occurrence he had been to consult Professor Quekett (of the College of Surgeons, London) on a scientific question, and whilst descending a staircase leading to the Hunterian Museum, made a false step, fell, and ruptured the rectus femoris muscle of both legs. In all probability at the same time some internal injury was sustained by the heart or larger vessels; but as only local inconvenience was experienced, no danger was apprehended; but whilst getting into bed on the 20th of January he felt a violent throb in the region of the heart, when he became fully aware that a speedy termination of his life was at hand, and this impression was verified within twenty minutes after." A bust was erected to his memory in the London Hospital by his friends.

PERIANTH. [Flower, *S.* 2.]

PERICLASE, a Mineral, occurring crystallised in regular octohedrons. Primary form a cube. Cleavage in three directions parallel to the faces of the cube. Colour obscure green. Hardness equal to felspar. Lustre vitreous. Translucent. Specific gravity 3·78. It is found in the lava of Vesuvius. Its analysis by Damour gives :—

Magnesia	92·57
Oxide of Iron	6·91
Insoluble Matter	0·86
	——100·34

PERISTEDION, a genus of Fishes belonging to the *Acanthopterygii* with hard cheeks. The body is covered with bony plates, forming a defensive armature. The nasal bone is divided into two points. The mouth has no teeth.

P. Malarmat, the Mailed Gurnard, was taken, according to Mr. Yarrell, off Plymouth in 1836. It is also a native of the Mediterranean. It is easily known from the other gurnards by its elongated and bifurcated nasal bones. It frequents deep water over rocky ground, approaching the shallows only at the period of spawning. It swims with great rapidity, occasionally breaking its nose against the rocks. It is fished in the Mediterranean, and as an article of food is in greatest estimation during Lent.

PERIWINKLE, a Plant. [Vinca.]

PERJURY. A summary power of committing persons guilty of perjury is vested in all the courts of the country by the statute 14 and 15 Vict., c. 100. One object of the statute is to give the prosecutor his costs, when the prosecution is directed by the court. It was passed to meet an expected increase of crimes of this nature, from the parties being allowed to give evidence in their own causes.

PEROVSKITE. [Mineralogy, *S.* 1.]

PERTH. [Canada, *S.* 2.]

PERTHES, CHRISTOPHER FRIEDRICH, one of the most distinguished booksellers of Germany, was born April 21, 1772, at Rudolfstadt, the capital of the petty German principality of Schwarzburg, where his father was secretary of the exchequer, who, dying in 1777, left his widow and son unprovided for, except by a pension of twenty-one florins to the widow. The widow sought to maintain herself by going to service as a nurse, while young Perthes was confided to the care of his grandmother. On her death in 1779 he was transferred to his maternal uncle, Friedrich Heubel, also a state official of the Prince of Schwarzburg, who as far as he was able instructed the young Perthes, instilled good principles into him, but little of literature. At the age of twelve he was sent to the gymnasium of Rudolfstadt, but his previous deficiencies rendered him unable to profit much by the instruction here afforded, a loss which he continued to lament in later life, and which he then made great efforts to repair. While at this seminary however he took great delight in reading travels, and they appear to have had much influence in developing a feeling of self-dependence on his own exertions; and another relation, Lieutenant-Colonel Heubel, the superintendent of public buildings, by taking young Perthes in his occasional visitations, gave him a liking for natural scenery. A brother of his father's was a bookseller at Gotha, and this seems to have led to the idea of dedicating Perthes to that trade. In 1786, therefore, he was taken to the great bookselling mart at Leipzic, as to a statute fair, to find a master for him. He was rejected by one because he could not construe *amo*, and by another as too delicate; but one, Böhme, agreed to accept him as an apprentice at the end of another year. On September 11, 1787, he entered upon his new occupation. His master was not unkind, but strict; he was employed in the lower and more irksome duties of his trade: particularly as a collector; his feet were frost-bitten in the winter; he was confined to his room for nine weeks, during which his master's daughter, Frederika, then only twelve years old, attended him, and read to him a translation of Muratori's 'History of Italy.' He recovered and became fondly attached to his nurse. While serving his apprenticeship his desire for acquiring knowledge was great, but his means were so restricted that he had little opportunity of doing so beyond his own unaided exertions. His mother's pension (about 2*l.* a-year), a few occasional presents from his uncle Heubel, and two dollars yearly from his master, formed the extent of his funds, and with these he had to supply himself with shoes and clothes. After he had been apprenticed some time, a new apprentice, named Nessig, was introduced. This associate became a candidate for the affections of Frederika. The rivalship revealed to Perthes that he was in love, and like a true German, he made a confidant of his rival. They agreed to each attempt to gain her, and that the unsuccessful suitor was to submit uncomplainingly to his fate. In 1792, when the French revolution broke out, both uncle and nephew took a great interest in its progress; but Perthes saw and expressed in his letters to his uncle reasons for apprehending danger. His manners appear to have been all his life peculiarly attractive, modest yet firm; and while with Böhme he became acquainted with Göthe, Herder, and Schiller. At the Easter fair of 1793, Hoffmann, a large publisher in Hamburg, having expressed a wish to hire him as an assistant, his master released him from his apprenticeship, which had yet a year to run, and he departed with Hoffmann to Hamburg. While here, though he sedulously attended to his business, he did not forget his first attachment, and corresponded with his rival, Nessig, who undertook to give a faithful account of Frederika, and the state of her affections. His notions of bookselling appear to have far exceeded those of either of his masters. In 1794 he writes: "Where will you find a body of men so deficient in the requisite information, and so negligent of the duties of their calling, as the booksellers? Germany is deluged with wretched and abominable publications, and will be delivered from this plague only when the booksellers shall care more for honour than for gold." After a residence of about three years with Hoffmann, during which he had won the esteem of many eminent literary men, and made great efforts to repair his defective education by study and by intercourse with the numerous French emigrants then in Hamburg, and having received a promise of the reversion of his uncle's business in Gotha, for which he was not inclined to wait, he determined to begin business for himself. This he effected on borrowed capital, and in partnership with his old fellow-apprentice, Nessig. As soon as this was effected, they both offered themselves to Frederika Böhme, who declined to marry either, though she owned that she loved both—a good reason, perhaps, for her resolution. Perthes was in despair. He writes, "my whole life-plan is ruined—ruined by her." But he immersed himself in business, in hopes of thus overcoming his apprehended ruin—and succeeded. The partnership with Nessig did not last long, as it was found that, though not unsuccessful, the profits were not enough for two; and he now proceeded on his own account. His acquaintance with literary men extended. Fred. H. Jacobi, the Stolbergs, Voss, and Count Reventlow were among them. By Jacobi he was introduced to Claudius, the editor of the 'Wandsbecker Bote' (Messenger), whose daughter Caroline he married, after a short courtship, on August 2nd of that year. She was a delicate retiring woman, possessed of strong religious feelings, and an ardent love for her husband; but his active bustling habits gave her occasional uneasiness, and she would have preferred his being more calm and less worldly. To her gentle remonstrances he replied, "I am persuaded that I am a man born to turn my own wheel, and that of others, with energy." In 1799, with an addition of capital, also borrowed, he entered into partnership with Besser, who, from his integrity, activity, and great literary knowledge, was of most essential service in the business. This went on happily and successfully till 1803, when the French occupied Hanover, placed Hamburg in a state of blockade, and in 1806 occupied the town itself; and though for a short time released by the peace of Tilsit, it was incorporated in 1810 with the French empire. Still the firm went on, though embarrassed by the Milan and Berlin Decrees, and the censorship to which the press was subjected. Perthes had, in his correspondence, lamented the apathy of Germany under the French yoke, and when the French retired before the Russians in 1813, he took an active part in restoring the old constitution, and became a member of the burgher guard. But the French under Davoust and Vandamme almost immediately returned, regained possession of Hamburg, levied enormous contributions, and devastated the town. Perthes had sent his wife and family to Wandsbeck, but he was a marked man, and one of those exempted from the general pardon which was proclaimed. He was forced to fly, the shop was plundered, and sealed up as sequestrated. It was now that the calm heroism and devoted attachment of his wife displayed itself. She thanked him from her heart "that your name stands among the ten enemies of the tyrant;" and subsequently, though suffering extreme deprivation, with one of her children dying, she exhorts him to persist in fulfilling his duty. In 1814 they were enabled to return to Hamburg, where, by the exertions of Besser, they met all their trade obligations, and the business again proceeded prosperously. In 1821 his excellent wife died, soon after which he resigned the Hamburg business to his partner, and in 1822 removed to Gotha, where he adventured more largely as a publisher, the works he chiefly produced being on theology and history. In theology he published for Neander, Ullman, Tholuck, Bunsen, and many others, who were opponents of the rationalistic opinions: and in history he published the 'General History of the State of Europe,' edited by Heeren and Ukert, to which many of the most eminent writers of Germany contributed. He was also the publisher of the well-known 'Almanach de Gotha.' In all these undertakings he was not only publisher, but a most efficient adviser, and his opinions were highly valued, not only by the contributors, but by men like Niebuhr and Schlegel. In 1825 he married a second time, and his choice was almost as fortunate as his first. Charlotte Becker, a widow, was an excellent mother to his children, and an attentive and affectionate wife to himself. Some few years before his death he resigned the business to his son Justus, by whom it is now carried on, and of which an establishment for printing maps on a large scale forms a part. He retired to the village of Friedrichroda, a few miles from Gotha, where, with a cheerful and tolerant piety which had always distinguished him, he awaited his dissolution, which took place on May 18, 1843.

Perthes' correspondence was very extensive, and was both instructive and entertaining. Excellent specimens of it are given in 'F. Perthes Leben. Nach dessen schriftlichen und mündlichen aufgezeichnet,' in 3 vols. 8vo, published 1848-55, by his son, Clemens Theodor, who is professor of law in the University of Bonn. Besides these, some of his correspondence was published in 1819 in 'Etwas über den Deutschen Adel, in Briefen,' a correspondence between Perthes, Fouqué, Moser, and others; and in 'Beiträge zur Geschichte Deutschlands in den Jahren 1805-1809, aus brieflichen Mittheilungen,' letters between Perthes, Johann von Müller, and others, issued in 1803. His son Clemens, besides the Memoirs of his father, is the author of 'Der Deutsche Staatsleben vor der Revolution. Eine Vorarbeit zum deutschen Staatsrecht,' 1845; and 'Einverleibung Krakaus, und die Schlussacte des Wiener Congresses,' 1846. The Memoirs have been translated with some condensation, in 2 vols. 8vo, published in 1856.

PESTALOZZI, JOHANN HEINRICH, was born January 12, 1746, at Zürich, in Switzerland. His father, who was a medical practitioner, died when Pestalozzi was about six years old; but his mother, with the assistance of some relatives, procured him a good education. He studied divinity and afterwards law, but instead of adopting either the clerical or legal profession, turned to farming as a means of support. At the age of twenty-three he married the daughter of a merchant of Zürich, purchased a small landed property which he named Neuhof, and went to reside upon it and cultivate it. The reading of Rousseau's 'Emile' had drawn his attention to the subject of education, and he began in 1775 to carry out his views by turning his farm into a farm-school for instructing the children of the poorer classes of the vicinity in industrial pursuits as well as in reading and writing. In this, however, he was little more successful than he had been in his agricultural operations: at the end of two years his school was broken up, and he became involved in debt. In order to relieve himself from his incumbrances, and to procure the means of subsistence, he produced his popular novel of 'Leinhardt und Gertrud,' 4 vols., Basel, 1781; in which, under the guise of depicting actual peasant life, he sought to show the neglected condition of the peasantry, and how by better teaching they might be improved both morally and physically. It was read with general interest, and the Agricultural Society of Bern awarded him for it a gold medal, which however his necessities compelled him at once to sell. It was followed by 'Christoph und Else,' Zürich, 1782. During 1782-83 he edited a periodical entitled 'Das Schweizer-Blatt für das Volk' ('Swiss-Journal for the People'), which was collected in 2 vols. 'Nachforschungen über den Gang der Natur in der Entwickelung des Menchengeschlechts' ('Investigations into the Process of Nature in the Improvement of the Human Race'), appeared at Zürich in 1797; and he wrote also other works of less importance.

In 1798, with the assistance of the Swiss Directory, he established a school for orphan children in a convent which had belonged to the Ursuline nuns at Stanz, in the canton of Unterwalden. Stanz had been sacked by a French army, and the children were such as were left without protectors to wander about the country. In the bare and deserted convent he had, without assistance and without books, to teach about eighty children of from four to ten years of age. He was thus driven by necessity to set the elder and better-taught children to teach the younger and more ignorant; and thus struck out the monitorial or mutual-instruction system of teaching, which, just about the same time, Lancaster was under somewhat similar circumstances led to adopt in England. [Lancaster, Joseph.] In less than a year Pestalozzi's benevolent labours were suddenly interrupted by the Austrians, who converted his orphan-house into a military hospital. He then removed to Burgdorf, eleven miles north-east from Bern, where he founded another school of a higher class, and produced his educational works, 'Wie Gertrud ihre Kinder lehrt' ('How Gertrude teaches her Children'), Bern, 1801; 'Buch der Mütter' ('Mothers' Book'), Bern, 1803; and some others. During this period of political excitement he joined the popular party, and in a considerable degree incurred the disapproval of the upper class. In 1802 the people of the canton of Bern sent him as their deputy to an educational conference summoned by Bonaparte, then First Consul, at Paris. His establishment at Burgdorf was prosperous, became celebrated, and was resorted to from all parts of Europe by persons interested in education, some for instruction and others for inspection. In 1804 he removed his establishment to München-Buchsee, near Hofwyl, in order to operate in conjunction with Fellenberg, who had a similar establishment at the latter place; but the two educational reformers disagreed, and in the same year Pestalozzi removed to Yverdun, in the canton of Vaud, where the government appropriated to his use an unoccupied castle. This establishment became even more prosperous and more celebrated than the one at Burgdorf, and had a still greater number of pupils and of visitors. Unfortunately dissensions arose among the teachers, in which Pestalozzi himself became implicated, and which embittered the latter years of his life. The number of pupils rapidly diminished, the establishment became a losing concern, and Pestalozzi was again involved in debt, which the proceeds of the complete edition of his works ('Pestalozzi's Sämmtliche Werke,' 15 vols., Stuttgart and Tübingen, 1819-26) hardly sufficed to liquidate. This edition was the result of a subscription got up in 1818 for the publication of his works, the names of the Emperor of Russia, the King of Prussia, and the King of Bavaria standing at the head of the list.

In 1825 Pestalozzi retired from his laborious duties to Neuhof, where his grandson resided. Here he wrote his 'Schwanengesang' ('Song of the [Dying] Swan'), 1826; and 'Meine Lebensschicksale als Vorsteher meiner Erziehungsanstalten in Burgdorf und Iferten.' ('My Life's Fortunes as Superintendent of my Educational Establishments at Burgdorf and Yverdun'), 1826. He died February 17, 1827, at Brugg, in the canton of Aargau.

PETERBOROUGH. [Canada, *S.* 2.]

PETERHEAD. [Aberdeenshire, *S.* 1.]

PETHERTON. [Somersetshire.]

PETIVERIACEÆ, a small natural order of Exogenous Plants, of which the principal genus is *Petiveria*. [Petiveria, *S.* 1.] There are 2 other genera and 10 species.

PETÖFI, SANDOR or ALEXANDER, an eminent poet, and more especially an eminent song-writer, who may be called the Burns of Hungary, was born at Félegyhaz, in the district of Little Kumania, in the county of Pesth, on the 1st of January 1823. His father, who had migrated from the mountains of the north of Hungary to the plains, bore then, and till his death the name of Petrovics, equivalent to 'Peterson,' which showed that he was of Slavonic descent; the son changed the name to Petöfi, which has the same meaning in the Magyar or Hungarian language. The fact is worthy of note, as showing, in conjunction with some similar instances, that in a country where the rivalry of different nationalities has been pushed to a disastrous extreme, the most vehement defenders of one nationality may be recruited from the ranks of another. Petöfi's father was a butcher, who, having succeeded in trade, was anxious to see his son in a profession of some kind, and seems to have been indifferent whether in divinity, law, or medicine. The youth was wild and unruly, and extravagantly stage-struck, and was expelled from the school at Selmecz, to which his father had sent him, for engaging in some theatrical performances. Not daring or not wishing to return home, he went to Pesth, where at the age of fourteen he gained a precarious livelihood by assisting as a scene-shifter at the theatre, but spent most of his time in the streets. His father came to Pesth in search of him, took him home by force, and kept him as a sort of prisoner for about two years, after which he again sent him to school at Oedenburg.

The first thing that Petöfi did on arriving there was to go the barracks and enlist as a soldier in an Austrian regiment, which he understood was to be quartered in the Tyrol, when he intended to desert, and enjoy a free life among the mountains. The regiment was sent instead to Croatia, and his disappointment was so great that he fell ill, and continued seriously affected so long that the regimental doctor in 1841 recommended his discharge. Being now of the age of eighteen he resumed his studies at the college of Pápa, near Raab, and became acquainted with two young men who have since attained to some eminence—Orlay as a painter, and Jokai as a novelist. At that time Orlay was ambitious of becoming a poet, Jokai a painter, and Petöfi an actor, and all three failed in their respective ambitions. Petöfi, who soon left college to commence his career as a strolling player, seems never to have met with even the most moderate degree of success, and was soon plunged in the most abject poverty. He had long been in the habit of composing songs for his own amusement, and on a visit to Pesth in 1843 he called with some of them on Bajza, the editor of the 'Athenæum,' a popular periodical, mentioning to him that they were the composition of one Petöfi, but not mentioning that Petöfi was himself. The poems awakened the attention of Vörösmarty, at that time the leading poet of Hungary, who predicted that the author would soon stand high, and began to exert himself to bring him into notice. Some other friends procured him literary employment to translate into Hungarian a novel of G. P. R. James's, entitled 'Forest Days,' and with the money thus obtained he set off for Debreczin, to gratify his theatrical aspirations, by appearing as the Prince of Morocco in a translation of the 'Merchant of Venice.' He found his way back to Pesth on foot, and Vachot, the editor of the 'Divatlap,' or 'Journal of Fashion,' engaged him as a regular contributor of poetry to its pages. At this period he suddenly burst into fame, and became in a few weeks the most popular poet in Hungary. Two or three of his short poems appeared every week, and they were at once on the lips of the nation. The ease and fluency of his language recommended him even to the lowest classes, while he counted some of his warmest admirers among the highest. The sudden tide of success seems to have carried him off his feet, and even his eulogists speak of him as having become perhaps the proudest man in Hungary. His triumphs however were not unmingled; a novel which he wrote at the suggestion of Eötvös, entitled 'A' Hohér Kötele' ('The Hangman's Rope'), dropped still-born, and when, in 1845, he offered a play to the managing committee of Pesth, it was unhesitatingly rejected. Though in the same year he was allowed to make an appearance on the stage at Pesth, in the character of 'the Deserter,' the result was what is called 'a dead failure,' and he then finally took the hint and withdrew from the stage. For some time afterwards he continued in the enjoyment of a wide-spread popularity; a larger poem under the title of 'A' Vitez Janos' ('the Hero John'), was received with unbounded applause, and he had a train of imitators, even in the particular of costume in which he was somewhat eccentric. He was at the height of his fame at the outbreak of the revolution of 1848, which found in him one of its most ardent admirers and supporters. He had always been an uncompromising advocate of the independence of Hungary, and distinguished for hostility to the aristocracy, as well as by a warm feeling of personal independence.

On the 15th of March, it was Petöfi who incited the students of the university to action by reading aloud in the yard of the university his poem of 'Talpra Magyar' ('Hungarians, up!') which was received with shouts of applause; the poem was the same day issued in innumerable copies, being the first poem printed in Hungary without passing the censorship; and at the theatre that evening, after the great events of the day, it was sung again and again, the whole audience joining in the chorus. His other poems, 'Most vagy soha' ('Now or Never'), and 'Csatadal' ('Battle-Song'), had a great influence on the popular mind. He failed however as a candidate for a seat in the National Assembly for Little Kumania, but seized every opportunity of demonstrating his adhesion to the principles of Kossuth. When on the 21st of August 1848, the two parties of the Moderate and the Extreme Liberals in the National Assembly came to a conflict on the question, if the words of command to the Hungarian army should be given in Hungarian, or as they had always been before, in German, Vörösmarty, who was one of the deputies, gave his vote on the side of the Moderates, who, on that occasion, were first brought into a minority by the party of Kossuth. Petöfi, who, only a few months before had dedicated the collected edition of his poems to Vörösmarty, "as a sign of love and esteem," on this occasion wrote a poetical address to him renouncing his friendship, each stanza concluding with the lines,

"I do not tear the laurel from thy brow,
'Tis thy own hand has torn it now;"

and in spite of the remonstrances of mutual friends, gave it to the public in the 'Életkepek' ('Pictures of Life'), a periodical he was then publishing in conjunction with Jokai. Soon after he exchanged the pen for the sword, and joined the division of the army under the command of General Bem, who appointed him his aide-de-camp. A dispute with General Mészaros, who found fault with the poet's inattention to discipline, induced him to throw up the appointment in May 1849, and quit the service, his enemies remarking that the quarrel was between a butcher (the meaning of Mészaros in Hungarian) and a butcher's boy. The approach of the Russians led him to take up arms anew; he again became aide-de-camp to Bem, and he shared the last terrible campaign of that general in Transylvania. After one of the most desperate fights of that period he was seen no more, and it was universally believed that he was one of the slain. His body however was never found, and in 1852 a report was in circulation among the Hungarian refugees in London and elsewhere, that Petöfi was still alive and in concealment. Six additional years have now elapsed without any tidings being heard of him; his wife has been long re-married, and there seems little probability that he is still among the living. In the last poem of the first collection of his works beginning 'Egy gondolat bánt engemet,' he expresses a horror of dying in bed, and puts up an ardent prayer for death on the battle-field.

There is a collected edition of the poems of Petöfi up to 1846, in two small volumes, of which a first edition was published at Pesth in 1847, and a second in 1848. Two additional volumes, containing his subsequent works, were seized and suppressed by the Austrian government after the defeat of the revolution of Hungary. Many of them are to be found in a volume entitled 'Hangok á multbol' ('Sounds from the Past'), published at Leipzig in 1851, of which a German translation by Vasfi and Benkö, with interesting notes, was issued at Brunswick in 1852, under the title of 'Nationallieder der Magyaren.' As the wonderfully idiomatic elegance of the language is always spoken of as one of the principal charms of the poems of Petöfi, the foreign reader can hardly expect to appreciate them with any approach to the relish of a native; but there is a lightness and airiness about the songs which make it easy to believe in the effect they are said to produce on the sympathies of an Hungarian reader.

It may be remarked, that though Petöfi has often been spoken of as a wild son of nature, he had, as has been shown, enjoyed ample opportunities of education; and he was in reality well acquainted with the German, French, and English languages and literature. Gyulai, from whose biographical article in the 'Uj Magyar Muzeum' our information is chiefly taken, informs us that in English his favourite authors were Shakspere, Byron, Moore, and Dickens; and that he was accustomed to call Dickens, from the kindliness which his writings tend to inculcate, a "benefactor of mankind." Characteristically enough in a song-writer, he regarded Béranger as "the world's greatest poet." His own long poems are very inferior to his short ones; and in prose he can only be considered to have succeeded in some short tales and articles in the 'Életkenek.'

PEVENSEY. [Sussex.]

PHARMACOSIDERITE. [Mineralogy, *S.* 1.]

PHASMIDÆ, a tribe of Orthopterous Insects, embracing a number of exotic forms which have been often included in the *Mantidæ*, from which they are distinguished by the fore-legs being of the ordinary size, and fitted like the rest for walking rather than running. From the other *Orthoptera* they are distinguished by the hind legs not being saltatorial.

The body is generally long and slender. The head is of moderate size, of an oval subdepressed form, porrected, with large globular eyes, in front of which the antennæ are placed, which are variable in form, but ordinarily long, slender, and composed of a great number of articulations. The ocelli are rudimentary or obsolete. The labrum is deeply notched in front; the jaws are strong and horny. The dorsal surface in both sexes consists of nine segments, but only seven are distinct in the females. All the legs are alike, being long and slender, often armed with short spurs along the edges. The fore wings are of small size, and attached at the posterior part of the mesothorax. The true wings are very large and attached to the anterior part of the metathorax. "As they far exceed the wing-covers in size, it is essential that provision should be made for their defence. This is effected not as in the earwig, by the transverse folding of the wing so as to enable it to be folded beneath the small wing-cover, but by the front margin of the hind wing being greatly thickened, serving as a flat plate, beneath which the other part of the wing is folded longitudinally, the latter part being often differently coloured. Thus in some species the short wing-covers and the front margin of the wing are pale-green, whilst the other part of the wing is pink. Many species however remain throughout their lives without ever acquiring wings or wing-covers." (Westwood, 'History of Insects.')

The odd appearance of these insects have got for them the name of Walking-Sticks, Straws, Leaves, Spectres, &c., and certainly nothing can be imagined more curious than the forms they assume. In many instances they might be mistaken for a portion of the branch of the trees on which they rest.

PHENAKITE. [Mineralogy, *S.* 1.]

PHENYLE. [Chemistry, *S.* 2.]

PHILLIPS, RICHARD, F.R.S., some time President of the Chemical Society of London, first Curator and Chemist of the Museum of Practical Geology, an eminent mineralogical and pharmaceutical chemist, was a younger son of James Phillips, a member of the Society of Friends, who carried on the business of a printer and bookseller in George Yard, Lombard Street, London. Richard was born in the year 1778. He was educated as a chemist and druggist, under William Allen, at the well-known pharmaceutical establishment, Plough-court, Lombard-street, London; but he received his first instructions in chemistry from Dr. George Fordyce. Richard Phillips and his elder brother William, the mineralogist, William Allen, Luke Howard, and several other members of the Society of Friends, and three young men who were not Quakers, were among the founders, eight in number, of the Askesian Society, already noticed in a preceding article on Mr. Pepys, who was one of those three. To Richard Phillips, says Dr. Daubeny, in his anniversary address as president of the Chemical Society in 1852, "we are indebted for the first correct analyses of the Bath waters, in the course of which investigation he discovered the cause of the apparent uncertainty in the indications afforded by the common tests for iron, caused by the variations that occur in their effects, according as carbonate of lime is present or not." The elaborate paper stating the process and results of these analyses, was first communicated to the Askesian Society, and published in the 'Philosophical Magazine.'

His labours in mineralogical chemistry were characterised by great neatness and precision, so that they may indeed be appealed to at the present time as models of skilful and exact research. The analyses of the Bath waters were succeeded by examinations of other celebrated mineral springs, and of several rare minerals. In 1823 he discovered that the mineral called uranite was not the hydrated oxide of uranium, as it had been previously supposed to be, but a hydrated double phosphate of that metal and copper. The presence of phosphoric acid in uranite had escaped the scrutiny of Berzelius, who was thus as much outdone in this particular respect by the subject of this notice, as Davy had been by him when he detected the presence of the same acid in wavellite, which the great English chemist had overlooked.

The late Dr. Thomas Thomson, Regius Professor of Chemistry in the University of Glasgow, the author of the celebrated 'System' of the science, in his 'History of Chemistry,' forming part of the 'National Library,' published in 1831, when reviewing the progress of analytical chemistry in Great Britain, bore the following honourable testimony to the merits of Mr. R. Phillips—a testimony involving also considerations relative to the social position of the cultivators of science in this country, which thinking men of all ranks perceive to be of daily augmenting importance to the community:—"Of modern British analytical chemists," says Dr. Thomson, "undoubtedly the first is Mr. Richard Phillips, to whom we are indebted for not a few analyses, conducted with great chemical skill, and performed with great accuracy. Unfortunately of late years he has done little, having been withdrawn from science by the necessity of providing for a large family, which can hardly be done in this country except by turning one's attention to trade or manufactures."

It was however in the pharmaceutical branch of practical chemistry that Mr. R. Phillips's services were most conspicuous, as might be expected from one of his peculiar acuteness of mind, after a training in the establishment in Plough-court, of which the chemical reputation ranked justly so high. Indeed, the perfect familiarity he possessed with the processes in use, enabled him to detect the errors into which the framers of the London Pharmacopœia had fallen; whilst the keenness of his reviews gave currency to his censures, of which even those who smarted under their severity, could scarcely help acknowledging the justice. Accordingly, at a subsequent period he was especially consulted on the drawing up of two of the editions of the 'London Pharmacopœia' by the College of Physicians itself, whose previous labours in that department he had so severely criticised, and thus led the way to many of the much needed corrections in the processes since introduced. Indeed, during the latter part of his life, he was appealed to as perhaps the highest living authority in this branch of chemistry; and his translation of the London Pharmacopœia, the last edition of which he was engaged at the time of his death in superintending, was looked upon as the best book of reference on all chemical questions involved in the preparation of medicines.

From the year 1821 Mr. R. Phillips conducted the 'Annals of Philosophy,' with the assistance of Mr. E. W. Brayley, jun. (now F.R.S., and Librarian to the London Institution), and when that periodical was incorporated with the 'Philosophical Magazine' in 1827, his services were secured as one of its editors, a post he held till his death. The principal articles on subjects of chemistry and mineralogy in the 'Penny Cyclopædia,' were contributed by him.

Mr. Phillips was successively lecturer on chemistry at the London Hospital, at the Government Military College at Sandhurst, at Mr. Grainger's School of Medicine in Southwark, and at St. Thomas's Hospital. In 1839 Mr. (afterwards Sir Henry) De la Beche, knowing that in the first instance chemical investigations of mineral products would be those chiefly appreciated by the government and the public, wisely selected him for the appointment of curator and chemist of the Museum of Economic Geology, now the Museum of Practical Geology in Jermyn-street, an office which he continued to hold till his death, which occurred May 11, 1851, in his seventy-third year, after a very short illness, having been absent from the museum for three or four days only. On the following day, Monday, May 12, the formal opening of the Museum took place, under the auspices of H. R. H. Prince Albert.

On the institution of the Chemical Society of London, in the year 1841, its founders had offered Mr. R. Phillips the honourable position of the first president, deeming it due alike to his seniority among English chemists and his distinguished reputation; and although he declined the office then, he became the president in 1849 and 1850. He had been elected a Fellow of the Royal Society in 1822.

"He might indeed be regarded," remarks Dr. Daubeny, "during the latter part of his life, as a connecting link between the chemists of the last generation and of the present, having been the contemporary of Davy and Wollaston no less than of Faraday and Graham; and in his death we have lost one of the last of that distinguished band of philosophers, who, before chemical science had so enlarged its boundaries as to include within its domain and to comprehend within the operation of its laws the products of animal and of vegetable life, occupied themselves almost exclusively in the investigation of the combinations of which mineral bodies are susceptible."

PHILLIPS, SAMUEL, LL.D., was born in 1815. His father, who was of the Jewish faith, and a tradesman in Regent-street, London, struck by the boy's liveliness of manner and skill in mimicry, conceived that he would make a successful actor. He accordingly trained him for the stage, and in June 1829, "Master Phillips, a young gentleman only fourteen years of age," was announced to appear at the Haymarket Theatre in the character of Richard III. Fortunately some powerful friends—the late Duke of Sussex being one—thought that the boy's cleverness deserved a better culture than it would find in such a school, and they induced his father to send him, in 1832, to the London University, whence he proceeded in the following year to the University of Göttingen. Having changed his religious views, he afterwards went to Sidney-Sussex College, Cambridge, with the intention of ultimately taking holy orders. His father's death, and the necessity there appeared of continuing the business for the support of his mother and family, changed his plans, and he returned, after a single term, to carry on in conjunction with his brother, the Regent-street shop. In this the brothers were unsuccessful, though they were highly commended for their honourable conduct.

He now (1841) turned to literature as a profession. His first work was the novel of 'Caleb Stukeley,' which originally appeared in 'Blackwood's Magazine,' but has since been two or three times reprinted in a separate form. He afterwards wrote other tales in the pages of that and other periodicals, but none of them we believe were published with his name. For a brief space—during the summer months of 1844—he resided at the seat of the Marquis of Ailesbury in Wiltshire, in order to read with Lord F. Bruce; and whilst there he was thrown from a horse and seriously hurt. He had perhaps always had a tendency to consumption; it was developed by the hurt, and during his remaining days he worked with the weight of that terrible malady pressing upon him. But he worked steadily on, and was able to secure himself a handsome income, and an honourable position among his literary compeers. Writing exclusively in newspapers and periodicals, it was only in the last year or two of his life that Mr. Phillips was at all known by name to the general public, yet he probably exercised a much more considerable influence on public opinion and public taste than many much better known men. For some time he wrote political leaders in the 'Morning Herald;' but he afterwards became one of the chiefs of the literary staff of the 'Times,' and during some years his brilliant criticisms on current literature afforded an agreeable relief among the news and politics of that powerful journal. In the 'Times' his pen was entirely confined to literary criticism,—at any rate he never wrote 'leaders'—and he continued to write its more important reviews down to his death. Two volumes of 'Essays from the Times,' by him, were published, though still without his name, in 1852 and 1854. Lucid, picturesque, often eloquent, and sometimes bitterly keen, yet discriminating, and with all the appearance of being scrupulously fair, they will no doubt keep their place as a permanent addition to our store of that class of essays: and some that were attributed to him, but which appeared after the publication of these volumes, are of at least equal merit. Besides his papers in the 'Times,' Mr. Phillips wrote reviews in the 'Literary Gazette,' &c. He also purchased, and for about a year edited, the 'John Bull' newspaper, but without much pecuniary success. In the formation of the Crystal Palace Company he took an active part; and for a time acted as secretary, and subsequently as 'literary director' to the company, and many of the arrangements are said to have been suggested by him. He wrote likewise the general 'Guide to the Crystal Palace and Park,' and the 'Portrait Gallery of the Crystal Palace.' He died at Brighton, where he had gone on account of his health, on the 14th of October, 1854, from the rupture of a large vessel on the lungs. He left a widow and five children, for whom he had been enabled to make a comfortable provision. In 1852 the University of Göttingen conferred on him the honorary degree of LL.D.

PHILLYRINE. [Chemistry, *S.* 2.]

PHLEGM, a common name for Mucus. [Mucus.]

PHLORIDZIN. [Chemistry, *S.* 2.]

PHOLARITE. [Mineralogy, *S.* 1.]

PHOSPHATITE, a name proposed for the native Phosphate of Lime derived from organic sources, and usually called *Coprolites*. The latter term conveys an impression which is evidently wrong, with regard to large quantities of the phosphate of lime now obtained for agricultural purposes. In that which is obtained from the Red Crag fragments of bones of large size are constantly present, and it is questionable if any portion of this phosphate has ever been excrementitious matter. Hence the impropriety of the term coprolite. The more probable origin of these masses seems to be that they are the debris of a huge sepulchre of *Cetacea*, sharks, and other animals, which was formed previously to the existence of the beds in which these remains are now found. After deposition in this sepulchre, the animal matter of the bones was gradually washed away, and the large quantities of phosphate of lime found in the water-worn nodules of the Red Crag are thus accounted for. [Coprolites, *S.* 2.]

PHOTOGRAPHY is both an *art* and a *science*. As an art it enables us to draw, depict, or write by means of light. As a science it teaches us how to observe and further to investigate the effects produced by light upon all natural bodies, whether animate or inanimate, mineral, vegetable, or animal. Its full study is of comparatively recent date, but it has already occupied the liveliest attention of nearly all the most eminent investigators in modern science. The names of Davy, Wedgwood, Thomas Young, Wollaston, and the two Herschels in this country—of Scheele, Ritter, Seebeck, Berthollet, and Becquerel on the Continent—testify to this effect. Photography is worthy of special attention from the fact that it requires for its rational and thoroughly successful pursuit a knowledge of chemistry, optics, and physics generally, together with an amount of artistic taste and manual dexterity such as must be useful not only for purposes of mental training, but under a variety of circumstances in actual life. The variety of its parts and aims gives it a special charm for those who like to have a pursuit admitting of both activity of mind and body; its processes are as much carried on out of doors as in close laboratories. Further it has this charm, that while it furnishes problems of the greatest interest and intricacy for the most advanced philosopher in optics or chemistry, it has its practical processes, which may be readily apprehended, and exercised for purposes of utility or recreation by those who are but little skilled in physical manipulations.

The history of photography has been so fully treated of by Mr. Robert Hunt, in his 'Researches on Light,' and in his 'Treatise on Photography,' and also by the Abbé Moigno, in his 'Repertoire d'Optique Moderne,' that we need not do here more than recapitulate in a brief manner the points of chief interest which they have given at greater length.

It may be well to say at the outset, that it was not till the year 1839 that Protography acquired for itself "a local habitation and a name," through the investigations of Fox Talbot and Daguerre, which resulted in the introduction of the two processes known as the Calotype or Talbotype, and Daguerreotype. As usual in the history of art and science, approximations had been attained to by earlier experimentalists. It is interesting to inquire into the labours of some of these. Proceeding historically, we shall find that observations relating to the science of photography precede the first attempts at establishing the principles of the art.

In 1722 Petit noticed that solutions of nitrate of potash and muriate of ammonia crystallised more readily in the light than they did in darkness. In 1777 the illustrious Scheele writes, "It is well known that the solution of silver in acid of nitre, poured on a piece of chalk and exposed to the beams of the sun, grows black. The light of the sun reflected from a white wall has the same effect, but more slowly, heat without light being without effect." Again, "Fix a glass prism at the window, and let the refracted sunbeams fall on the floor. In this coloured light put a paper strewed with *luna cornua* (chloride of silver), and you will observe that this horn silver grows sooner black in the violet ray than in any of the other rays."

Senebier repeated these experiments, and also experimented on the influence of light in the bleaching of wax.

In 1798 Count Rumford sent to the 'Philosophical Transactions' a memoir entitled 'An Inquiry concerning the Chemical Properties that have been attributed to Light.' In this paper the Count attempts to prove that all the effects produced upon metallic solutions by bright sunshine are due to heat. In 1802 Mr. Harrup refuted this view, and showed that several salts of mercury were reduced by light alone, and not by heat.

In 1801 Ritter proved the existence of rays in the solar spectrum, which are to be found beyond its visible limits, and these rays have the power of darkening chloride of silver. These researches having excited attention, M. Berard, Seebeck, Berthollet, Sir W. Herschel, Sir H. Englefield, Wollaston, Davy, and others, made various experiments which tended still further to confirm the proof that light had a special influence over bodies beyond that exercised through its heat; and that the colour of the light was in some way related to this newly observed action of the sunbeam.

Before proceeding to notice the early efforts of those who laid the foundation of the *art* of photography, with which we are now to be chiefly engaged, we may observe that Priestley, Senebier, Ingenhousz, De Candolle, Saussure, and Ritter, directed attention to the influence of light upon plants—an interesting and important subject. Others followed in a similar track, still, however, leaving the matter in a comparatively obscure condition. The action of light on the human frame, and on animal life generally, has not yet been fairly investigated. That some special action will be detected there can be no doubt. We have long thought that light will come to be considered as important an element to health as fresh air and wholesome food. It may possibly be that much mental or bodily labour, exercised in the absence of the stimulus of daylight, is directly injurious to animal life.

But let us proceed to trace rapidly the *art* of photography to its source. In the Journals of the Royal Institution of Great Britain for 1802 will be found a paper by "Thomas Wedgwood and Humphry Davy"—the first a brother of the famous porcelain manufacturer, the second the Sir H. Davy of a later period. Their joint paper was entitled 'An Account of a Method of Copying Paintings upon Glass and of making Profiles by the Agency of Light upon Nitrate of Silver; with Observations by H. Davy.' This paper contains the complete germs of the photographic art, namely, the application of an optical instrument to imprint upon a sensitive chemical surface the images of all natural objects illuminated by the sunbeam, or other source of light. The instruments used by these observers were the *camera obscura* and the solar microscope: but let us first see how this important invention took shape in the mind of Wedgwood.

According to Davy, Wedgwood first commenced his researches with a view to copy the images of the *camera obscura*; and for this purpose, says Davy, "he first used nitrate of silver, which was mentioned to him by a friend as a substance very sensible to the influence of light." This nitrate of silver was applied in solution to surfaces of white paper and leather. "White paper or white leather," to quote the words of the memoir of 1802, "moistened with solution of nitrate of silver, undergoes no change when kept in a dark place; but on being exposed to the daylight, it speedily changes colour, and, after passing through different shades of grey and brown, becomes at length nearly black. The alterations of colour take place more speedily in proportion as the light is more intense. In the direct beam of the sun two or three minutes are sufficient to produce the full effect; in the shade several hours are required; and light transmitted through different-coloured glasses acts upon it with different degrees of intensity." . . . . "When the shadow of any figure is thrown upon the prepared surface, the part concealed by it remains white, and the other parts speedily become dark. For copying paintings on glass the solution should be applied on leather, and in this case it is more readily acted on than when paper is used. After the colour has been once fixed on the leather or paper, it cannot be removed by the application of water, or water and soap; and it is in a high degree permanent. The copy of a painting, or the profile, immediately after being taken must be kept in an obscure place; it may, indeed, be examined in the shade, but in this case the exposure should be only for a few minutes: by the light of candles or lamps, as commonly employed, it is not sensibly affected." No means were found to fix permanently the impressions thus produced. And, as regards the primary end of Wedgwood's researches, we are told that "The images formed by means of a camera obscura have been found to be too faint to produce in any moderate time an effect upon the nitrate of silver." Davy adds, "In following these processes, I have found that the images of small objects produced by means of the solar microscope, may be copied without difficulty on prepared paper. This will probably be a useful application of the method: that it may be employed successfully, however, it is necessary that the paper be placed at but a small distance from the lens."

The muriate (chloride) of silver was found to be more sensitive to light than the nitrate. "Even in the twilight, the colour of the moist muriate of silver spread upon paper slowly changed from white to faint violet; though under similar circumstances no immediate alteration was produced upon the nitrate." Davy concludes with these remarkable words: "Nothing but a method of preventing the unshaded parts of the delineations from being coloured by exposure to the day, is wanting to render this process as useful as it is elegant."

From this time the art in England slumbered until 1834, when Mr. Fox Talbot, without knowing what had been done, commenced experiments with the same end in view.

But we must now turn to a neighbouring country, France. In 1813 M. Niépce, of Chalons on the Soane, was engaged in a task identical in conception with that of Wedgwood. He was endeavouring by means of bituminous varnishes and metal plates to fix permanently the images of the camera, and he succeeded to a remarkable extent. His experiments were carried on until 1827, in which year he presented a memoir with specimens to the Royal Society of London; but as he kept his processes secret no notice was taken of his labours. Niépce returned to France dispirited. He there however continued his experiments, making pictures on a surface of bitumen laid upon a metal plate, which he afterwards engraved by ordinary engraver's acid. The rationale of his process is this: Light is capable of hardening a bituminous surface in such a way that the usual solvents of bitumen no longer act readily upon the altered part of the surface, and therefore only the shaded portions of a partially illuminated plate would yield to such solvents as the mineral naphthas, for example, furnish. But when a metal plate had been partially laid bare by the removal of the bitumen in the shadows, nothing was easier than to etch such a plate by aqua fortis, and this was what Niépce did. A plate thus made and prints from it are now in the possession of Mr. Robert Brown, of the Bristish Museum. It is to be hoped that they will be placed in the Museum itself. M. Niépce named his art *Heliography*.

In 1829 M. Niépce became acquainted with a M. Daguerre, who was noted for his dioramic paintings, and who was, it is alleged, also engaged upon methods for fixing the images of the camera. A deed of partnership was executed between the two experimentalists, and they jointly pursued their labours until the death of Niépce, in July 1833. A new arrangement was then made between his son M. Isidore Niépce and Daguerre.

At length came the memorable year 1839, when the whole scientific and artistic world was startled at the announcement that objects could be made to draw their own pictures with an accuracy and minuteness quite unattainable by hand. In January 1839 the first specimens by Daguerre were shown, but the process was withheld until the month of July. This enabled Mr. Fox Talbot to secure to himself the merit of priority of publication of a method by which sun-drawn pictures could be successfully produced. He on the 13th of January communicated to the Royal Society a paper, entitled 'Some Account of the Art of Photogenic Drawing, or the Process by which Natural Objects may be made to delineate themselves without the Aid of the Artist's Pencil.' And on the 21st of February in the same year, he gave another communication on the method of preparing sensitive paper and of fixing the images obtained. That the two experimentalists, Talbot and Daguerre, were independent discoverers is evident from the dissimilarity of their processes; the light and camera obscura being the only means strictly in common.

Mr. Talbot's method consisted in washing letter-paper over repeatedly with alternate solutions of salt and nitrate of silver; at a certain stage a surface was obtained which gave images under the influence of the camera, and these images were fixed by immersion in a strong solution of salt and water, in which the unaltered parts of the chloride of silver were soluble. This process was not very sensitive, and was therefore set aside by Mr. Talbot's later discoveries of 1840.

Let us now examine the nature of Daguerre's process called the Daguerreotype. A plate of silvered copper is highly polished, and then exposed to the vapour of the chemical element iodine, which imparts to the plate a series of colours, depending on the quantity of iodine absorbed. The exposure to the vapour was carried on until the plate assumed a rosy tint, or simply a deep orange-yellow, bordering on red. The plate was now sensitive, and had only to be exposed at the focus of the camera obscura in order to obtain a picture of any strongly illuminated object. Some minutes were necessary even in full sunshine. The plate was then withdrawn into the darkened room in which it had been prepared, and there it was exposed to the vapour of heated mercury, which has the wonderful property of attaching itself only to those parts of the iodised plate which have been exposed to light: and this deposit takes place in proportion to the original intensity of light of the image. Thus a picture was produced which represented in shades of black and white the original optical image seen on the ground-glass screen of the camera.

A solution of the hyposulphite of soda was used to fix the image by removing the compound of iodine and silver which still veiled in some degree the shadows on the plate. Subsequently M. Fizeau improved the appearance of daguerreotypes by imparting to them a warm tinge by a thin film of gold which was thrown down upon the image by a spontaneous electro-chemical action.

The original Daguerreotype process was not sufficiently sensitive to be used in portraiture. To Mr. Goddard we owe the great improvement of the introduction of a second chemical agent which now enables us to make pictures in a second of time. In 1840 Mr. Goddard combined bromine with iodine, and at once published the result. In the dull weather of November of that year, he obtained portraits in a few seconds; Daguerre's process requiring many minutes, even in a strong light.

One of the best modes of procedure now adopted is the following: Take a plate of silvered copper and polish it by means of tripoli powder and oil of lavender or rosemary, applied by cotton velvet; finishing the polish by *clean* cotton velvet alone. Then expose the silver to a mixture of iodine and pure sand in such a manner that the vapour of the iodine shall act equally upon the surface of the silver plate, to which it imparts a coating which is seen to be coloured when examined by light reflected from any white surface, a piece of paper for example. As soon as the plate has assumed an orange-yellow colour it is removed, and then exposed to the vapour issuing from a peculiar red compound of bromine with lime, called 'bromide of lime.' Over this it absorbs bromine, and assumes a rose tint, and as soon as this shade of colour has been obtained, the plate must be removed and again exposed to the iodine vessel until the rose colour has deepened into a plum tint. The plate is then ready for exposure in the camera obscura. No time can be stated for these various exposures as temperature influences the results. A few seconds in each case suffice. The plate must be prepared in a room which can be darkened, the light of a candle, or that obtained through yellow glass being alone used at the last iodizing, and in some of the subsequent operations. After exposure in the camera the plate is exposed to the vapour of mercury for a few minutes, the mercury being at a temperature of about 180° Fahr. Here the picture is developed by the action of the mercury upon the bromo-iodized surface, the mercury being, it is believed by some, deposited upon the plate in proportion to the amount of light which fell upon its surface during its exposure in the camera. On its removal from the mercury box the plate is partially fixed by washing its surface with a strong solution of hyposulphite of soda. The final fixation is effected by boiling upon the plate a solution of a double salt, called hyposulphite of soda and gold. The image is now fixed upon the plate, and may be coloured by brushing over it colours in very fine powder. The image should be kept so as to exclude the vapours of an impure atmosphere such as is usually found in large towns. Sulphuretted vapours will at once darken the light part of the image. The film of stain may, however, generally be removed by a solution of cyanide of potassium.

Having given an account of the daguerreotype, we might proceed to relate the history of Mr. Fox Talbot's researches, which led to the invention of the first successful process in photography on paper; but as these will be found detailed in Mr. Talbot's work 'The Pencil of Nature,' and in the Specifications of his Patents, we prefer to pass at once to consider a process which has now almost superseded all others, and which certainly sprang out of Mr. Fox Talbot's discoveries. Mr. Talbot used iodide of silver with nitrate of silver in excess, upon paper, for the purpose of procuring an image which remained latent until developed by a solution of gallic acid. The process now used, and called the Collodion Process, of Mr. Scott Archer, consists in the use of a film, on glass, of collodion, containing also iodide of silver with an excess of nitrate, the development being accomplished by pyro-gallic acid in the place of gallic acid. The analogy is complete, but the latter materials improve very much the ultimate results.

Collodion is made by dissolving in ether and alcohol cotton-wool which has been altered in its properties by treatment with strong acids. The following is a good mode of proceeding, and is due mainly to the researches of Mr. Hadow: Take of pure nitrate of potash in fine powder 510 grains, of oil of vitriol (specific gravity 1·833 about) 15½ drachms, of water 1½ drachms; stir together, and when at a temperature of from 150 to 155° Fahr., add, bit by bit, 15 grains of cotton-wool to each ounce of the acid mixture. Allow the cotton to soak for four or five minutes, and then wash it many times in water until it is quite free from acid. Then, to make the collodion, take 9 grains of the dry cotton, and add 6 drachms of pure ether (sp. gr. ·725 to ·730), and 2 drachms of pure alcohol (sp. gr. ·818 to ·820). The cotton should at once dissolve. In another bottle prepare what is called the 'iodizing solution' by taking alcohol (sp. gr. ·818 to ·820) one ounce, iodide of potassium 12 grains, iodide of cadmium 4 grains; dissolve the salts in the alcohol, and keep the solution for use. To make 'iodized collodion,' mix six drachms of collodion with two drachms of the iodizing solution; this mixture changes by keeping, and should therefore be made only in moderate quantities. Having prepared the iodized collodion, a plate of glass is covered with it by pouring a quantity on the centre of the plate, and then allowing the liquid to flow to the corners in such a way that the glass shall be uniformly covered; the excess is then run off at one corner into a bottle set apart for the purpose. After a few seconds the film of iodized collodion is sufficiently firm to be fit for immersion—in the dark—in what is called the 'nitrate bath.' This bath is made by dissolving 30 grains of nitrate of silver in one ounce of distilled water. The nitrate of silver should be pure, and free from excess of nitric acid, and it should be saturated, when in solution, with iodide of silver; a little acetic acid, too, may be added. The plate is immersed in this bath for a few minutes, drained, and then exposed in the camera obscura. To develope the image, a solution of pyrogallic acid containing one grain of the salt to one ounce of water acidulated by 20 drops, or minims, of glacial acetic acid is poured upon the plate. If the image is not intense enough, a little weak solution of nitrate of silver must be added. The image obtained is fixed by a strong solution of hyposulphite of soda, in which it is immersed, or, instead, a weak solution of cyanide of potassium may be poured upon the plate, and left there until the yellow film of iodide of silver disappears. The plate is then washed and dried, and protected by a film of varnish: amber in chloroform being usually preferred for this purpose.

The picture thus obtained is, as in the calotype or Talbotype process of Mr. Fox Talbot, a *negative* one, that is to say, a picture having its light and shade reversed; though by modifying the collodion process *direct* positives may be at once obtained; a good negative, however, is a more valuable acquisition. In order to obtain copies correct in light and shade and position, a *positive* has to be made. There are many processes by which this can be done; but we will here give only one, which answers perfectly. Take the white of an egg and beat up, with every fluid ounce of it 12 grains of common salt: remove the froth thus obtained, and continue beating until all has become froth. Leave this froth to itself, and the greater part of the white of egg will become again liquid. Pour this liquid into a flat shallow dish, and upon it place carefully, so as to exclude bubbles of air, a sheet of thin paper, French paper is usually chosen; leave the paper for two or three minutes floating, so as to coat only one side with the 'salted albumen,' as the white of egg mixture is now called. Then carefully remove the sheet, and pin it up by a corner to dry. This operation can be carried on in daylight. To make this paper sensitive, it is floated upon a solution of nitrate of silver containing 60 grains of nitrate to one ounce of water. Here it is left for two or three minutes, and then removed and suspended to dry. This last operation must be performed in a room dimly lighted, as in the case of the daguerreotype and collodion final preparation. Upon the dry paper the negative picture is placed face to face, and the whole exposed in a proper 'pressure-frame' to the sun or to daylight. After a few minutes the picture is found printed, and must next be fixed by immersion in a solution of hyposulphite of soda, one part of the salt in from 6 to 10 parts of water. Ten or fifteen minutes' immersion would suffice to fix the picture; but in order to produce an agreeable tint of colour, a longer immersion is had recourse to, with the addition to the 'fixing bath' of a few grains of a neutral solution of chloride of gold. After several hours' immersion in this bath, the picture is removed, and washed repeatedly with plenty of water; hot distilled water being used at last. This fixing bath is made fresh for each day's work. The pictures, when washed and dried, may be mounted on card-board by means of starch, gum, or gelatine: paste is supposed to injure the picture under some circumstances. Exposure of the finished picture to impure atmospheric vapours, and to damp, is to be avoided. Mr. Malone has advised that the picture should be heated in a solution of caustic potash in order to secure its greater permanency. He also insists on the injurious action of sulphur in certain forms upon the print.

There is another branch of photography which is worthy of the attention of the student, but which has not yet come into practical operation in a perfectly satisfactory manner. It is that of photographic engraving. The labours of Niépce, Grove, Fizeau, Talbot, Pretsch of Poitevin, and others have done much to forward this art, but at present all is too uncertain to justify our extending this article by a description of the processes.

Stimulated by the experiments of Sir John Herschel, M. Ed. Becquerel and others, M. Niépce de St. Victor commenced a series of beautiful experiments upon coloured flames and their photographic images. He laid before the Academy of Sciences, Paris, a detailed memoir upon the subject on the 4th of March, 1851. This was followed by others on June 2, 1851; Feb. 9, 1852; and November 6, 1852. By the method described in these papers, M. Niépce succeeded in obtaining upon silver plates which had been rendered sensitive by a chloride of copper, images which faithfully reproduced the colours in coloured engravings, flowers both artificial and natural, lay-figures dressed in stuffs and gold and silver lace, precious stones, &c. These were obtained both by the process of photographic printing and in the camera; the light and brilliant colours being obtained with comparative ease, but the darker and more sombre colours more slowly. The colours he rendered more vivid and at the same time more lasting by the action of ammonia. But beautiful as were the results, and much more nearly as they seemed to approach the solution of the problem of photographing the colours of nature, they proved to be only comparatively permanent. The colours soon began to fade, and eventually disappeared altogether. This method (mainly due to M. Ed. Becquerel) M. Niépce named Heliochrome. M. Ed. Becquerel, by the use of silver plates, coated with a dark compound of chlorine and silver, obtained by the voltaic decomposition of hydrochloric acid, has succeeded in obtaining coloured images of the solar spectrum, but no method of fixing them permanently has been discovered.

In scientific photography much remains to be done. We know but little of the properties of light in its influence on vegetation and animal life. Mr. Robert Hunt and others have, however, established some interesting facts in the former direction, and lately some experiments made upon the eggs of insects seem to show that light of various colours and intensities acts differently according to its colour and other peculiar qualities. There is no branch of science which will better repay the philosophical experimentalist for his investigations than that of photography. The most marvellous and unexpected results have been constantly obtained. As an instance let us take the recent discovery of M. Niépce de St. Victor, which seems to prove that bodies acted upon by the sun absorb its powers in such a manner that they can emit photographically the same kind of influence which they have originally received from the sun. A bottling up of light—so to speak—has thus been arrived at.

Those who would pursue photography further should consult Hunt's 'Researches on Light,' the Abbé Moigno's 'Repertoire d'Optique Moderne,' and Mr. Hardwich's 'Treatise on Photographic Chemistry.' There are many papers also of interest to be found in the 'Comptes Rendus' of the Paris Academy of Sciences, in our own Royal Society's 'Transactions,' and above all in the journals of the various Photographic Societies.

PHYCIS, a genus of fishes belonging to the family *Gadidæ*. It has an elongated body; two dorsal fins, the first short, the second long; ventral fins with a single ray only at the base, afterwards divided; chin with one barbule.

P. furcatus, the Forked Hake, the Hake-Dame, the Common Fork Beard, is a rare fish on the British coasts. It has been taken most frequently in Cornwall. It is about two feet in length, but not very good eating.

PHYLLOSTOMA. [CHEIROPTERA.]

PHYSIC, PRACTICE OF. The more common diseases of the human system are treated of in the 'Penny Cyclopædia,' either under the head of the particular disease, or the organs or system of organs disordered. In the First Supplement, under the article NOSOLOGY, a classification of diseases will be found. In the present article, some forms of disease are noticed which have either been recently described or on which new light has been thrown by recent research. The subjects have been arranged for the convenience of reference in an alphabetical form.

ACCLIMATION is a term applied to that change in the human system produced by residence in a place whose climate is different from that to which it has been accustomed, and which enables it to resist those causes of disease which readily act upon it before such change has taken place. A person is thus rendered similar in constitution to the natives of the country which he has adopted. This subject is one of great importance, and has not yet received the attention it demands. As far as present evidence goes, it appears that the white races attain their highest physical and intellectual development, the greatest amount of health, and reach the greatest age, above 40° in the western and 45° in the eastern hemispheres. Whenever they pass below these latitudes they begin to deteriorate and exhibit unmistakeable symptoms of decadence in both health and strength. The same law holds good with the dark races of the tropical parts of the earth. The negro who lives in the interior of Africa, is killed by cold. The limits of his health and strength are found at 40° north or south. If he proceeds to higher latitudes, he deteriorates and becomes exterminated. In the northern states of America the mortality of the black population is double that of the white.

"The laws of climate show that each race of mankind has its prescribed salubrious limits. All of them seem to possess a certain degree of constitutional pliability by which they are able to bear, to a certain extent, great changes of temperature and latitude; and those races that are indigenous to temperate climates support best the extremes of other latitudes. The inhabitants of the arctic regions, as also of the tropics, have a certain pliancy of constitution; and while the inhabitants of the middle latitudes may emigrate 30° south or 30° north with comparative impunity, the Esquimaux in the one extreme, or the Negro, Hindoo, or Malay, in the other, have no power to withstand the vicissitudes of climate encountered in traversing the 70° of latitude between Greenland and the equator. The fair races of northern Europe below the arctic zone find Jamaica, Louisiana, and India, to be extreme climates; and they and their descendants are no longer to be recognised after a prolonged residence there. When an Englishman is placed in the most beautiful part of Bengal or Jamaica, where malaria does not exist, and although he may be subjected to no attack of acute diseases, but may live with a tolerable degree of health his threescore years and ten, he nevertheless ceases to be the same healthy individual he once was; and, moreover, his descendants degenerate. He complains bitterly of the heat, and becomes tanned; his plump plethoric frame becomes attenuated; his blood loses fibrine and red globules; both mind and body become sluggish; gray hairs and other marks show that age has come on prematurely—the man of forty looks fifty years old; the average duration of life is shortened (as shown in life insurance tables); and the race in time would be exterminated if cut off from fresh supplies of emigrants from the home country. Our army medical historians tell us that our troops do not become acclimatised in India. Length of residence in a distant land affords no immunity from the diseases of its climate, which act with redoubled energy on the stranger from the temperate zones. On the contrary, the mortality among officers and troops is greatest among those who remain longest in those climates." (Johnson, Martin, Tulloch, Macpherson, Boudin.) Dr. Macpherson also makes the significant remark, that the small mortality among officers compared with soldiers, in India, is due to the greater facilities they enjoy of obtaining change of climate when they fall sick. Although the constitution of the man may be so modified that comparative health may be retained, yet there is a morbid degradation of the physical and intellectual constitution. If, however, he or his descendants are taken back to their native climate, they may yet revert to the healthful standard of their original types. The good effects of limiting the period of service of our troops abroad to three years, has shown this in sustaining for a greater period the strength of the regiments; a protracted residence of the European regiments in India having been followed by the most disastrous results. "European regiments in India have melted away like the spectres of a dream. A thousand strong men form this year a regiment: a year passes, and one hundred and twenty-five new recruits are required to fill up the broken column; and eight years having come and gone, not a man of the original thousand remains in the dissolving corps."

"With regard to the Bombay Fusilier European regiment, for instance, Dr. Arnot has shown that its losses average 104 per 1000 per annum; a loss equivalent to the entire absorption of the regiment in nine years and seven months. In Bengal also it is an ascertained fact, that a British regiment of 1,000 men dissolves entirely away in 11 years, even in favourable times, and with all the improved conditions of the service. Dr. Arnot's statistics show that the Bengal army loses annually 9 per cent. of its numbers, giving a total loss in eight years of upwards of 14,005 men out of an army of 156,130 men." (Aitken's 'Handbook of Medicine.')

In the island of Ceylon the rate of mortality has been recorded amongst five different races of which the British troops are composed. The following table gives the result:—

	Annual death in 1000 men
Native troops of Bengal and Madras	12
Troops recruited on the coast of Ceylon	23
Malays	24
Negro troops	50
English troops	69

Although from these facts it would appear there is an insuperable barrier to the prolonged occupation of tropical countries by white races, yet much may be done by attention to the laws of health and disease. One cause of the great amount of mortality amongst Europeans in the tropics is that they continue the habits they had acquired in cold countries when they arrive in the hotter parts of the world. An attention to diet, clothing, and residence, would do much to remove many of the causes of disease. It would appear also that many of the races that now inhabit cold climates made their way from warmer countries, and that changes gradually produced in the constitution, as by the slow advance of peoples north or south, may overcome that tendency to succumb which is so evident in the rapid removals to which the above data refer. The question of the permanent occupation of tropical countries has become one of vital importance to the two great European governments of England and France. How this can be done at the least expense of human life can only be ascertained by the study of the laws which regulate acclimation.

ADDISON'S DISEASE. The name of Dr. Addison, physician to Guy's Hospital, has been connected with a diseased condition of the system, which is made apparent by a discoloration of the skin. Hence this disease is also called 'Bronzed Skin.' The existence of this discoloured skin has long been known as a symptom of certain cachectic states of the system; but Dr. Addison was the first to point out that this state of the skin always existed in connection with a diseased condition of the supra-renal capsules. These bodies belong to the class of ductless glands, and till the time of Dr. Addison's researches upon bronzed skin appeared, little was known of their uses and functions in the human body. The following conclusions with regard to these bodies have been arrived at by Dr. Harley as the result of his experiments:—

1. The supra-renal capsules are not solely fœtal organs.
2. They are not absolutely essential to life.
3. The removal of the right is generally more fatal than the left.

4. That convulsions do not necessarily follow their removal.

5. The absence of their function is attended neither by great emaciation nor debility.

6. If death follows an experiment, it occurs as the result of injuring neighbouring parts.

7. Absence of the supra-renal bodies is not proved to have any special effect in arresting the transformation of hæmatin or in increasing the formation of blood-crystals.

8. The suppression of the supra-renal capsular function is not attended by an increased deposit of pigment in the skin or its appendages.

9. The problem of the connection of the bronzed skin and supra-renal capsular disease is more likely to be solved in the dead-house than in the physiological laboratory.

These conclusions were chiefly arrived at by experiments on rats, but they would seem to indicate that the connection between the bronzed skin and supra-renal capsules is not clearly made out.

The distinguishing features of the disease to which the name bronzed skin has been given, are general languor and debility, great feebleness of the heart's action, irritability of the stomach, a peculiar change of colour of the skin, and these symptoms usually occurring in connection with a diseased condition of the supra-renal capsules. The general symptoms are in fact those of anæmia, or cases in which the blood is imperfectly developed. Dr. Addison says of this discoloration of the skin, that it usually increases with the advance of the disease. "The anæmia, languor, failure of appetite, and feebleness of the heart become aggravated; a darkish streak usually appears upon the commissure of the lips; the body wastes, but without the extreme emaciation and dry harsh condition of the surface so commonly observed in ordinary malignant diseases; the pulse becomes smaller and weaker, and without any special complaint of pain or uneasiness, the patient at length gradually sinks and expires. In one case, which may be said to have been acute in its development as well as rapid in its course, and in which both capsules were found universally diseased after death, the mottled or checkered discoloration was very manifest, the anæmic condition strongly marked, and the sickness and vomiting urgent; but the pulse, instead of being small and feeble as usual, was large, soft, extremely compressible, and jerking on the slightest exertion or emotion, and the patient speedily died." (Addison.)

Although the connection between the state of the skin and the disease of the capsules was exhibited in all Dr. Addison's original cases, many exceptions have been recorded. Cases have occurred in which extensive disease of the supra-renal capsules has occurred without any bronzed skin, and cases of bronzed skin have been seen where no disease of the supra-renal capsules could be detected after death.

Dr. Harley, in the paper before referred to, concludes:—

1. That bronzed skin may exist without the supra-renal capsules being diseased.

2. That complete degeneration or total absence of the supra-renal capsules may occur without any bronzing of the skin.

3. That bronzed skin may be associated with a variety of differently-marked conditions of the system, among which a prominent one is disease of the supra-renal capsules.

4. That bronzed skin may be present without any derangement of the other functions of the body being observed. ('British and Foreign Medico-Chirurgical Review,' No. 42, 1848.) Dr. Harley is of opinion that the general symptoms in this disease are produced by a "diseased state of the solar plexus *per se*, or by irritation of the ganglionic system of nerves, caused by the close proximity and intimate connection of diseased supra-renal capsules."

The blood has been examined by the microscope in some of these cases, and found to present an increased quantity of the white blood cells, as observed in the disease known as Leucocythemia. [BLOOD, DISEASES OF.]

The microscopic character of the skin has been carefully examined in this disease, and it has been found to present the same appearance as observed in the skin of the black man. The pigmentary matter of the skin was found to be increased, and existed in larger quantities in the under than in the upper layers of the epidermis.

The treatment of this disease is not affected by our knowledge of its supposed cause. The remedies which would be applicable to bloodless and depressed conditions of the system should be used here. Tonics, nutritious diet, fresh air, and the means resorted to for restoring health in anæmia and leucocythemia may be had recourse to here.

The prognosis in this disease is unfavourable, although cases are reported in which recovery has taken place.

ANÆMIA, a diseased condition of the human body, in which is implied either a morbid condition of the blood, or a relative diminution of some of its most important constituents. This disease is also called *oligonæmia* and *spanæmia*, terms which, like anæmia, express a deficiency or paucity of the constituents of the blood. This state of the system is generally indicated by the excessive paleness of the face and the whole surface of the body. The lips are pale. The conjunctiva is of an unnatural white, having a pearly lustre. The veins on the surface are small, blue, and collapsed. These general symptoms are frequently attended with derangements of the nervous system. There is frequently violent pain in the head, and not unfrequently disordered sensations, as singing in the ears and flashings before the eyes. The whole surface of the body is frequently preternaturally tender, the slightest touch causing the patient to start. The course of the spine is frequently excessively tender, leading to the supposition that there is spinal irritation. The circulating system is deranged; palpitations of the heart come on after slight exertion. The pulse is mostly small, feeble, and quick, excited to rapid action on slight exertions. The breathing is quickened by exertion, and there is generally lassitude and inability to take much exercise. This disease is accompanied with disturbances of the circulating system, which may be detected by means of the stethoscope. These are heard in the heart, arteries, and veins. The sound heard in the heart is a 'bellows' murmur of varying intensity, and is heard most distinctly at the apex. This sound is not present in all cases of anæmia, nor is its occurrence diagnostic of anæmia; but it is very important to know that it may be entirely dependent on the anæmic condition, and removed with it. The arterial murmurs are not frequently heard; they are synchronous with the beat of the pulse, and when present may even be recognised by the character of the pulse. The venous murmurs are much more common. They are continuous, and produce various buzzing, humming, musical, and singing murmurs. "They are most frequently heard on the right side of the neck, at the junction of the external and internal jugular vein." (Aitken.)

The venous murmurs are seldom absent to a greater or less extent in anæmia.

When the blood of anæmic persons is examined under the microscope a deficiency of blood globules is observed. Andral records a case in which there were but 30 parts of blood globules in 1000 of blood. The other constituents of the blood, as far as observations at present go, seem to suffer little alteration.

The *causes* of anæmia are anything acting on the system by which the quantity of blood is diminished or the healthy development of the blood cells prevented. Thus, amongst the causes of this disease we may reckon: 1. Want of food. 2. Want of proper food. 3. Indigestion or imperfect nutrition, from whatever cause. 4. Derangement of the liver, spleen, &c. 5. Hæmorrhages, as from hæmorrhoids, the stomach, lungs, wounds, &c. 6. All extensive discharges from wounds, ulcers, or mucous surfaces.

A knowledge of the causes of anæmia at once suggests its treatment. Where it depends on a want of food altogether, or of proper food, then food of a proper kind must be supplied. Where improper food, as alcohol, produces imperfect assimilation, it must be withdrawn. Deficient nutritionary changes often come on as the result of impure air, and change from an impure to a pure air often acts most beneficially. In certain cases dependent on imperfect blood-cell formation great benefit results from the administration of iron. Cases are recorded in which, under an iron treatment, the blood-cells have increased from 32 to 95 in a 1000. Other tonics may also be administered with advantage. In cases of anæmia in marshy districts quinine is of great service.

BRIGHT'S DISEASE. An affection of the kidneys, having very definite symptoms, and exhibiting uniformity of structural change, was first pointed out by Dr. Bright, of Guy's Hospital, and is generally called after him. This disease is also called *Albuminuria* and *granular disease of the kidney;* the first on account of its diagnostic symptom, albumen in the urine, the second on account of the morbid condition presented by the kidney. This formidable disease presents several stages or varieties, and some discussion has taken place as to whether the symptom of albumen in the urine may not occur in several distinct morbid conditions of the kidney. There is no doubt that albumen may be found in the urine in even functional derangements of the kidney; but the term Bright's Disease is very conveniently applied to all those forms of structural change in the kidney which are accompanied with albuminous urine.

The general symptoms accompanying this disease vary according to the intensity of the disease and the condition of the patient. One of the first symptoms to which the physician's attention is usually drawn, is the presence of dropsy. This may occur in the skin or in any of the cavities of the body. It is frequently noticed in the face; and in all varieties of this disease an effusion of fluid is observed underneath the conjunctiva, producing the appearance of a watery eye. In addition to dropsical effusions, inflammatory affections of the mucous and serous membranes are very common accompaniments of Bright's disease. The heart also is frequently affected, and pericarditis and endocarditis are observed. Affections of the brain are also not unfrequently present, especially in the more severe cases arising from the poisoned condition of the blood.

In all cases of this disease, the urine contains albumen. This is easily detected either by coagulating the albumen by heat or nitric acid. The specific gravity of the urine is also decreased, being sometimes as low as 1·010, whilst healthy urine has a specific gravity of 1·020. It contains less urea than healthy urine. Under the microscope it also presents appearances indicative of the nature of the disease. These appearances consist of casts of the minute tubes of the kidneys, formed by substances produced in various stages of the disease. They are thus classified by Dr. Bennett:—

1. *Exudative casts*, consisting of the coagulated exudation or fibrine which is poured into the tube during the inflammatory stage.

2. *Desquamative casts*, consisting of masses of the epithelium lining the tubes, and occurring in all stages of the disease.

3. *Fatty casts*, consisting of patches of epithelium as in the last, but which have undergone a fatty transformation by the accumulation of a greater or less number of fatty granules in its cells.

4. *Waxy casts*, presenting an exceedingly diaphanous and structureless substance. They are frequently associated with the two last.

Dr. Bright originally described three stages of this disease, but later observers have recognised six.

1. The catarrhal form, in which the kidneys are enlarged, and contain an increased quantity of blood. In this stage only a small quantity of urine is passed containing the exudative and desquamative casts.

2. In this stage the kidney is enlarged to nearly double its size, and is white and granular in its appearance. The tubes of the kidney are obliterated by the inflammatory deposit. The urine is very albuminous, and of light specific gravity.

3. The kidney presents a mottled appearance. It is probably a transition from the first to the second stage.

4. In this stage the kidney is large, dense, and white. The tissues of the kidney have become charged. The urine is scanty, of low specific gravity, and defective in urea and other excretory matters.

5. In this stage the kidney is hard, granular, and contracted. The kidney is smaller than in health, the surface is uneven and puckered, the tunic adherent. There is no deposit in the tubes, but fibrous matter has been deposited in the tissues of the kidney, and the tubes are strangulated. The urine may not contain albumen. Its specific gravity is sometimes as low as 1·005.

6. This stage has been called the 'coarse kidney.' The organ is large and dark. The specific gravity of the urine is high, and it is loaded with urates.

The presence of fatty matter in the casts of the kidneys may occur in any of these stages, and does not appear to exist as a separate form of the disease.

The cause of this disease is anything which will unduly excite the action of the kidney. Thus it comes on as the result of spirit drinking, which powerfully excites the action of the kidneys. Exposure to cold and diminution of the action of the skin will also produce it. It comes on frequently after scarlatina, when the skin is highly susceptible of any diminution of temperature.

The treatment must be active in the early stages. Purgatives may be given and blood abstracted locally, and the febrile symptoms treated accordingly. Mercury is not found beneficial. When chronic, diaphoretics and diuretics are both admissible. Amongst the former, Dover's powder and warm baths, and the latter, bitartrate of potash and digitalis. The patient should be protected from cold; a warm climate is serviceable; and a nutritious but not stimulating diet, with fresh air and exercise, are desirable.

Blood, Diseases of. A large number of diseases are now referred to disordered conditions of the blood. Amongst these are the following:—Anæmia, Diabetes, Continued Fevers, Eruptive Fevers, Syphilis, Mercurial Poisoning, Rheumatism, Gout, Scorbutics, Obesity, Leucocythemia, and Pyæmia. With the exception of the two last, these diseases have been treated of in the 'Penny Cyclopædia.'

Leucocythemia, as a distinct disease, was first pointed out by Dr. Bennett, of Edinburgh, in 1845. The name is derived from the fact, that in these cases the white or colourless corpuscles of the blood are increased in number. This state appears to be brought about by loss of blood, chronic diseases, more especially affections of the lymphatic glands and spleen. It is accompanied by debility, wasting, cough or diarrhœa, and a generally unhealthy condition of the system. The increase of the white corpuscles of the blood, which are easily detected, does not appear to occur of itself, but is generally dependent on some morbid condition which has preceded. The most frequent complication is enlargement of the spleen. Vogel states that in nineteen cases this complication existed in sixteen. Occasionally the liver is found enlarged, and in some cases the lymphatic glands are the organs most extensively affected. The occurrence of this disease has led to highly interesting inquiries as to the origin and nature of the white cells of the blood, which are increased so largely in these cases. Dr. Bennett, in his work on the 'Principles and Practice of Medicine,' (1858), gives the following conclusions as to the result of his own elaborate and carefully conducted inquiries:—

"1. That the blood-corpuscles of vertebrate animals are originally formed in the lymphatic glandular system, and that the great majority of them, on joining the circulation, become coloured in a manner as yet unexplained. Hence the blood may be considered as a secretion from the lymphatic glands, although in the higher animals that secretion only becomes fully formed after it has received colour by exposure to oxygen in the lungs.

"2. That in mammalia, the lymphatic glandular system is composed of the spleen, thymus, thyroid, supra-renal, pituitary, pineal, and lymphatic glands.

"3. That in fishes, reptiles, and birds, the coloured blood-corpuscles are nucleated cells, originating in those glands; but that in mammals they are free nuclei, sometimes derived as such from the glands, at others developed within colourless cells.

"4. That in certain hypertrophies of the lymphatic glands in man, their cell-elements are multiplied to an unusual extent, and under such circumstances find their way into the blood, and constitute an increase in the number of its colourless cells. A corresponding diminution in the formation of free nuclei, and consequently of coloured corpuscles, must also occur. This is leucocythemia."

The treatment of this disease must be directed to the removal of those affections by which it is preceded and accompanied. Unfortunately, these are mostly of such a nature as to resist all treatment after the white cells have been discovered in the blood.

Pyæmia. Pus in the blood. By this term is understood a peculiar and dangerous disturbance of the system, supposed to be produced by the admixture of pus with the blood. In the cases in which this disease occurs, the pus is supposed to gain access to the blood from a suppurating surface in which the veins are opened, or by the production of pus on the interior surfaces of the vein, as in suppurating phlebitis. Many cases, however, of this disease have been recorded in which no open suppurating wound of the body could be discovered.

This disease usually sets in with more or less violent shivering fits. When suppurating surfaces exist they dry up, or the discharge becomes greyish and fetid, the surfaces of the wound assume a withered, flabby aspect. The patient becomes exceedingly languid and exhausted, and is sometimes plunged into a deep stupor, or has occasional delirium; the inspirations increase, the breath exhales a purulent odour, the lungs are congested, the skin becomes daily more yellowish, articular pains with swelling, and intra-synovial effusion occur sucessively in several of the joints. The tongue is dry, and coated with a brown fur; the teeth and lips are covered with sores, the abdomen is tender and frequently tympanitic, the pulse is quick and becomes tremulous and rapid, the eye becomes dull, partial paralyses present themselves, the voice is lost, and the patient sinks from the fourth to the tenth day.

After death abscesses are found in the lungs, liver, spleen, brain, kidneys, heart, pleura, joints, muscles, and the subcutaneous connective tissue.

In many cases pus-cells, or an increase of the white corpuscles, have been found in the blood. This increase is not, however, a diagnostic symptom, as many cases have occurred in which no increase in the white cells (which are not easily distinguished in the blood from the pus-cells, and have been supposed to be identical) has been observed.

The pathology of this disease has excited much discussion. Whilst some have regarded it as entirely dependent on the introduction of pus into the blood, others maintain that it depends on the introduction of a peculiar poison into the blood. Dr. Bennett injected pus into the blood of an ass without producing ill effects, and the above symptoms come on without any introduction of pus from without. It is more probable therefore that the disease arises from a peculiar state of the blood, either arising from vital changes in itself, or produced by the introduction of an external poison.

This disease is most frequently fatal, and no one plan of treatment can be laid down. Where suppurating surfaces are present these must be attended to, and accumulations of pus in abscesses should be removed by free incisions. The system must be supported by stimulants. Large doses of quinine have been recommended.

Under the head of FEVER, 'Penny Cyclopædia,' an account is given of the principal forms assumed by continued fever. Recent researches have led some pathologists to the conclusion that, under the name of continued fever, several distinct diseases resembling each other have been included. Dr. Jenner has given the following summary of the various forms of fever now recognised as follows:—

"*Febricula.*—A disease attended by chilliness, alternating with a sense of heat, headache, white tongue, confined bowels, high-coloured scanty urine, hot and dry skin, and frequent pulse, terminating in from two to seven days, and having for its cause excess, exposure, over-fatigue, &c.—(*i. e.*) the cause of febricula is not specific.

"*Relapsing Fever.*—A disease arising from a specific cause, attended by rigors and chilliness, headache, vomiting, white tongue, epigastric tenderness, confined bowels, enlarged liver and spleen, high-coloured urine, frequent pulse, hot skin, and occasionally by jaundice, and terminating in apparent convalescence in from five to eight days; in a week a relapse—(*i. e.*) a repetition of the symptoms present during the primary attack. After death, spleen and liver are found considerably enlarged; absence of marked congestion of internal organs.

"*Typhoid Fever.*—A disease arising from a specific cause, attended by rigors, chilliness, headache, successive crops of rose spots, frequent pulse, sonorous râle, diarrhœa, fulness, resonance, and tenderness of the abdomen, gurgling in the right iliac fossa, increased splenic dulness, delirium, dry and brown tongue, and prostration, and terminating by the 30th day. After death enlargement of the mesenteric glands, disease of Peyer's patches, enlargement of the spleen, disseminated ulcerations, disseminated inflammations.

"*Typhus Fever.*—A disease arising from a specific cause, attended by rigors, chilliness, headache, mulberry rash, frequent pulse, delirium, dry brown tongue, and prostration, and terminating by the twenty-first day. After death, disseminated and extreme congestions; in young persons, enlargement of the spleen." ('Medical Times,' 20th Paper.)

On the other hand, Dr. Duncan of Liverpool maintains, that not only are there no specific differences between the various kinds of continued fever, but that there are none between this and intermittent or remittent fevers. All these, he maintains, belong to one form of disease, and are curable by one remedy, and that is quinine. He prescribes ten grains of the sulphate of quinine every two hours until five or six doses are taken, and states that it cuts short all forms of fever in the same way as it does intermittent fever or ague. This practice has been followed by many medical men with favourable results, but with others it has entirely failed. Dr. Bennett of Edinburgh tried this remedy in nineteen cases, which he has related in his "chemical lectures," but the result of these cases was not favourable to the use of this remedy.

DENGUE (*Scarlatina Rheumatica*) is a peculiar febrile disease, conjoined with sudden severe pains in the small joints, which are usually swollen. It is accompanied by heat of skin, intense pain of the head and eyeballs, and the appearance of a cutaneous eruption on the third or fourth day. It is an infectious disease, and has a tendency to develope itself epidemically. The chief peculiarity of this disease is the combination of the symptoms of an exanthematous fever with rheumatic or neuralgic affections of the joints.

This disease has not been observed in Great Britain. "It has been chiefly prevalent in Rangoon, Calcutta, Berhampore, Benares, Chunaighur, in the East Indies; the island of St. Thomas in the West Indies; the Southern States of America; the ports on the Gulf of Mexico; the towns of New Orleans, Savannah, Charleston, Philadelphia, and New York. It was epidemic in 1824—28, and nothing appears to have been heard of it again till 1849 and 1850, when it again visited the Southern States of America." (Aitken.)

The general course of the disease is that the patient is attacked with headache, intolerance of light, chilliness, and pains in the back and joints. The small joints swell, the skin becomes hot, the pulse frequent, and the face flushed. The tongue is red. Sometimes an eruption appears at this stage. This state lasts from twelve hours to three or four days, after which it subsides, leaving the patient very feeble. This remission is, however, only temporary. In the course of two or three days there is a return of the fever and pains, with a thickly coated tongue, nausea, and tenderness of the epigastrium. On the sixth or seventh day a scarlet rash appears on the hands, which rapidly spreads over the whole of the body, and gives relief to the febrile irritation. The eruption is very irregular, sometimes being smooth, but at others being papular, vesicular, pustular, or even furunculous. The symptoms gradually subside, leaving the patient with some rheumatic stiffness, and feelings of weakness and mental depression. During the last epidemic at Calcutta the throat was sore, and the articular symptoms were less obvious.

The treatment of this disease consists simply in the palliation of the symptoms. When the nervous irritability and pain are considerable, then opium has been found of essential service. The disease might at first sight be regarded as a mild form of Scarlatina. Some of the symptoms, however, are sufficiently characteristic.

DIPHTHERITE or DIPHTHERITES (from διφθέρα, a skin or membrane) a term applied by M. Bretonneau and other French writers to a peculiar inflammation of the mucous membrane of the throat or pharynx, which is accompanied by the production of a false membrane. This disease first attracted attention at Tours in France, where it prevailed as an epidemic in 1818. It subsequently appeared in other towns of France, and alarmed the inhabitants of Boulogne in 1856. It has also been seen in India since its discovery and description by Bretonneau. No cases seem to have been accurately observed in this country till 1857. But during this year and the beginning of the present (1858) this disease has prevailed in Essex and many other counties of England. It has also been recorded as a cause of death in London, and the Registrar-General has assigned a place for it in his list of diseases accompanying the bills of mortality. When this disease was first described, it was regarded by some writers in this country as a variety of croup, and by others as a form of scarlet fever. Now that it has appeared, few observers could be found who would not agree that it is a disease *sui generis*. The invasion of this disease has been looked on with greater anxiety, as there seems to be little doubt of its belonging to the contagious or communicable class. It is also very fatal, and already a large amount of mortality has been caused by it in this country.

The distinguishing feature of this disease is the formation of a false membrane upon the surface of the mucous membrane of the fauces. This membrane is of a whitish or ash-gray colour, and frequently extends forwards from the pharynx and tonsils to the soft palate and into the nostrils, and backwards into the œsophagus. It is seldom found in the larynx and the trachea, and in this respect it differs from croup, and may be easily distinguished from it. When the membrane is found in the larynx or trachea, it is always subsequent to its appearance in the fauces. At the commencement of the disease, the membrane is seen in the form of a white spot on the pharynx or tonsils, from which it gradually extends all around. As it goes on, the membrane comes away in spots or presents fissures, through which the mucous membrane may be seen of a deep red or even of a purplish and claret colour. During the progress of the disease the cervical and submaxillary glands become swollen, and there is a fetid discharge from the nose and mouth. As the sloughs separate from the fauces, hæmorrhage frequently occurs.

The general symptoms are those of low fever. The disease sets in with shivering and intense depression, there is dryness and tingling of the throat and ears, difficulty of swallowing, and very frequently headache. The tongue is loaded, the pulse is frequent and feeble. In the early stages it might be taken for scarlet fever. But there is no active fever, no eruption of the skin, no redness of the papillæ of the tongue, and when the patient recovers, no desquamation of the cuticle as is constantly the case in that disease.

The prognosis in these cases is unfavourable. This disease generally terminates life by extending to the air passages and producing effusion in the glottis, which speedily terminates life.

This disease is from the beginning attended with a great depression of the vital powers, and its treatment demands that the vital processes should be sustained. A purgative may be given at the onset, but in most cases wine may be administered from the commencement of the attack. Many writers also speak highly of the chlorate of potash administered in the same way as in scarlet fever. To this may be added the preparations of ammonia. Quinine has also been highly commended, with the mineral acids. The throat also requires local treatment. Two remedies have been generally employed, nitrate of silver and chlorine. The nitrate of silver is applied in the proportion of one drachm to an ounce of water on a sponge several times in the course of the day. Dr. Watson recommends injecting the nares with a solution of chlorine in water. This relieves the fetid smell which is very disagreeable to the patient and those around.

This disease occurring in districts, and attacking in succession the members of a family, has led to the conviction that it is contagious. As it is so dangerous a disease, it is well to act on the doubt, and to take those measures which would be adopted in the case of contagious diseases, as small-pox and scarlet fever.

Glanders or Farcy is a name given by veterinary surgeons to a disease affecting horses and other cattle. It appears in the form of a suppurative disease of the mucous membrane of the nose and of a pustular eruption. The former is sometimes called glanders and the latter farcy, but the two often occur together, and the pus discharged by the one will produce the other. In 1821, Mr. Muscroft drew attention to the fact that this disease could be communicated from the horse to the human system. In the same year cases occurred in Germany, and since then it has been demonstrated by a large number of cases that this disease often spreads from the horse to man. When it attacks man it is characterised by vascular injection of the nasal mucous membrane, on which chancre-like sores are formed, extending to the frontal sinus and neighbouring mucous surfaces, from which a profuse and offensive discharge flows. At the same time a tubercular or pustular eruption appears upon the skin, followed by suppurating bloody or gangrenous ulceration in various parts. These symptoms may be either *acute* or *chronic*. In the acute cases a primary fever is followed by the local disease. In chronic cases the local affection alone presents itself. The acute disease is ushered in by rigors, pains in the back and limbs. These symptoms are followed by phlegmonous tumours in various parts of the body, which are accompanied with pain and tenderness, and terminate in abscesses or boils. At the same time a discharge takes place from the nostrils of a matter more or less purulent, viscid, and mixed with blood. The eyelids frequently become tumefied, and discharge a thick viscid matter like that from the nose. About the twelfth day of the disease an eruption breaks out on the face, trunk, and limbs. It is preceded and accompanied by profuse and fetid sweats. The eruption is scattered, and resembles, according to circumstances, the vesicles of cow-pox or the pustules of small-pox or ecthyma. These are sometimes accompanied with large vesicles (bullæ), which become black and discharging leave gangrenous sores. At first the pulse is full and quick; but it becomes rapid, small, irregular, and intermittent. The tongue is at first loaded with white fur, which afterwards becomes brown or black. Diarrhœa and tympanitis often come on in the course of the disease. This disease is generally fatal from the seventeenth to the twenty-first day. In the chronic cases the febrile symptoms are not so prominent. The local symptoms are much the same, but they progress more slowly. The abscesses are attended with a large amount of subcutaneous inflammation. In this state patients may recover, but they die from a fortnight to a month. A twelvemonth has been known to elapse before a patient has recovered or died.

There is no doubt that these symptoms are the result of a poison introduced into the system of man from the horse. In all cases contact with glandered horses has been ascertained to have taken place before the breaking out of the disease. Matter has been taken from the ulcers and membranes in men and horses have been inoculated, and the disease has been produced. The disease has also been produced by compelling animals to swallow the poisoned matter in their food. There can, therefore, be no doubt that the poison can be absorbed both from mucous and cutaneous surfaces. This being ascertained, it becomes more than ever necessary to prevent contact with glandered horses. Such horses have been known to give the disease to persons riding behind them or passing near them by snorting the matter from their nostrils into the air. All glandered horses ought to be destroyed. In Germany the conviction of the danger of this disease is so strong, that all horses proved to have come in contact with glandered horses are ordered to be destroyed. Not only can this disease be communicated from horse to horse, and from the horse to man, but cases have occurred in which those attending glandered individuals have become affected. The poison of glanders soon manifests itself. Mr. Turner inoculated two young donkeys, and in one the maxillary glands became tender on the second day, and the discharge took place from the nose on the third day, whilst in the second the glands became swollen on the third day, and the discharge took place on the sixth. Cases have been recorded in which the incubation of the poison must have taken at least three months. In the human being the poison has remained latent from two to eight days after exposure.

This disease in its acute form is very fatal. Of fifteen cases recorded by Rayer only one recovered. Of the treatment, therefore, little can be said as a matter of experience. The general symptoms in the latter stages are those of low malignant fever, and a stimulant plan of treatment is indicated. Cases have been bled, and the blood was buffed and cupped, but there is no reason to believe that the bleeding did any good. In the chronic forms of the disease recovery is more frequent. The symptoms indicate the necessity of a generous diet.

Microscopic Diagnosis. The recent improvements in the construction of the microscope have not only rendered this instrument necessary in physiological and pathological investigations, but essential as a means of diagnosis in many diseased conditions of the human system. The very general demand for this instrument as an important aid to the eye in examining minute structures and objects, has led to the construction of various forms adapted for the use of the medical man. The description of this instrument will be found in the article Microscope, and an account of the methods of using it under Microscope, Uses of, in the second supplement of the 'Penny Cyclopædia.' In the present article the application of this instrument to the diagnosis of disease will alone be referred to, and the subject may be divided under the two heads of Diseased Structures and Diseased Secretions.

Diseased Structures.—1. *Cancer.* The distinction between cancer and other forms of diseased structure in the human body, is one of the most important departments of diagnosis, as upon this depends a just estimate of the action of any particular system of treatment, and the solution of the question of the curability of cancer. There can be no doubt that many ulcers have been called cancerous, which have no claim to be regarded as such; whilst others, with a true cancerous character, have been overlooked. Although the microscope cannot in all cases decide the character of a questionable ulceration, it has nevertheless thrown great light on the true nature of cancerous growths, and is a most important aid in their determination. Cancerous exudation generally presents three forms, which, however, are constantly found running one into the other. These have been named *schirrhus*, *encephaloma*, and *colloid cancer*. In all these forms certain cells are discovered by the aid of the microscope, which have been called *cancer-cells*. These cells may be round, oval, caudate, spindle-shaped, oblong, square, heart-shaped, or of other indescribable forms. In size they vary from $\frac{1}{400}$th to the $\frac{1}{1200}$th of an inch in diameter. The cell-wall when young is smooth and distended, but when old it becomes flaccid and more or less corrugated. These cells contain in their interior always one nucleus, often two, and sometimes a larger number. These nuclei vary in size. Besides the nuclei the cells contain a colourless fluid, which is at first clear, but afterwards becomes opalescent from the presence of molecules and granules. On the addition of water the cells become enlarged by its' absorption into their interior. On adding to them acetic acid, the young cells become absorbed, whilst the older cells are rendered more transparent, and the nuclei remain unaffected, or become thicker from contraction.

In *schirrhus* these cells are found either in distinct cysts or isolated amongst a mass of filaments which vary in size, and run in different directions, sometimes forming waved bands, and at others an inextricable plexus. In *encephaloma* the same fibrous structure is observed, but it is looser. In the softer parts no traces of fibres are observed, and the cancer-cells abound. When blood is extravasated in this structure, it constitutes the form of cancer known by the name of *fungus hæmatodes*. The *colloid cancer* is found also to consist of a fibrous structure, but which is so arranged as to form areolæ or loculi, which are filled with a gray or amber-coloured glutinous matter. This matter is sometimes quite structureless, but at other times it presents the nucleated cells characteristic of cancer.

Sometimes the cancerous matter is found mixed with oil globules, and crystals of cholesterin and margarine. At other times it becomes hardened by the deposit of calcareous substances. Thus indicating the tendency of cancer to assume the forms of fatty and mineral degeneration. (Bennett, 'Principles and Practice of Medicine.')

2. *Tubercle*. This form of diseased structure is found in the lungs of persons labouring under phthisis. It generally presents a yellowish or dirty white colour, and has a consistence varying from that of cream to a substance resembling tough cheese. "A small portion squeezed between glasses and examined under the microscope presents a number of irregular-shaped bodies approaching a round, oval, or triangular form, varying in their longest diameters from the $\frac{1}{3000}$th to the $\frac{1}{1200}$th of an inch. These bodies contain from one to seven granules, are unaffected by water, but rendered very transparent by acetic acid." (Bennett.) These bodies are called tubercle-corpuscles, and are mingled with molecules and granules, in a greater or less number, according to the consistence of the tubercle. When the tubercle becomes hardened by calcareous deposits, few of these bodies are seen, the mass consisting of irregular particles of phosphate of lime, and crystals of cholesterin. In the earlier stages of tuberculous deposit of the lungs, the system is found to contain small portions of the disintegrated tissue of the lungs, and in some cases this appearance has been observed when no physical or other decided indications of tubercle existed.

3. *Blood*. In some forms of the disease the blood-cells exhibit a changed character, which can alone be detected by the microscope. This is seen most remarkably in a disease recently discovered by Dr. Bennett, of Edinburgh, called "Leucocythemia," in which the white corpuscles of the blood, which are much fewer than the red in healthy blood are found to be greatly increased in number. [BLOOD, DISEASES OF.]

In many diseases the blood presents an unusual degree of thickness. In this condition the red corpuscles easily lose under pressure their rounded margin, and assume a caudate or flask form. They do not aggregate together in the usual form of rolls, but present masses of an irregular shape.

In blood produced by internal hæmorrhage the red cells readily break down and are partly dissolved. The liquor sanguinis in which they float is also found to contain a large number of granules. In these conditions also the blood-cells frequently present nuclei in their interior.

In cholera the blood has been observed to undergo a remarkable change. Dr. Bennett states, that in blood he examined the red corpuscles were paler than usual, the colourless ones were normal, and mingled with these were others which varied both in shape and size. The latter were generally circular, but some were oval and a few caudate. Their long diameter varied from the $\frac{1}{1200}$th to the $\frac{1}{3000}$th of an inch, and their transverse diameter $\frac{1}{3000}$th to the $\frac{1}{4000}$th of an inch.

In certain cases the serum of the blood presents a milky appearance, and on being allowed to rest a creamy pellicle is formed on its surface. On placing this under the microscope it is found to be composed of minute particles of oil, which resemble the smaller molecules found in milk and the chyle.

The blood has been observed to undergo other changes, observable by the microscope, in conditions of plethora, fever, jaundice, dropsy, cholera, and other diseases; these have not however been sufficiently accurately described to be relied on at present as a means of diagnosis.

4. *Pus*. It becomes sometimes a matter of considerable diagnostic importance to detect the presence of pus-globules in discharges from the human body, as when present they indicate the occurrence of suppuration, sometimes in parts of the body which cannot be observed. Normal or good pus, as it is called, consists of numerous corpuscles floating in a clear liquid. The corpuscles are globular in form, with a smooth margin and a finely granular surface. They are exceedingly like the white blood-corpuscles in their general appearance. They vary in size from the $\frac{1}{1200}$th to the $\frac{1}{3000}$th of an inch in diameter. They generally contain in their interior a round or oval nucleus, which becomes very distinct on the addition of water, and the rough surface of the cell also becomes smooth. The nuclei are liberated from their cells by the addition of acetic acid, in the form of two, three, four, or rarely five granules, each having a central nucleolus. Occasionally the pus-corpuscles are surrounded by a second membrane. At other times they are not perfectly globular, presenting a greater or less irregularity of their margins, and accompanied with granules and molecules. This occurs in pus from scrofulous ulcers and other kinds of what is called *unhealthy pus*.

5. *Vomited Matters*. It is frequently of importance to examine the matters thrown up from the stomach by vomiting. One of the most interesting results of the application of the microscope to these matters has been the discovery of a plant which has been called *Sarcina Ventriculi*. Occasionally other forms of plants have been found in the vomited matters, although these have probably been introduced from without. In cases where poisons have been taken which produce vomiting, the application of the microscope will detect the kind of poison. In this way the husks of the ripe fruit of the Deadly Nightshade, the seeds and leaves of *Lobelia inflata*, and other poisonous substances, have been discovered. It is also a matter of importance sometimes to ascertain the nature of the food taken by children or insensible persons who can give no account of themselves, and this can be done by the examination of the vomited matters by the microscope. When the mucous surfaces of the stomach are affected with inflammation or ulceration, the discharges from the stomach will afford indications of the nature of the disease.

6. *Fæces*. The contents of the bowels, when examined by the microscope, often afford important diagnostic indications. They contain naturally the matters secreted by the mucous membranes of the intestines and the remains of the food. They will also contain various morbid products. Amongst these latter may be mentioned plants and animals. Confervæ and fungi have been found in the fæces, and various organic bodies, now known to be introduced from without, were at one time regarded as the cause of cholera. The presence of pus- and blood-corpuscles may also indicate diseased conditions of the membranes of the intestines. In cholera the rice-water evacuations consist of mucus and the remains of epithelial cells. The nature of food of an injurious character may frequently be discovered, by the aid of the microscope, in the feculent matters.

7. *Plants*. The lower forms of plants, belonging to the orders *Confervæ* and *Fungi*, frequently accompany diseases of the body. These are mentioned in the article ENTOPHYTA, *S.* 2.

8. *Animals*.—Several microscopic forms of animals are found to accompany diseased conditions. Some forms of *Infusoria* have been found in the mucous discharges from the mouth and other parts of the body. The cystic conditions of annuloid worms can only be made out by the microscope, as in the case of the *Trichina spiralis* which is probably the larval condition of the *Trichocephalus dispar*. The

scolex heads of *Echinococcus* and *Cysticercus* can only be distinguished by the microscope, and are diagnostic of the nature of the cysts in which they are found. Amongst the articulate animals producing disease, and only to be detected by the microscope are the *Sarcoptes Scabiei*, producing the itch, and the *Demodex folliculorum* which inhabits the follicles of the skin.

9. *Degenerated Tissues.*—The tissues of the body are liable to have their normal constituents replaced by substances which are morbid. The nature of these degenerations can only be definitely made out by the aid of the microscope. Thus the muscular tissue is liable to have its sarcous elements replaced by fatty matter, causing fatty degeneration. When this occurs in the heart, it becomes one of the most serious lesions to which this organ is subject, and is a frequent cause of fatal results. It has also been recently shown by Virchow and others, that starch is present in the tissues of the body, and to this form of degeneration the term amyloid has been applied.

Diseased Secretions. 1. *Urine.*—This fluid contains various salts and histological elements which can only be detected by the microscope. Many of these are very characteristic of diseased conditions. [Bright's Disease, *S.* 2; Microscope, uses of, *S.* 2.]

2. *Saliva.*—This secretion may present various alterations dependent on disease of the mucous membrane of the mouth and tongue. The epithelial scales naturally found in the saliva are altered in their character. They become opaque and granular. Sometimes confervoid growths are attached to them. In thrush the ulcers are now known to be covered with a fungus called *oidium albicans*, which seems to be the cause of this disease. The filaments of this fungus may frequently be detected in the saliva and the discharge from the mouth. The characteristic appearances of the fur on the tongue, under the microscope, is yet a desideratum in the practice of medicine.

3. *Mucus.*—This secretion is found on all healthy mucous membranes. When the membranes become diseased, this secretion is changed in its characters, and various conditions indicative of the nature of the change may be observed under the microscope. In inflammatory affections, the so called mucus-corpuscles, which resemble pus-corpuscles, are increased in number. The mucus contains also epithelial cells, which may be changed in their character from morbid conditions. These corpuscles and cells are contained in a viscous fluid, which contain a very readily coagulable albumen. This substance is seen to be diminished in quantity in morbid conditions of the mucous membrane.

4. *Milk.*—Diseased conditions of the milk can be determined by the microscope. In a healthy state it contains oil-globules, which are from the $\frac{1}{3000}$th to the $\frac{1}{4000}$th of an inch in diameter. These globules are enclosed in a membranous envelope. In healthy milk they are of a perfectly globular form, and roll freely over each other. In unhealthy milk the globules are of various sizes, and when acid they run together in masses. For a few days after the birth of the young, these globules are mixed with others of a larger size and more variable. They give the milk a yellow colour, and it is then called *cotostrum*. They should disappear in the human milk the fifth or sixth day after parturition. If they remain longer, the milk must be considered unhealthy. Milk can be obtained from the mammæ during the early months of pregnancy, and its peculiar characteristics are easily distinguished by the microscope. Under such circumstances it is a most important indication of pregnancy.

Worms.—The researches of Siebold, Küchemeister, Leuckart, Rainey, and others have recently thrown much light on the history and development of these parasites of the human body. The following is a classification of the various forms of worms found inhabiting the human body as given in Dr. Lankester's translation of Küchenmeister's work 'on the Animal and Vegetable Parasites attacking the Human Body.'

Division Annulosa.
Sub-division Annuloida.
Order Scolecidæ.
Section Platyelmia—Flat worms.
Family Tæniadæ=Cestodæ.
A. Mature States:
Bothriocephalus latus—Broad Tape-worm.
Tænia solium—Common Tape-worm.
Tænia mediocanellata.
Tænia nana.
Tænia ? (Cape of Good Hope).
B. Immature States:
Cysticercus cellulosæ.
Cysticercus tenuicollis.
Echinococcus scoliciparíens (*E. veterinorum*).
Echinococcus altricipariens (*E. hominis*).
Acephalocysts.
Family Trematoda.
Distoma hepaticum—Fluke.
Distoma lanceolatum.
Distoma Buskii—Busk's Fluke.
Distoma heterophyes.
Distoma hæmatobium.
Distoma ophthalmobium.
Monostoma lentis.
Posystoma pinguicola.
Section Nematelmia—Round Worms.
Family Gordiaceæ.
Filaria Medinensis—Guinea-worm.
Filaria oculi humani.
Family Nematoidea.
Ascaris lumbricoides—Round Worm.
Oxyuris vermicularis—Thread Worm.
Trichocephalus dispar (Mature Stage). }
Trichina spiralis (Immature Stage). }
Strongylus gigas.
Strongylus longivaginatus (*Filaria bronchialis*).
Spiroptera hominis.
Ancylostomum duodenale.
Dactylius aculeatus.

The most important point made out in the history of these creatures is the fact, that during their development they pass from one animal body to another, and that the whole group of what are Cystic worms are but immature stages of the more perfectly formed worms. The history of the common tape-worm (*Tænia solium*) of the human body may be taken as a type of the whole. The eggs of this worm are contained in the segments of the mature worm, which are called *proglottides*. These eggs, in order to their future growth and development, must be swallowed and submitted to a process of digestion by some other animal before they reach maturity. This process may occur in many species of animals, but that in which it takes place most commonly is the pig. In the intestines of the pig the egg becomes an embryo, which is supplied with six hooks, by means of which it penetrates the tissues of the intestines, and entering the blood-vessels is carried by the current of the blood to the various organs of the body. This embryo having reached a place of rest, is developed into the cystic worm known by the name of *Cysticercus cellulosæ*. This form of the worm is well known, and produces in the flesh of the pig that appearance which is called in the markets "measly pork." Here it remains and dies, unless the flesh containing it is eaten by some other animal. When eaten by man and submitted to the process of digestion, the cystic worm is further developed. In the cyst there is a head called the "Scolex head," supplied with suckers and hooks, adapted to laying hold of the mucous membrane of the intestines, which, when effected, results in the growth of those segments which are known as the characteristic of the tape-worm. The scolex head is now the head of the tape-worm, and the segments are the proglottides which continue to increase, and eventually each segment is developed into a sexual being, containing both the male and female organs of generation, and the eggs are produced. These facts have been well established by experiments made by both Von Siebold and Küchemeister. Man is also subject to the attack of cystic worms, *Echinococcus*, &c., which attain their mature development in other animals. The tape-worms of the lower animals have the same origin, and their history has now been traced in a large number of animals. Other forms of worms have been found to undergo similar changes in their larval conditions. The common fluke, which is sometimes found in the liver of sheep, commences its existence as a *Cercaria*, and being swallowed by fresh water mollusca undergoes a further development before it enters the stomach of the sheep, and becomes developed into the fluke in its liver. The *Trichina spiralis*, a little worm found in the muscles of man, is now believed to be the early stage of the growth of the *Tricocephalus dispar*, a very frequent inhabitant of the intestines of man. The mature and immature forms of these worms found in man and some of the lower animals, are exhibited in the following diagram:—

List of Mature and Immature Worms and their Habitats.

Immature State.	Habitat.	Mature state.	Habitat.
	TENIADÆ.		
Cysticercus cellulosæ	Pig	*Tænia solium*	Man
C. fasciolaris	Rat, mouse	*T. crassicollis*	Cat
C. pisiformis	Rabbit	*T. serrata vera*	Dog
C. tenuicollis	Sheep, horse, monkey, man	*T. ex cysticerco tenuicolli*	Dog
C. innominatus Hyperdæi	Mole, field-mouse	*T. tenuicollis*	Marten, weasel
C. longicollis Hyperdæi	——	*T. crassiceps*	Dog
Cœnurus cerebralis	Sheep, ox	*T. cœnurus*	Dog
Echinococcus veterinorum (*E. scoliciparien*s Küch.)	Man, ruminantia	*T. echinococcus sc.*	Dog
E. hominis (*E. altriciparien*s Küch.)	Man, domestic an.	*T. echinococcus alt.*	
	TREMATODA.		
Cercaria	Fresh water mussel	*Distoma hepaticum*	Sheep, man
	NEMATOIDEA.		
Trichina spiralis	Man	*Trichocephalus dispar*	Man

The practical conclusion to which these researches lead, is the necessity of preventing the introduction into the system of the eggs and immature forms of these worms. The eggs of the various forms of tape-worms which produce the cystic states of the worm, are introduced into the stomach by water, salads, and all kinds of uncleanly food. The cystic worms themselves are introduced through the medium of raw or partially cooked flesh, especially pork, which should be carefully avoided.

PICKERING. [Yorkshire.]

PICOLINE. [Chemistry, *S.* 2.]

PICRIC ACID. [Chemistry, *S.* 2,]

PICROTOXINE. [Chemistry, *S.* 2.]

PICRYLE. [Chemistry, *S.* 2.]

PICTON. [Canada, *S.* 2.]

PIETERMARITZBURG. [Natal, *S.* 2.]

PIGEON PEA is the seed of the plant called by Linnæus *Cytisus Cajan*, and by De Candolle *Cajanus bicolor* and *Cajanus flavus*. It is a kind of pulse highly esteemed by all classes of the natives of India, and is by them regarded as holding the third rank among such articles of food.

PIGMENT. [Tissues, Organic, *S.* 1.]

PILOT-FISH. [Centronotus.]

PINDAR, PETER. [Wolcot, John.]

PINGUITE. [Mineralogy, *S.* 1.]

PIPE-FISH. [Syngnathidæ, *S.* 2.]

PIROLICHENIN. [Chemistry, *S.* 1.]

PISCIS. [Fish.]

PISSOPHANE. [Mineralogy, *S.* 1.]

PITCHBLENDE. [Uranium.]

PLACERVILLE. [California, *S.* 2.]

PLACODINE. [Mineralogy, *S.* 1.]

PLAGIONITE. [Mineralogy, *S.* 1.]

PLAICE. [Pleuronectidæ.]

PLANTA GENISTA. [Genista.]

PLASTER OF PARIS. [Gypsum.]

PLATA, LA, STATES OF. The historical notice of the *Argentine Confederation* has been brought down to 1836 [Plata, La], when Rosas had been created governor, or captain-general, with almost dictatorial power. By this arrangement the provincial government of Buenos Ayres was invested with extraordinary powers, and temporarily charged with the transaction of all matters appertaining to the common interests of the confederation, and the carrying out of its business with foreign nations. Rosas had previously served as governor and captain-general of Buenos Ayres for the usual term of three years, and had obtained unrivalled influence in that province, chiefly through his military powers, as displayed against the Indians. His decision and energy secured for a while internal peace, and the provinces began to recover from the effects of the long prevalent anarchy. But cruelty and despotism marked his sway at home, and his ambition, which continually prompted him to endeavour to extend his power over the whole country watered by the Plata and the Paraná, led him into disputes with foreign powers: and these ultimately brought about his downfall. His commercial policy had for its object to secure to Buenos Ayres the monopoly of the trade of the Plata, his political policy to obtain a like territorial superiority. On the death of Francia, dictator of Paraguay, he refused to acknowledge the independence of that power, insisting that it should join the Argentine Confederation, at the same time he refused to allow the navigation of the Paraná by vessels bound to Paraguay. Lopez, the new dictator of Paraguay, therefore entered into alliance with the Banda Oriental, now called Uruguay, with which Rosas was at war. These powers applied for assistance to Brazil. The war was prolonged until the whole country on both sides of the Plata and the Paraná was in a state of confusion. On the earnest appeal of the merchants and others interested, Great Britain volunteered her mediation, but it was rejected by Rosas who marched his troops within a few miles of Monte Video, which his fleet at the same time blockaded. The emperor of Brazil now interfered, and sent a special mission to request the interposition of the courts of London and Paris. The British and French governments in February, 1845, decided on sending plenipotentiaries to the Plata to offer their mediation, and to announce their intention to enforce a cessation of hostilities if needful, by an armed intervention. The offer was rejected by Rosas, but readily accepted by his opponents. The united fleet of England and France at once commenced operations by seizing the fleet of Rosas which was blockading Monte Video, and the island of Martin Garcia which commands the entrances of the Paraná and the Uruguay. The harbour of Buenos Ayres was at the same time declared under blockade, and the combined fleet prepared to open the Paraná and convoy as far as Corrientes any merchant vessels that might desire to ascend that river. Rosas on his part made hasty preparations to intercept the fleet by planting batteries with parks of heavy artillery at Point Obligado; and placing three strong chains across the river, supported by 24 vessels and 10 fire-ships. On the 19th of November, 1845, the combined fleet consisting of eight sailing and three steam vessels forced the passage with trifling loss to itself, but entirely destroying the batteries, and considerably injuring the army of Rosas. On the return of the fleet, with a convoy of 110 vessels, it was encountered at San Lorenzo by a very powerful battery which Rosas had erected in an admirable position, in the full expectation of destroying a large number of the merchant vessels, and of crippling the naval force. The battery commanded the river, and was difficult of attack by the steamers, but it was speedily silenced by a rocket-brigade, which had been the previous night secretly landed on a small island in the river. The combined fleet escaped with trifling loss, the rocket-brigade lost not a man; but four of the merchant vessels which, through unskilful pilotage, ran ashore, were burnt to prevent them falling into the hands of Rosas. The loss to the Argentine army was very great. Again plenipotentiaries were sent out by the combined powers, but Rosas refused to yield; and England withdrew from the blockade in July, 1848. It was however continued by France until January, 1849. On the final withdrawal of the two great powers in 1850, Brazil determined on active interference. The power of Rosas, essentially despotic, and devoted to the maintenance of the supremacy of Buenos Ayres, had moreover become intolerable to the provinces which desired a federal and equal union. Accordingly, towards the close of 1850, Brazil, Uruguay, and Paraguay entered into a treaty, to which Corrientes and Entre Rios, as represented by General Urquiza, became parties, by which they bound themselves to continue hostilities until they had effected the deposition of Rosas, "whose power and tyranny" they declared to be "incompatible with the peace and happiness of this part of the world." Early in the spring of 1851 a Brazilian fleet blockaded Buenos Ayres, and soon after an Argentine force commanded by Urquiza crossed the Uruguay. The struggle was now virtually terminated. General Oribe who commanded the army of Rosas in Monte Video, made a show of resistance, but it was merely to gain time in order to complete his arrangements with Urquiza, and he soon after capitulated. His soldiers for the most part joined the army of Urquiza, who at the head of a force amounting it is said to 70,000 men, crossed into Buenos Ayres. A general engagement was fought on the plains of Moron, February, 2, 1851, when the army of Rosas was entirely defeated. Rosas, who had commanded in person, succeeded in escaping from the field; and, in the dress of a peasant, he reached in safety the house of the British minister at Buenos Ayres. From thence, with his daughter, he proceeded on board H. M.'s steamer Locust, and on the 10th of February sailed in the Conflict steamer for England.

But the fall of the tyrant did not bring peace to the unhappy country. Urquiza, by the governors of the provinces assembled at San Nicolas, was invested with the chief power, and appointed Provisional Director of the Argentine Confederation. The Chamber of Representatives of Buenos Ayres, however, declared against him, and protested against the proceedings of the convention, on the ground of the superior privileges of Buenos Ayres being menaced. Urquiza dissolved the Chamber, and insurrection broke out. Civil war, with all its aggravated evils, continued during 1853; but on the 20th of December, 1854, the separation of Buenos Ayres from the other states of the Argentine Confederation was settled by treaty; and it has since been acknowledged as an independent state by the principal governments of America and Europe. The republic of Buenos Ayres is briefly described under Plata, La, as one of the provinces of the Argentine Confederation. The capital city is described under Buenos Ayres. *San Nicolas de los Arroyos*, the city next in size and importance, stands on high ground on the right bank of the Paraná, about 190 miles N.W. from Buenos Ayres, and has a population of about 8000. The other towns are comparatively small.

PLATANACEÆ, *Planes*, a natural order of Exogenous Plants. The species are amentiferous trees or shrubs, with alternate deciduous palmate or toothed stipulate leaves, and unisexual naked flowers in globose catkins. The barren flowers with stamens single, mixed with scales. Fertile flowers with ovary 1-celled, style thick and subulate. Ovules 1-2, orthotropal; suspended. Nuts clavate, with a persistent style. Seeds usually solitary and albuminous; radicle inferior. They are natives of the Levant and North America chiefly. They are fine trees, but their timber is not durable.

There is but one genus (*Platanus*) in the order and six species. [Plane.] The family resembles *Artocarpaceæ* and *Altingiaceæ*.

PLATYSTERNON. [Tortoises.]

PLEADING, AT LAW and IN EQUITY. Although modern Statutes have made several alterations in the procedure of the Superior Courts both of Law and Equity, the outline of the system of pleading in use in these Courts, which is given under Pleading, vol. xviii., p. 245, *et seq.*, is still substantially accurate. The more important changes effected in the procedure of the Common Law Courts have been mentioned under Abatement [*S.* 2], Injunction [*S.* 2], and Mandamus [*S.* 2]; those in the Court of Chancery under Equity [*S.* 2]. It may be added here that the system of pleading devised for the new Courts of Probate and Divorce, is of the nature of that now in use in the Courts of Common Law.

PLOCARIA, a genus of Plants belonging to the alliance *Algales*, the order *Ceramiaceæ*, and the sub-order *Sphærococceæ*. One of the species, *P. Helminthocorton*, is called Corsican Moss, and has a considerable reputation as a vermifuge. It is a native of the Mediterranean.

PLUMBO-CALCITE. [Mineralogy, *S.* 1.]

PLUNKETT, WILLIAM CONYNGHAM, first Lord Plunkett, of Newton, County Cork, was the second son of the Rev. Thomas Plunkett, a Presbyterian minister at Enniskillen, in which town his son William was born in July 1764. Having some scruples as to the received doctrine of the Trinity, the elder Plunkett removed to Dublin, where he became minister of the Strand-street chapel. His eldest son practised for many years as a physician in that metropolis, and bequeathed to his brother a large library and a considerable fortune. William was still a boy when his father died, leaving the care of his family to the piety and zeal of his congregation. His dying request was not in vain, and the sons received by their assistance a good education. William was sent to Trinity College, Dublin, where he obtained a scholarship and a degree, and where he was the friend and contemporary of the late Dr. Magee, archbishop of Dublin. Mr. Plunkett was called to the bar in 1787. He had already gained some reputation by his speeches delivered in the debating club of the university, then known as the Historical Society; and the late Earl of Charlemont soon afterwards introduced him into the Irish Parliament, as member for the borough from which he derived his title.

Mr. Plunkett commenced his public career by bold and sarcastic oratory, reserving himself almost entirely for great occasions. Hence his name is but little associated with the every day business of legislation; the fame which he acquired in the Irish House of Commons is principally connected with the zeal with which he opposed the legislative Union in 1800. The vehement oratory with which he denounced the ministry on this occasion, proved the means of increasing his professional engagements in the Irish courts of law. His income now rose rapidly, and with its proceeds he repaid, with liberal interest, the contributions of his father's congregation which had been the means of enabling him to get a start in life. About the same time he married Catharine, only daughter of John M'Causland, Esq., who had represented the county of Donegal in four successive parliaments. When the rebellion of 1798 broke out, Mr. Plunkett gave the aid of his professional talents to its victims, and indeed was at one time so intimate with Robert Emmett and his associates, that he was more than once publicly accused of being concerned in their unhappy proceedings. The accusation however was shown to be unfounded.

In 1803 he was appointed solicitor-general for Ireland, from which post he was promoted in 1805 to that of attorney-general. In the following year the Whigs, with Lord Grenville at their head, came into office, and he determined to throw in his lot with them. Accordingly he retained the attorney-generalship under their administration, whose well-known views offered an opportunity for the Catholic Association to press upon their notice the importance of granting Roman Catholic emancipation. Of this subject, Mr. Plunkett was always an able and energetic advocate. The death of Mr. Fox having broken up the Grenville administration in 1807, Mr. Plunkett retired, and applied himself to the pursuit of chancery practice with such success, that for several years he was engaged as leading counsel in almost every important Irish chancery suit, and rapidly accumulated a large fortune.

Mr. Plunkett first entered the British House of Commons in 1807 as member for Midhurst. In 1812 he was elected to represent the University of Dublin, which at that time returned only a single member; and he was re-elected in 1818. Of his first speech in the House of Commons, which at once secured for him a high reputation, Mr. Canning affirmed, that it brought back the days of Burke and Pitt, of Fox and Sheridan. In 1822 a number of ministerial changes took place on the death of the Marquis of Londonderry, and among others Mr. Plunkett was re-appointed attorney-general for Ireland, the late Marquis of Wellesley being lord-lieutenant, and in that capacity he was engaged to prosecute on behalf of the crown a large number of the Dublin Orangemen, and of the insurgents in the south of Ireland. Early in 1827 Mr. Canning proposed to appoint Mr. Plunkett master of the rolls in England, but the intention was ultimately abandoned. In the following June however he was elevated to the post of lord chief-justice of the common pleas in Ireland, and created a peer of the United Kingdom. He held the chief-justiceship for three years, and resigned it at the downfall of the Wellington administration. His judicial career was not marked by any great brilliancy or success, which indeed there were no remarkable or stirring events to call forth. But it was otherwise in the English House of Lords, where he sat by the Duke of Wellington, at his Grace's especial request, to advise with him at every step of the Roman Catholic Emancipation Bill, of which he 'took charge' in its passage through the Upper House.

With the passing of this measure the political career of Lord Plunkett may be said to have closed, though he was appointed Lord Chancellor of Ireland by the ministry of Earl Grey at the close of 1830. This post he occupied for eleven years, with the brief interval of a few months in 1834-35, during which the seals were held by Sir Edward Sugden (now Lord St. Leonards). He ultimately only resigned the chancellorship a few months before the removal of the Liberal administration of Lord Melbourne from office in 1841, when he was induced to resign in order to make way for Lord Campbell. During his later years Lord Plunkett had almost wholly retired from political life, and indeed for several years before his death he had not come over to England to take his seat in the House of Lords, but spent his declining days in the enjoyment of the society of his family and private friends, at his country villa near Bray, where he died on the 4th of January 1854. His eldest son, now second Lord Plunkett, is also Bishop of Tuam.

On the whole, nature was bountiful to Lord Plunkett, and accident favoured him at almost every step of his long and brilliant career. He was sixty-six years of age when he took his seat in the Irish Court of Chancery, and it could scarcely be expected that as chancellor he could add much to his previous fame. His reputation shot upwards from a narrow ground-work. His speeches were at once few and famous;

they excited the unqualified applause of his contemporaries, and his name is still foremost among the orators of the 19th century. But the great principles of legislation, which men seek and find in the speeches of Pitt and Burke, are seldom met with in the startling orations of Lord Plunkett. He could hardly be called a statesman—scarcely even a sound or experienced practical politician; and there were abler judges and more learned men than himself among his brethren on the Irish bench, though probably there were none of equal powers of native eloquence.

POE, EDGAR ALLAN, was born at Baltimore, in the United States, in January 1811. He was descended of a good family, but his father and mother, who had become strolling players, having died when he was quite a child, he was adopted by a Mr. John Allan, a wealthy merchant, who had known his father, and having no children of his own, treated him as his son. In 1816 Mr. and Mrs. Allan brought him to England, where he was put to school at Stoke Newington. He returned to America in 1822, was first placed in an academy at Richmond, in Virginia, and thence sent to the university of Charlottesville in the same state. At all these places of instruction his progress was rapid, and he held a high rank as a scholar, but his extravagance was so great, and his conduct so licentious, that he was expelled from the university. He returned home, and on Mr. Allan refusing to honour some of his drafts for gambling debts incurred at the university, he wrote a satirical and abusive letter to his benefactor, left the house, and set off to Greece to help to free that land from the tyranny of the Turks. He never reached Greece, but after wandering about Europe for nearly a year, he arrived at St. Petersburg, fell into the hands of the police for a drunken riot, was rescued by the intervention of the minister of the United States, and by him sent back to America. His old patron welcomed him home, and as he now expressed a desire to adopt the military profession, he procured him the appointment of a cadet in the Military Academy at Westpoint in New York. Here, after a short period of assiduous application, his old habits returned, and within a twelvemonth he was cashiered for insubordination and drunkenness. He returned to Mr. Allan at Richmond, who again received him with kindness, but that gentleman having married a second wife, Poe satirised both him and his wife so severely that he was forced to quit that place of refuge, nor would Mr. Allan ever see him again or assist him any further. He had by this time published a small volume of poems, and from the favourable reception they had met with, he thought he might support himself by his pen. He failed, and enlisted as a private soldier. From this situation he was rescued by some military friends he had made at Westpoint, who procured his release. He again had recourse to his pen, and this time with more success. He became connected with various magazines and other periodical works, with some as contributor, and with others as editor; but his irregular habits constantly prevented the engagements being permanent. He followed this course at Baltimore, Virginia, Philadelphia, and New York, where he arrived in 1844. His undoubted talent unfailingly procured him employment, while his intemperate and immoral habits as necessarily occasioned his dismissal. In 1848 he gave a series of lectures in New York on the universe, which were afterwards embodied in a work entitled 'Eureka, a Prose Poem.' In the autumn of 1848 he joined a temperance society, but this could not save him. He went in 1849 to Virginia to deliver lectures, and on the 4th of October he set out on his return to New York. At Baltimore he met with some acquaintances, who invited him to drink; he forgot his pledge, became so utterly intoxicated that he was picked up in the street, carried to a hospital, and died the following day, October 7th, 1849. His works, as may be supposed from the previous sketch, consist wholly of short pieces. He wanted the steadiness and perseverance to produce anything worthy of his genius; but they exhibit in a remarkable degree the possession of faculties of a high order. In his tales there is magnificence of imagination and description; a remarkable display of analytical power, though wasted upon trivial subjects; a love and an acute observation of nature, and an admiration of the beautiful, which it is remarkable in such a man never descends into the sensuous; considerable humour, and a ghastly and mystical sublimity in some of his fictions that is deeply impressive. In his poetry he is tender and melodious, with great command of language: and in conversation he is described as having been highly eloquent, but irritable and sarcastic. There are few more striking instances of perverted talent, and personal advantages thrown away, than that of Edgar Poe. Two small volumes of tales and one of poetry, besides the 'Eureka' already mentioned, are all that remain of him.

POLAND. The Emperor of Russia, by a ukase, dated August 21, 1844, divided Poland into five governments, exclusive of the city of Warsaw, which are governed in the same manner as the other provinces of the empire, each having a military and a civil governor. The following table shows the area and population of the present divisions according to the official returns for the year 1851:—

Governments.	Old Provinces.	Square Miles.	Population in 1851.
Warsaw	Mazovia Kalisz	14,219	1,544,790
Radom	Kielce, or Cracow Sandomir	9,289	939,344
Lublin	Podlachia Lublin	11,934	1,028,383
Plock		6,411	548,413
Augustovo		7,237	626,594
Warsaw City		—	164,115
Total		49,090	4,851,639

POLAR COUNTRIES AND SEAS. The countries and seas which lie between the northern coasts of America and the North Pole are noticed in the article North-West Passage, *S.* 2; those which are situated on the other sides of the North Pole are described under their respective names. [Greenland; Iceland; Spitzbergen; Nova Zembla; Siberia.] It only remains to notice certain conditions of the countries and seas which surround the North Pole. The discoveries which have been made in the seas surrounding the South Pole are narrated in the article South Polar Countries.

The seas which surround the North and South Poles are named the Arctic Ocean or North Polar Sea, and the Antarctic Ocean, or South Polar Sea. The two oceans are bounded by two imaginary circles which surround the globe at about 66° 30′ N. lat. and 66° 30′ S. lat. At the Poles themselves there is only one day of six months, during which the sun never sets, and one night of six months, when the sun never rises. In the spaces comprised between the Polar Circles and the Poles the quantities of continuous day and continuous night vary according to the distances from the Poles. Thus, at the north point of Nova Zembla, 75° N. lat., there is uninterrupted light from May 1st to August 12th, and uninterrupted darkness from November 8th to February 9th. At the Arctic Circle the greatest length of continuous light is 24 hours at the summer solstice, or Midsummer's-Day, whilst, at the same time, at the Antarctic Circle, the sun is 24 hours below the horizon; and the reverse at the opposite seasons of the year. The general coldness of the Polar Regions arises from the sun's rays striking the earth obliquely, as at the equator the heat is produced by the sun's rays falling upon the earth vertically.

The two great continents of the Northern Hemisphere terminate towards the North Pole near 70° N. lat., which parallel may therefore be considered as the general boundary-line of the North Polar Sea. The lands comprised within this polar basin, besides the northern shores of Europe, Asia, and America, include the northern parts of Greenland and Nova Zembla, the islands of Spitzbergen, the Liakehov Islands, and the great mass of islands which lie opposite to the northern coasts of British America. The North Polar Sea has only one entrance from the Pacific Ocean, by Behring's Strait, the narrowest part of which, between East Cape and Prince of Wales Cape, is only about 18 miles across. From the Atlantic Ocean, besides the great entrance by the Spitzbergen Seas, it is now known that there are entrances by Smith's Sound from Baffin's Bay, and by the Wellington Channel from Barrow's Strait.

A large portion of the Arctic Ocean is constantly filled with extensive fields and moving masses of thick and impenetrable ice. This portion seems to extend round the Pole at variable distances from the shores of Siberia, Russian America, and British America. In an easterly direction it extends from the north point of Nova Zembla to the western side of Melville Island. Here the navigation westward up Barrow's Strait ceases, the 'pack-ice,' as it is called, presenting an impassable barrier. On entering the Arctic Ocean from the Pacific through Behring's Strait, the most daring and skilful navigators have not been able to penetrate much farther in a northern direction than 70° N. lat. Captain Cook, in his last voyage, after passing through Behring's Strait, sailed as far westward as North Cape, 180° W. long.; but here the masses of ice prevented any farther advance. If the navigator, after passing through Behring's Strait, turns eastward, he finds, in summer, between the American shores and the pack-ice, a narrow passage much encumbered with broken ice, and may thus with some difficulty reach the most north-eastern point of the American continent; or, having reached Baring Island, may turn northward and try to accomplish the North-West Passage by following either of the tracks of Captain M'Clure.

The great entrance to the Arctic Ocean by the Spitzbergen Seas is not attended with much difficulty. Ships sail every year from the shores of the Atlantic Ocean to Archangel, and must necessarily pass round North Cape, 71° 10′ N. lat.; other vessels proceed annually to fish for whales, which they never expect to take south of about 78° N. lat.; and others much smaller go every year from Hammerfest and other places to fish for walruses along the western shores of Spitzbergen. Barentz, the Dutch navigator, in 1594 and 1596, traced the western shores of Nova Zembla as far as North Cape, 75° N. lat.; and the Russian navigator Ziwolka, who in 1836 surveyed the island of Nova Zembla, found no difficulty in tracing the western coast to Cape Nassau, and even the eastern coast to 61° E. long.; but impenetrable masses of ice prevented his advance farther to the east.

The greater or less severity of cold in the Arctic Seas seems to depend more on circumstances of locality than on the degrees of latitude. Thus, on the European side of the Polar Basin, the navigation, as has been shown, is open as far as 80° N. lat.; on the Asiatic side it is generally closed by masses of ice; on the American side the cold is very severe, and the navigation everywhere difficult and in many parts dangerous. At North Cape, in Europe, 71° 10′ N. lat., the mean temperature of the year is 32° Fahr.; at Bear Island (Cherry Island), between North Cape and Spitzbergen, 70° 30′ N. lat., the mildness of the climate is extraordinary; but opposite the coasts of Siberia, farther to the east, the floating masses of ice render the navigation so dangerous that some portions of the coast-line have not been surveyed. This tract includes the most northern point of Siberia, Cape Severo (Severo Vostochinii Noss). In this part of the Polar Basin are the Liakehov Islands, the largest of which are named Kotelnoï Fadeifskoï, New Siberia, and Liakehov. They are situated between 73° and 76° N. lat. On these islands the snow does not entirely melt even in summer, and there is no vegetation whatever. Along these coasts of Siberia it has been ascertained that in winter the large body of the sea is free from ice at certain distances from the shore. North of New Siberia and Kotelnoï the distance is less than 20 miles. Farther east it approaches nearer to the coast. Near 165° E. long. it is about 170 miles distant; but between 175° and 180° E. long., opposite Cape Yacan, it is only about 4 miles distant. At Ustyansk, in Siberia, near the mouth of the river Yana, 70° 55′ N. lat., the mean temperature of the year is only 4° Fahr. At Winter Island, on the north-eastern coast of America, in 66° 11′ N. lat., 83° 30′ W. long., the mean annual temperature is not more than 7° Fahr., while on the south shore of Melville Island, about 74° N. lat., the mercury of the thermometer is frozen every winter during four or five months.

That there is a great sea comparatively unincumbered with ice in the vicinity of the North Pole, and perhaps flowing over it, seems to have been rendered probable by many facts and circumstances. Barentz, in 1594, remarked, "as soon as we made from the land [Nova Zembla] and put more into the sea, although it was much farther northward, presently we felt more warmth." Captain Parry, in his attempt to reach the North Pole in 1827, leaving his ship, the Hecla, moored in a bay on the north-east coast of Spitzbergen, proceeded with his party over the ice, dragging the boats and sledges which had been constructed for the purpose. On July 27th they reached 82° 45′ N. lat., 19° 25′ E. long., when, the season being far advanced, and finding that the ice over which they were travelling northward was itself drifting southward, they relinquished their attempt, and commenced their return-journey. On August 12th they reached Little Table Island, or rather a rock north of it, which Captain Parry named Ross's Islet, and which is the farthest land known in the northern hemisphere; it is in 80° 47′ 30″ N. lat., 20° 24′ E. long. Captain Parry and his party were absent from the Hecla 61 days, the distance traversed being 654 miles. On July 15th, being then in 82° 17′ N. lat., it rained incessantly for 21 hours. On July 16th the temperature was 37¾° Fahr. in the shade. "In the evening it was so warm in the sun, though the temperature in the shade was only 35°, that the tar was running out of the seams of the boats." They found the ice everywhere broken, but most so when they were farthest north. After the middle of July no ice entered the bay where the Hecla was moored, and for some weeks afterwards not a piece was seen in the vicinity.

In further confirmation of there being a great sea in the vicinity of the North Pole, it may be stated that Sir Edward Belcher saw an extensive sea with little ice north of the Wellington Channel, as did also Captain Penny north-west of the Victoria Channel: that Captain Inglefield saw a great sea north-east of Whale Sound, near the head of Baffin's Bay, and also north of Smith's Sound, which is an outlet into the Polar Basin from the head of Baffin's Bay. The same extensive open sea was seen by Dr. Kane from a position still further north of Smith's Sound than that which was attained by Captain Inglefield.

The difference of temperature between the north-western shores of Europe and the north-eastern shores of America seems to be owing to two main causes—the Gulf-Stream, and the drifting of the ice-masses from the shores of Siberia. The Gulf-Stream is a great warm current many miles in width, which flows in a north-eastern direction from the Gulf of Mexico across the Atlantic, and passing by the British Islands and along the coast of Norway, penetrates the Polar Sea as far as the northern shores of Spitzbergen and Nova Zembla. Here in the spring it meets the powerful current caused by the breaking-up of the ice in the great rivers of Siberia. As this vast body of water and broken ice advances towards the shores of Nova Zembla and Spitzbergen the Gulf-Stream opposes its farther progress south and gives it a direction westward, so that it passes by East Greenland and Iceland, and reaches the shores of America and Newfoundland, where the masses of floating ice (sometimes miles in length and of great thickness) descend in the spring as low as 40° N. lat. On the coast of Norway, on the contrary, as far as 71° N. lat., not a piece of drift-ice is ever seen.

The countries which surround the North Pole generally afford an abundant supply of animal food, consisting of the walrus, the polar bear, the moose-deer, the rein-deer, the wolf, the polar hare, and the seal. The number of aquatic birds is very large, and various kinds of fish are in great abundance.

POLEVOY, NIKOLAY ALEXIEVICH, one of the few distinguished authors whom Siberia has yet produced, was born on the 22nd of June (old style) 1796, at Irkutsk. His father, who was descended from an adventurous family of merchants, settled for some generations at Kursk, where the names of Polevoy and Golikov are excessively common, had been left an orphan at the age of thirteen, and sent to Tobolsk in the employ of a relation of the name of Golikov. Most of the elder Polevoy's life was spent in commercial enterprises in Siberia, and at one time he had the prospect of making a fortune by establishing a new company for commerce with Russian America, but the union of the two old companies crushed the plan. In 1805 he set up a manufactory of earthenware at Irkutsk, and "he used," says his son, "to pronounce with enthusiasm the name of Wedgwood." In assisting in the business of this manufactory, and of a brandy distillery with which his father was also connected, the early years of Polevoy were passed. He never apparently received any schooling; he learned to read from an elder sister at six years old; at eight he used to read aloud to his mother novels, and to his father the Bible, and the 'Moscow News,' and at ten he assisted his father in the counting-house, and amused himself by composing a manuscript newspaper (in imitation of the 'Moscow News' ('Moskovskiya Viedomosti'), which he called the 'Asiatic News' ('Aziyatskiya Viedomosti'). The father was in the habit of boasting of his relation the historian Golikov, who had written a history of Peter the Great in thirty volumes, and the boy formed the singular project of writing additions to a work already so voluminous. He also tried his hand at composing plays, and produced a drama, 'The Marriage of the Tzar Alexis Mikhailovich,' and a tragedy, entitled 'Blanche of

Bourbon.' "At last," says Polevoy in the autobiography prefixed to his 'Ocherki Russkoy Litteraturui,' published in 1839, "I became my father's walking dictionary in geography and history, for my memory at that time was such as I have never met with in anybody else. To learn by heart a whole tragedy cost me nothing. In a word, if I must describe my mental progress up to the year 1811, it was this: I had read about a thousand volumes of all kinds and sorts, and remembered all that I read from the verses of Karamzin, and the articles in the 'Courier of Europe' (a Russian Magazine), to the Chronological Tables and the Bible, from which I could repeat whole chapters by heart. I was known in the town of Irkutsk as 'the wonderful boy,' with whom the governor himself used to converse, and the director of the grammar-school to dispute as with a learned man." In 1811 his father resolved to leave Siberia and establish himself in Moscow; the son, who was sent on before him, then on the first occasion of his quitting Irkutsk, passed through all Siberia, saw a play for the first time at the theatre of the great fair of Makariev, and on his arrival at Moscow spent much of his time at the theatre and the bookshops, wrote tragedies and romances, and was unwillingly recalled to business and the brandy distillery by the arrival of his father. This took place in June 1812, and both business and pleasure were soon at an end in the devoted city, where the conflagration was witnessed by father and son as fugitives from before the army of Napoleon I. For a few years afterwards Polevoy was almost in constant movement from St. Petersburg to Irkutsk, and from Irkutsk to Kursk, and his literary ardour, deadened by the reproaches of his father, who now wished him to become a 'man of business,' appears to have been all but extinguished. It suddenly revived when he was about eighteen, a clerk at Kursk; but the main cause of its renewal, according to his own account, was his discontent with his then situation and its limited prospects, and his conviction that in Russia there was no other way to consideration for a person in his position but through learning and literary success. Himself and his younger brother, Xenophont, began to study French and German in secret, devoting many hours of the night to their books; and the knowledge of foreign languages led him into a new world of reading. In 1817, when the Emperor Alexander paid a visit to Kursk, Polevoy sent to the 'Russian Courier' an article describing the event, and had the pleasure of seeing for the first time his name in print. Other contributions followed, and the name became known; on a visit to St. Petersburg he was introduced to Zhukovsky, Griboyedov, Grech, and Bulgarin; and in 1825 he commenced at Moscow the publication of a magazine entitled the 'Moscow Telegraph.'

For the twenty-one years that followed, Polevoy was in incessant literary activity. The 'Moscow Telegraph' soon made itself conspicuous by the vigour and spirit of its remarks on the literature of the day; the example was extensively followed, and the Russian literary historians date a new era in criticism from the articles of Polevoy. It was naturally supposed that the editor had little spare time at his disposal, but the public was surprised to hear in 1829 that he had completed a history of the Russian nation, in 12 vols., containing a continuous narrative from the earliest times to the reign of the Emperor Nicolas. The early volumes of this history were assailed without mercy by many who were astonished at the presumption of its author in measuring himself with Karamzin, and of the twelve volumes only six appeared in print, the last in 1833. Possibly its further progress may have been checked by the censorship, as the 'Moscow Telegraph' was thought too liberal in its tendencies, and suppressed by the Russian government. This was in or about 1835. Polevoy removed to St. Petersburg, and his activity, instead of slackening, became greater than ever. "In Moscow," says Nikitenko, in an article on his work in the 'Biblioteka dlya Chteniya' for 1846 (vol. lxxvi.), "Polevoy was a journalist, an historian, a romance-writer. In St. Petersburg he was both an editor and a contributor to several journals; he composed romances, tales, essays, translations from Shakspere, and such a multitude of dramas, tragedies, comedies, vaudevilles, national farces, and so on, that criticism gave up the attempt to follow him. We do not know what to be most astonished at—the number and bulk of his productions, the variety of their character, or the rapidity with which he threw them off." The natural result of this rapidity was, that the name of Polevoy, which at one time promised to be one of the brightest in the Russian literary horizon, lost much of its lustre. For the last ten years of his life his reputation sunk instead of rising. He died at St. Petersburg, on the 22nd of February 1846 (o. s.), after three weeks of nervous fever, and it was declared by his medical attendants that his constitution was completely worn out by his incessant literary labours. He died in poor circumstances, and left a large family.

The most interesting work of Polevoy is perhaps his 'Ocherki Russkoy Litteraturui,' or 'Sketches of Russian Literature,' 2 vols. 8vo, St. Petersburg, 1839. It consists of reprints of select critical articles which had appeared in the 'Telegraph' and elsewhere, on Devzhavin, Karamzin, Pushkin, and other of the most prominent names in Russian literature. The collection entitled 'Dramatic Works and Translations of N. A. Polevoy' ('Dramaticheskie Sochineniya i Perevodui'), 4 vols., St. Petersburg, 1842-43, comprises only the more popular of his productions, several of which enjoyed a great success, in particular the 'Grandfather of the Russian Fleet' ('Diedushka Russkago Flota'), founded on the history of the old boat which bears that name, which Peter the Great took as the model for his ship-building. The author's favourite, as he tells us himself, was 'Parasha Siberiachka' ('Parasha the Siberian Girl'), founded on the same historical anecdote which supplied Madame Cottin with the ground-work of 'Elizabeth, or the Exiles of Siberia.' In another play, 'Soldatskoe Serdtse' ('A Soldier's Heart'), the hero is his still-living friend Bulgarin, on a real incident in whose life it is founded. Polevoy's translation of 'Hamlet,' which was produced at Moscow in January 1837, is unusually close to Shakspere; not even the scene of the gravediggers is omitted, and the dialogue passes from blank verse to prose, in imitation of the original, but the versification seems to be far from successful. His 'Life of Suvorov,' or Suwarrow, is a very popular book in Russia. His 'Life of Peter the Great' (4 vols., 1843), is the best biography of that wonderful man the Russians yet possess, and superior beyond all comparison to the tedious compilation of the author's kinsman Golikov. His 'Life of Napoleon' (5 vols.) was only brought by himself to a point a little beyond the conflagration of Moscow, and was finished after his death by his brother Xenophont. His 'Stolietie Rossii' ('Century of Russia'), or an historical picture of Russia from 1745 to 1845 (2 vols., 1845), is perhaps the least satisfactory of his historical works, but it contains passages of interest to a European reader.

Though the 'Moscow Telegraph' was suppressed in Polevoy's hands, and its author is spoken of by Hertzen as having the reputation of a decided liberal, his patriotism as a Russian is one of the qualities which most forcibly strike the attention of a foreigner. "Russia," he exclaims at the conclusion of this work, "is not a shapeless mass like the Roman empire, not violently put together like the dominions of Napoleon, not scattered over the whole world like the British sovereignty, the three examples of vast empires composed of different and various parts, brought together in one mass. . . . . Russia like the ocean dashes on the shores that surround it, and what its waves have covered becomes its incontestable dominion—no human force shall tear from it its subject provinces." "Assuming the title of Emperor in place of that of Tzar, moving the capital from Moscow to St. Petersburg, shaving beards and shortening caftans, altering manners, customs, and laws, it was after all from the original elements of the Russian empire, from the Russian mind and the Russian soil, that Peter the Great reconstructed Russia. He still remained a Russian sovereign, and his subject, though fraternising with the German, remained a Russian man. With his decided tendencies towards western Europe, it was impossible that something superfluous should not find admission, that traces of it should not remain till even now, but they are perishing and will perish, as the Gallicisms die out of our Russian tongue." . . . . "And sixty millions of a nation like this, fastened together by one power and inspired with faith in that power, are directed by a single will, and acknowledge that will as sacred. What will not these sixty millions do? The future belongs to us. Whence otherwise comes the fear with which we inspire Europe and the West, the fear from which it strives to reassure itself by calumnies against us. This fear takes its rise from a consciousness which is not the consciousness of strength, from a feeling different from that of hope in the future, on which we Russians look with such boldness and such faith."

POLICE. The establishment of a police force all over England has at last been made compulsory by the Statute

19 and 20 Vict. c. 69; which subjects the whole force to the inspection, and, to some extent, control of the Secretary of State. One fourth of the charge for the pay and clothing of the police of any county or borough must be paid by the Treasury, when the force has been certified to have been maintained for the previous year in a state of efficiency in point of numbers and description. (Blackstone's 'Commentaries,' Mr. Kerr's edition, vol. i. p. 352.)

POLISHING SLATE. [MINERALOGY, *S.* 1.]

POLPERRO. [CORNWALL.]

POLYERGUS, a genus of *Formicidæ*, separated from *Formica* by Latreille. The type of the genus is *F. rufescens*, the Amazon Ant. The species are destitute of stings, and have the antennæ near the mouth and the mandibles narrow, curved, or very much hooked. The habits of the Amazon Ant, *P. rufescens*, are very remarkable. The neuters of this species unite with those of *Formica sanguinea* in making war upon the neuters of other species of *Formicidæ*, especially *F. cunicularia* and *F. fusca*. The result of the conquest is the making slaves of the latter, who are always found doing the hard work of the colonies of their enslavers. [ANT.]

POLYPTERUS, a genus of Fishes belonging to the family *Clupeidæ*. The sides of the upper jaw are immoveable; the head is covered with sharpened bony plates; the body with strong scales; it has one gill ray; a number of separate fins on the back; the teeth like a rasp, with long ones in front; the stomach large; a double air-bladder, with large lobes, the left one opening freely into the gullet. There are two species; one found in the Nile, the other in the river of Senegal. These fish are interesting as forming the only living representatives of a large family now extinct. They belong to the large division of extinct fish called Sauroid, on account of their resemblance to the Lizard tribes.

POLYZOA, frequently termed *Bryozoa*, are animals belonging to the Molluscous Sub-Kingdom, closely allied in some respects with the *Tunicata*, and especially with the Compound Ascidians, whilst in others they approach the *Brachiopoda*.

The analogies presented in their structure with that in other Molluscous groups having been pointed out in the article MOLLUSCA, *S.* 2, it will be needless here further to refer to them. The present article, after giving a brief view of the more important structural peculiarities of the class, will be devoted more especially to their mode of classification; but since the term *Polyzoa*, here employed, has by no means obtained universal adoption, it appears requisite to say a few words explanatory of the reasons which have induced us to prefer that term to the name *Bryozoa*, more usually employed by many British and by most Continental naturalists.

Section I. Historical.

Formerly confounded with the Sertularian and other phytoid *Zoophytes*, or *Radiata* [POLYPIFERA], it is only within the last thirty years that the *Polyzoa* have been admitted to their proper place in the animal kingdom, having been advanced in fact from one sub-kingdom to another. Their advance from the *Radiata* to the *Mollusca* may be said to date from the researches of Dr. Grant, contained in his 'Observations on the Structure and Nature of Flustræ,' in 1827; and of Milne-Edwards, in conjunction with M. Audouin, given in their 'Résumé des Recherches sur les Animaux sans Vertèbres faites aux iles Chaussey,' in 1828. To the former of these observers we are indebted for the first intimation of several important facts in the anatomy of these creatures—among others, of the existence of cilia on the tentacles, and the curvature of the intestinal canal, with other particulars of less importance. He failed, however, to notice the existence of a second or anal orifice to the intestinal canal; a fact of the highest importance, as indicating in that respect their close approximation to the *Ascidiæ*, or tunicate molluscs. This opening was discovered by Milne-Edwards and Audouin, and its importance was by them duly appreciated. In other respects their observations agreed with those of Dr. Grant. The existence of this anal orifice was regarded by its discoverers as sufficient to justify a complete change in the ideas then generally entertained with respect to the natural affinities of these animals with the rest of the *Zoophytes*. They proposed to distribute the animals belonging to the class of *Polypi*, as then received, into four principal groups, which are in fact pretty nearly identical with those in which they are at present most generally placed. The fourth of these families contained the *Flustræ* and other Polypes whose digestive canal opened on the exterior by two distinct openings, and whose organisation approached that of the Compound Ascidians.

The latter class, though thus distinguished from its apparent allies, received no name from the eminent naturalists to whom its foundation was due; and of the names subsequently applied to it, it remains simply to determine which is entitled to the priority. The appellations proposed for this class that have received any acceptation at all are three—*Polyzoa*, *Bryozoa*, and *Ciliobrachiata*. The first of these terms (as a singular noun) was used by Mr. J. V. Thompson in a Memoir, constituting the fifth part or number of his 'Zoological Researches,' and applied by him "to a distinct class of Polypes hitherto in great measure confounded with the *Hydroida*." This paper was published in December, and probably on the first of December, 1830. The appellation of *Bryozoa* was given by Professor Ehrenberg to those Polypes in which two openings existed to the digestive canal, and which he thus distinguished from a second class, termed by him the *Anthozoa*, in which but one orifice was presented. His paper on the 'Corals of the Red Sea,' in which this subdivision of the Polypes was first proposed, was read, or rather was in part read, before the Berlin Academy, on the 3rd of March, 1831. It was not completed, however, till December, 1833, nor published until February, 1834; and this date, for reasons it is needless here to refer to, should most probably be regarded as the true date of its publication. The part of the same writer's 'Symbolæ Physicæ,' in which the term is used, was not published till June, 1831. Consequently, the earliest date which can, by any latitude of admission, be given to the first publication of the term *Bryozoa*, is March, 1831, or at least three months after that of Mr. J. V. Thompson's 'Researches,' in which that of *Polyzoa* is proposed. In a very valuable paper published in the 'Philosophical Transactions' for 1837, Dr. A. Farre proposes to employ the term *Ciliobrachiata* for this class of Polypes, from the circumstance that their tentacles are ciliated. But this term, though appropriate and good, has since been but rarely employed, and is obviously without any claim to priority.

Section II. Structure and Functions.

The main points in the anatomy and structural relations of the *Polyzoa* will be found under the article MOLLUSCA, *S.* 2; but in order to render the account of their classification (which is properly the subject of the present article) more intelligible, it will be necessary briefly to detail the structural, and with them some of the physiological conditions presented in the soft and hard parts of the animals.

The *Polyzoa* may be defined as Compound Molluscous Animals, in which the nervous system consists of a single ganglion, situated between the mouth and the anus, having a distinct mouth surrounded more or less completely by a row of ciliated tentacles; usually hermaphrodite, and propagated by buds or ova; in the mature state mostly fixed, though some possess the power of locomotion.

Though differing widely in external appearance, the animal itself is constructed upon a very uniform type throughout all the subdivisions of the class, and for this reason, the anatomy of one species or order will, with trifling exceptions, apply to all. The following account of their structure is, in great measure, taken from that given by Professor Allman in his 'Report on the Freshwater Polyzoa,' published in the 'Proceedings of the British Association' for 1850; and, with the exception of the word 'polyzoary,' or 'polyzoarium,' which is here used to express the compound growth formed by the associated animals, instead of 'cœnæcium,' proposed by that naturalist, the terms used by him have been adopted—

1. Polypide, to signify the soft or retractile portion of the *Polyzoon*. 2. Ectocyst and Endocyst, to express the two distinct tunics of which the cells of the polyzoary are formed; the former being applied to the external and the latter to the internal tunic. The part surrounding the mouth, upon which the tentacles are placed, is termed, 3, the Lophophore; and 4, the Perigastric Space, is the space included between the walls of the endocyst and the alimentary canal.

But besides these terms, which apply more particularly to the polypide itself, several others are required in the description of the polyzoary. These are—

Cell, the hard portion of the external tunic, into which in most cases the polypide is capable of being retracted by the action of certain muscles. The parts of the cell are—1, the

Mouth, or that opening, as it may be termed, through which the polypide makes its exit and its entrance. The borders of this opening are sometimes furnished with Oral Spines, and it is sometimes closed when the creature has retreated into the cell, by a Crescentic Lip, usually having a cartilaginous border, and closed by special muscles. (*Figs.* 5 and 5*a.*) In many cases the wall of the cell is of equal thickness and similar structure throughout, but in the Cheilostomatous sub-order the front of the cell, or that side upon which the mouth opens and the animal comes out, very often differs in structure from the rest. That is to say, a greater or less extent of the front may remain wholly or in great measure membranaceous, as in the genus *Membranipora* (*fig.* 14); or be filled in by a sculptured or perforated calcareous expansion, as in *Catenicella* (*figs.* 1, 2), *Lepralia* (*fig.* 15), and many others. The space thus defined when left membranaceous (as it appears in most if not all cases to be at an early period in the formation of the cell), is termed the Aperture. The borders of the aperture are sometimes furnished with Marginal Spines. In some instances, as in *Caberea* and *Scrupocellaria* (sp.), the aperture is protected in front by a curious outgrowth from near the margin, which is termed a Pedunculate Operculum. The back of the cell is that part, of course, which is opposite to the front; the mouth is situated at or near the upper part of the cell, and is either terminal or subterminal. Other parts, which may be regarded as appendages to the cells, but which are not universally present, are certain organs, either of offence, defence, or prehension, termed Avicularia and Vibracula; the former constituting a sort of pincers, and the other consisting of a long, slender, moveable seta. However diverse in appearance, these two kinds of organs are all constructed upon the same general type; that is to say, the organ consists of a hollow cup, or cell, containing two sets of muscles, for the movements of the mobile limb, the mandible, as it is termed, in the one case, and the seta in the other. The avicularia again are either pedunculate and moveable upon the peduncle, or sessile, which latter may be either simply sessile or deeply immersed. The Ovicell is an organ of an arched or globose or pyriform shape found on many of the *Cheilostomata* and on some of the *Cyclostomata*, apparently destined for the development of ova. In the former class it is invariably situated above the mouth; and in the latter the analogous organ seems to represent a metamorphosed cell, and in situation corresponds with the other cells of the polyzoary.

The importance of the avicularian and vibracular organs, in a systematic point of view, may be estimated from the circumstance that, out of 36 genera of Cheilostomatous *Polyzoa*, 20 include species armed with one or the other, or with both; and that of 191 species no less than 126 are so furnished. They appear to be confined solely to the *Cheilostomata.*

In many cases the polyzoary is affixed by numerous slender corneous tubes, which seem to be merely subservient to that purpose; these are termed Radical Tubes.

The Polyzoary, or colony itself, is formed of an aggregation of cells, which throughout the two former orders of the class as here arranged, arise one from another, either singly or in pairs, from each cell (*fig.* 15*a*, which represents the beginning of the polyzoary of *Lepralia ciliata*), and from various parts of the cell, as on the back or sides, near the top or not far from the bottom. And it is to the variety of modes in which the cells arise that the diversity of form of the polyzoary is due. In one division of the third sub-order, the *Ctenostomata*, the cells do not arise one from another, but from a tube common to several cells, and which is either divided or not into distinct internodes. This portion of the polyzoary is termed the Basal Tube.

Having thus defined most of the terms which it is necessary to employ for the purposes of classification, we will briefly describe the anatomy of the various parts of the animal in the order in which it is given by Professor Allman.

Organs for the Preservation of the Individual.

A. Dermal System.

The Polyzoary is formed of a number of little chambers, or cells, organically united, each of which contains a polypide, and consists of two portions—an internal tunic, soft, transparent, and contractile (the Endocyst), and an external investment (the Ectocyst). The endocyst lines the interior of the cells and when it arrives at their orifice would protrude beyond the ectocyst, were it not that here it becomes invaginated, or inverted into itself, and then terminates by becoming attached round the base of the tentacular crown; during the exsertion of the polypide it undergoes eversion, sometimes complete, sometimes incomplete. The endocyst consequently constitutes a cell, or sac, in which the polypide is suspended, surrounded by the perigastric space. These sacs are all closed above where they are attached to the polypide, and below, in some cases, their cavities are in communication with those of the neighbouring sacs (or with the basal tube); but more generally no such communication exists. The ectocyst and endocyst represent respectively the external and middle tunics of the *Tunicata*, or the mantle and shell of other Molluscs.

The endocyst is in all cases thin and membranaceous, and often contains transverse muscular fibres. A portion, perhaps the whole, of the inner surface is clothed with vibratile cilia. The ectocyst varies greatly in composition and aspect. Throughout the greater number of the *Polyzoa* it is hardened by the deposition of calcareous matter, whilst in many others it is horny and flexible, and in some even of an almost gelatinous consistence. In the *P. hippocrepia* it is in most species composed of a tough pergamentaceous brown membrane, strengthened by the deposition of irregularly formed siliceous particles, sometimes rendering it quite opaque. In other cases again, as in the genus *Anguinella* v. Ben., the soft and flexible, and as it were flocculent ectocyst, is pervaded by aluminous and siliceous particles, and the same is the case, to a less marked extent, in some other of the *Ctenostomata*. In *Cristatella* and *Pedicellina* the ectocyst would, at first sight, seem to be entirely absent, and the cell to be composed exclusively of the endocyst. Careful examination however shows that both are present, and that the ectocyst consists of a highly organised and transparent tunic, free from any earthy deposit. In some instances, and very distinctly in the *Selenariadæ*, or Lunulites, the surface of the calcareous ectocyst is further covered with a thin horny cuticle, apparently resembling that on the shells of many Molluscs.

B. Organs of Digestion.

These consist of an alimentary canal, commencing at the mouth and terminating at the anus; and subdivided into several portions, which have received the same names as those of the apparently corresponding parts of the alimentary tract in the higher animals. The mouth is edentulous and usually unarmed, though sometimes (as in the proper *P. hippocrepia*) furnished with a valve-like organ of very peculiar formation, and which is considered by Professor Allman to be analogous with the 'languet' of the Ascidians.

From the mouth an œsophagus, or pharynx, leads downwards to the stomach, or in some cases, as in *Bowerbankia*, into a sort of gizzard, which in that genus is armed on each side with a serrated tooth. The stomach is a thick walled sac, which in most cases dilates inferiorly into a rounded cul-de-sac, or pyloric cavity, from which the intestine springs.

The pyloric orifice is distinctly valvular, and is furnished with prominent lips, which project into the intestine. The intestine, wide at the origin, rapidly diminishes in diameter till it terminates at a distinct anus near the mouth. The liver is represented by spherical corpuscles of a brown colour, seated on the wall of the stomach. The mouth and upper part of the œsophagus and the commencement of the intestines, are, in most cases, at any rate, furnished with vibratile cilia.

C. Organs of Respiration and Circulation.

Upon the tentacular crown and the walls of the perigastric space, which corresponds with the 'sinus system' of the *Tunicata*, would seem chiefly to devolve the function of bringing under the influence of the aerating medium the nutritious fluid of the tissues.

The tentacular crown of a Polyzoon consists of two portions: 1, a sort of stage, or disc, which surrounds the mouth—the Lophophore; and 2, of a row of tentacles, which are borne in an uninterrupted series round the margin of the lophophore. The lophophore throughout almost the entire class is orbicular or annular; but in the *Hippocrepia* its posterior margin, or that which corresponds to the rectum, is prolonged into two triangular lobes, or arms, so that in that order it exhibits the form of a deep crescent. This condition of the lophophore is found in no marine species, and in *Fredericella*, a fresh-water form, the arms of the crescent are obsolete, and the lophophore might, on a superficial view, be regarded as orbicular; but a careful examination, Professor Allman goes on to say, will render manifest its departure from the orbicular form, the side corresponding to the arms of the crescent being slightly prolonged obliquely upwards. In all cases the lophophore forms the roof of the perigastric space; in the species with crescentic lophophores the interior of the arms is clothed with vibratile cilia.

The tentacles are tubular, closed at their free extremity and opening at the opposite end through the lophophore into the perigastric space. In all the *Polyzoa* they are armed upon their opposed sides (in *Pedicellina* on one only?) with vibratile cilia, arranged in a single series, and vibrating towards the extremity of the tentacle upon one side and towards the base on the other. A nervous filament and muscular fibres may be traced into the tentacles. In the proper *P. hippocrepia* the entire plume of tentacles is surrounded at its base by an exceedingly delicate transparent membrane in the form of a cup or calyx, considered by Professor Allman as analogous to the membrane of the respiratory sac in the *Tunicata;* but this calyx has not yet been detected in any marine polyzoon. In the genus *Pedicellina* the tentacles are also surrounded at their base by a kind of membranous calyx, but this is of an entirely different import from the membrane connecting the bases of the tentacles of the *P. hippocrepia.*

The perigastric space and the interior of the lophophore and tentacles all freely communicate with one another, and are filled with a clear fluid, in which float numerous particles of a very irregular form and size. This fluid obviously represents the blood or common nutrient and respiratory fluid of other Molluscs. It is kept in motion by the cilia with which the endocyst is lined, but there is no special circulatory organ as in the *Ascidiæ.*

D. Organs of Motion.

The muscular system in the *Polyzoa* is highly developed, and the muscles are especially interesting in a physiological point of view, for they seem to present an example of true muscular tissue reduced to its simplest and essential form. They are composed of bundles of elementary fibres, totally separate from each other, throughout their entire course, and which are distinctly marked with transverse striæ. They resemble in fact very closely the fibres of the thoracic muscles of insects. In the marine *Polyzoa* however another kind of fibres may be noticed, presenting nodular enlargements, which would seem to resemble very closely the isolated, organic muscular fibres of the higher animals. The muscles are disposed in distinct sets, and it is by the agency of these various groups that the different movements of protrusion and retraction of the polypide are effected, together with the actions of the tentacles and of the avicularia and vibracula. For the arrangement of the muscles in the former class of organs see *fig.* 2 (5), in the article MOLLUSCA, *S.* 2. The curious analogies in the disposition of these muscles in the *Polyzoa* with that of the muscles which act upon the shells of the *Brachiopoda* are also pointed out in that place.

E. Organs of Sensation.

A distinct nervous system was first shown to exist in the *Polyzoa* by M. Dumortier in *Lophopus crystallinus,* and has been demonstrated by Van Beneden in *Laguncula,* and by Allman in all the Hippocrepian genera except *Paludicella;* it may be deemed therefore to exist generally in the class, and will probably be found essentially alike in all. In all the species of the Hippocrepian order there may be seen, attached to the external surface of the œsophagus, on its rectal aspect, just below the mouth, a hollow oval body of a yellowish colour, which is undoubtedly a nervous ganglion, as Professor Allman has succeeded in distinctly observing nervous filaments in connection with it; some of which may be traced going to each tentacle. The ganglion also sends off filaments upwards towards the mouth, and one may be observed passing downwards along the œsophagus; but nothing like a complete collar surrounding the tube has been observed. The *Polyzoa* do not seem to possess any special organs of sense.

F. Organs of Locomotion.

In *Cristatella,* the ectocyst, according to Professor Allman, is highly contractile, and presents, below, a flattened disc, destitute of apertures. Upon this disc, which closely resembles the foot of a Gasteropod, the singular polyzoary creeps about upon the stems and leaves of aquatic plants. Except in the embryonic condition no other Polyzoon would seem to possess any power of locomotion; or at any rate none has been noticed, but several reasons would seem to render it probable that the species belonging to the *Selenariadæ* may be capable of locomotion by means of their curiously constructed vibracula.

G. Reproduction.

In the *Polyzoa,* observes Professor Allman, three distinct modes of reproduction may be witnessed, namely:—By buds or gemmæ; by true ova: and by free locomotive embryoes.

1. Reproduction by Gemmæ.—The gemmæ always originate in the endocyst, first appearing as small tubercles projecting into the perigastric space, but which may soon be seen to take a development in an outward direction. The bud now presents the appearance of a vesicle projecting from the exterior of the parent-cell, closed at its external or free extremity, but having its cavity in communication with the perigastric space. The polypide is gradually developed in the interior of the gemma by the differentiation of its fine granular contents, and the extremity of the bud ultimately opens so as to admit of the exsertion and retraction of the young animal. Thus is produced a fresh cell of the polyzoary, whose ultimate form, as has been before observed, depends upon the point of the cell at which the bud springs. This differs in almost every species, and upon this difference depends the diverse physiognomy of the various species. For instance, if each cell pullulates at a single point at the upper and back part, a polyzoary, consisting of a single series of cells, such as that of *Ætea,* or of *Hippothoa* (*fig.* 6), will be presented; if from each cell two are given off and remain in close apposition, a circularly expanded disc of greater or less regularity will be produced, as seen in *Lepralia* (*figs.* 15 and 15 *a*), some *Membraniporæ,* &c., and so on.

2. Reproduction by Ova.—All the fresh-water, and probably, also, all the marine *Polyzoa,* produce true ova, which are formed in a definite organ or ovary; and from the existence of a true ovary and of ova, we are at once led to expect the co-existence of a male organ. That a testis is present in all the species of fresh-water *Polyzoa,* at any rate, no doubt, according to Professor Allman, can be entertained, and in *Laguncula* (*Farrella*) *repens,* the existence of this organ is described and figured by Van Beneden. In *Paludicella* Professor Allman says, "that the ovary and testes are both found in the same cell. The former is an irregularly shaped body, adherent to the inner surface of the endocyst, towards the upper part of the cell. The testicle is an irregularly lobed mass attached, like the ovary, to the inner surface of the endocyst. It occupies a position near the bottom of the cell, and is thus separated by a wide interval from the ovary. Both organs are attached to the side of the stomach by a cylindrical cord." The form of the ovary in the proper *Hippocrepia* would appear more to resemble a moniliform cord. In *Laguncula* (*Farrella*), according to Van Beneden, the ovary and testis, in form and situation would seem very closely to resemble those in *Paludicella.* It would appear also that the impregnation of the ova is effected by their escaping from the ovary into the perigastric cavity, where they are brought into contact with the spermatozoa, which have in like manner escaped from the testis into the same cavity, and are swimming actively about in vast numbers in the fluid with which it is occupied. There does not appear to be any special opening for the escape of the ova after impregnation, which is probably effected by a rupture in some part of the endocyst. The forms of the ova vary a good deal in different genera, and in some cases they are ciliated.

3. Professor Allman also describes a mode of reproduction by free embryoes, but does not seem to have noticed their mode or plan of development.

The embryo upon its escape from the ovum appears sometimes to be ciliated, sometimes not. In the case of *Lepralia coccinea,* a cheilostomatous species, the appearance of an embryo of the ciliated kind and its subsequent development are well described by Mr. Gosse. ('Naturalist's Rambles on the Devonshire Coast,' p. 218.)

But although the above brief description of the reproduction of the *Polyzoa* by ova formed and impregnated within the perigastric sac be undoubtedly correct, as applied not only to the species in which it has actually been observed, but from analogy to others as well, it cannot be denied that very considerable obscurity rests upon the mode in which the ova are developed in the ovicells or receptacles, which have received that name, and as to the relation which those organs bear to the rest of the animal. There can be no doubt that these organs do contain an ovum or ova, and that these ova are developed ab origine, in them, and there undergo segmentation; but how these ova are fertilised, and why a difference so great as this in the position of the ovigerous organ should exist in apparently closely allied genera or even species, is at present inscrutable.

Section III. Classification.

The more general relations of the *Polyzoa* having, as before observed, been described under the head of MOLLUSCA, the remainder of this article will be devoted to the mode in which they may be conveniently arranged among themselves.

With our present defective knowledge of many particulars respecting the conformation of the *Polypides*, the classification of the *Polyzoa* can only be attempted with any prospect of useful results, from the study of the Polyzoary; that is to say, so far as regards the determination of the subordinate groups—the orders themselves being defined by characters derived from the Polypide, or soft portion of the animal. The following scheme, which in its main features has been long received, appears to offer as convenient, and so far as our present acquaintance with the subject allows, perhaps as natural a classification as can be expected.

Class POLYZOA.

Social molluscous animals, whose nervous system consists of a single post-œsophageal ganglion, with branches, but without a nervous ring around the œsophagus; and without any special organs of sense or of circulation. Mouth surrounded more or less completely with a single row of ciliated tentacles.

Polyzoa, J. V. Thompson, 'Zool. Research.,' Mem. 5, p. 92 (1830).
Bryozoa, Ehrenb., 'Corallen-Thiere des Roth. Meer,' 1831 (1834?).
Molluscan Zoophytes, seu *Zoophyta Ascidioida*, Johnston, 'Mag. Zool. and Bot.,' 1836.
Ciliobrachiata, Farre, 'Phil. Trans.,' 1837.

Order I. *Polyzoa infundibulata*, Gervais.

Tentacles disposed on an uninterrupted annular lophophore, surrounding the unarmed mouth.

Sub-Order I. *Cheilostomata*.

The crescentic subterminal mouth of the cell is furnished with a moveable lip, by which it is closed when the animal retreats.

Escharadæ, *Flustradæ*, *Cellariadæ* (ex. *Crisia*), Fleming.
Polypiaria operculifera et cellariæa (ex. *Crisia*), Blainville.
Escharina, *Celleporina*, Ehrenberg.
Urceolata (pars), Hagenow.

A. Cells disposed in a single series.

Family 1. *Catenicellidæ*, Busk.

Cells connected by short flexible tubes.

Gen. 1. *Catenicella*, Blainv. (*Figs.* 1, 2.)

Cells connected by short corneous tubes, all facing the same way; polyzoary phytoid, erect, dichotomously branched; cell at the bifurcation geminate.

a. Fenestratæ. Cells fenestrate in front; ovicells terminal.
β. Vittatæ. Cells with a narrow elongated band or vitta on each side in front; ovicells galeriform, not terminal.
Catenicella, Blainville; 'Brit. Mus. Cat.,' p. 3.
Catenaria, Savigny, 'Egypt,' pl. 13.
About seventeen species known; mostly Australian.

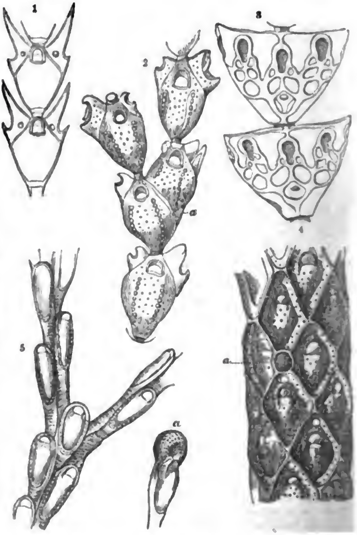
Gen. 2. *Alysidium*, Busk.

Cells connected by short corneous tubes. Two cells arising from each cell at a bifurcation.
Alysidium, 'Brit. Mus. Cat.,' p. 13.
Three species known.

Gen. 3. *Calpidium*, Busk. (*Fig.* 3.)

Cells with an avicularium on each side; each cell with three distinct apertures, arising one from the upper part of another in a linear series, connected by short corneous tubes.

Calpidium, Busk; 'Voyage of Rattlesnake,' i. 364 (*fig.* 3); 'Brit. Mus. Cat.,' p. 14.
One species.



1, *Catenicella taurina.* 2, *Catenicella elegans*; *a*, geminate cell. 3, *Calpidium ornatum.* 4, *Salicornaria farciminoides*; *a* avicularium. 5, *Cellularia Peachii*; *a*, ovicell.

Family 2. *Scrupariadæ*.

Junctions of the cells rigid.

Crisiadæ (part), Gray.
Scrupariadæ, Gray.
Eucratiadæ (part), Johnst.

Gen. 1. *Scruparia*, Oken.

Cells decumbent; aperture oblique, subterminal; branches given off from the front of a cell below the aperture.
Scruparia (*a*), Oken.
Scruparia, 'Brit. Mus. Cat.,' p. 28.

Gen. 2. *Hippothoa*, Lamouroux. (*Fig.* 6.)

Cells decumbent, adherent; branches given off from the sides of the cells.
Hippothoa, Lamx.; Gray; Johnst.; 'Brit. Mus. Cat.,' p. 29.
Catenicella (pars), Blainville (non M. Edwards).
Terebripora, D'Orbigny.
Tubulipora (sp.), Jameson.
Three species known.

Gen. 3. *Ætea*, Lamouroux.

Cells tubular, erect, scattered; adnate and decumbent at the base.
Ætea, Lamx.; Gray; 'Brit. Mus. Cat.,' p. 30.
Anguinaria, Lamarck; Johnston.
Falcaria (*β*), Oken.
Four species.

Gen. 4. *Beania*, Johnston. (*Fig.* 7.)

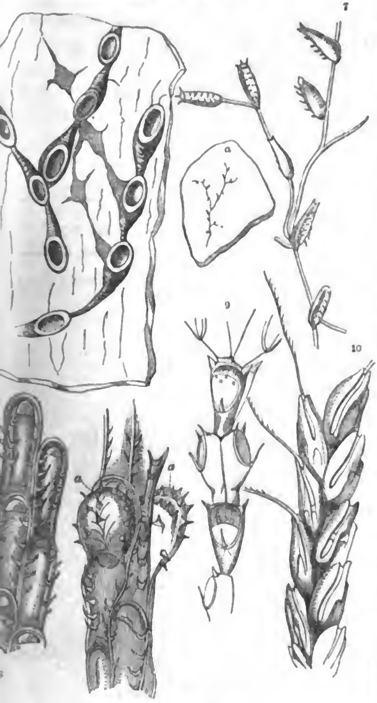
Cells arising one from another by a slender filiform prolongation or tube, and open in front; marginal spines hollow, inarching.
Beania, Johnst.; Gray; 'Brit. Mus. Cat.,' p. 32.
Two species.

B. Cells disposed in a double or in multiple series.

Family 3. *Salicornariadæ.*

Cells disposed around an imaginary axis, forming cylindrical branches of a dichotomously divided erect polyzoary.

Salicornarianæ, Gray.
Salicornariadæ, 'Brit. Mus. Cat.,' p. 15.



6, *Hippothoa catenularia.* 7, *Beania mirabilis*; *a*, natural size. 8, *Farciminaria aculeata*; *a*, ovicella. 9, *Dimetopia cornuta.* 10, *Caberea Boryi.*

Gen. 1. *Salicornaria*, Cuvier. (*Fig.* 4.)

Front of each cell much depressed, surrounded by an elevated ridge, by which the surface of the branch is divided into more or less regular, rhomboidal or hexagonal spaces; avicularia scattered; ovicells immersed, inconspicuous; branches articulated.

Salicornaria, Cuvier; Johnston; 'Brit. Mus. Cat.,' p. 15.
Farcimia, Fleming; Johnston, 'Ed.' i.
Cellaria (a), Lamarck; Lamx.; De Blainville.
Five species.

Gen. 2. *Nellia*, Busk.

Front of cell convex, with a distinct raised border; aperture very large; ovicells (?); no avicularia.

Salicornaria (sp.), Busk., 'Voyage of Rattlesnake,' i. 367.
Nellia, 'Brit. Mus. Cat.,' p. 18.
Two species.

Gen. 3. *Vincularia*, Defrance. (*Fig.* 19.)

Polyzoary rigid, calcareous, inarticulated; surface not areolated; aperture large; no avicularia; ovicells inconspicuous.

Vincularia, Defrance; Blainv.; Hagenow; 'Brit. Mus. Cat.,' p. 96.
Glauconoma, Goldfuss.
Siphonella, Hagenow.
Cellaria (pars), Reuss.
One recent species; numerous fossil.

Gen. 4. *Farciminaria*, Busk. (*Fig.* 8.)

Polyzoary corneous, flexible; margin of aperture much raised; aperture very large; ovicells cucullate, prominent; no avicularia.

Farciminaria, 'Brit. Mus. Cat.,' p. 32.
One species.

Family 4. *Cellulariadæ*, Busk.

Cells disposed in the same plane, forming linear branches of a dichotomously divided phytoid, erect, articulated polyzoary.

Bugulidæ (pars), Gray.
Cellularidæ (pars), Johnston.
Escharidæ (pars), Johnston; Gray.
Cellulariadæ, 'Brit. Mus. Cat.,' p. 19.

Gen. 1. *Cellularia*, Pallas. (*Fig.* 5.)

Cells bi-triserial; more than four in each internode; oblong or rhomboidal, contiguous; perforated behind, unarmed, or very rarely with an avicularium on the upper and outer angle of the cells.

Cellularia (pars), Pallas; Fleming; Johnston (pars); 'Brit. Mus. Cat.,' p. 19.
Bugula (pars), Gray; Oken.
Three species.

Gen. 2. *Menipea*, Lamouroux.

Cells oblong, or elongated and attenuated downwards; imperforate behind, with a sessile avicularium (frequently absent) on the upper and outer angle, and one or more sessile avicularia on the front of the cell below the aperture (not always present).

Menipea, Lamx.; 'Brit. Mus. Cat.,' p. 20.
Cellaria (pars), Linn.; Solander.
Crisia (pars), Lamx.
Tricellaria, Fleming; Blainville.
Six species.

Gen 3. *Scrupocellaria*, Van Beneden.

Cells rhomboidal, with a sinus on the outer and hinder aspect; each furnished with a sessile avicularium at the upper and outer angle, and with a vibraculum behind. Cells biserial and numerous in each internode.

Scrupocellaria, Van Beneden; Gray; 'Brit. Mus. Cat.,' p. 23.
Bicellaria (sp.), Blainville.
Cellularia (sp.), Pallas; Johnston.
Cellaria (sp.) Solander; Lamarck.
Scruparia (sp.), Oken.
Seven species.

Gen. 4. *Canda*, Lamouroux.

Cells rhomboidal, sinuated on the outer side for the lodgment of a vibraculum; no avicularium on the upper and outer angle; sometimes one in front of the cell.

Canda, Lamx.; Blainville; Gray; 'Brit. Mus. Cat.,' p. 26.
Cellaria (sp.), Lamarck.
Cellarina, Van Beneden.
Bicellaria (sp.), Blainville.
Scrupocellaria, Gray.
Cellularia (sp.), Johnston.
Two species.

Gen. 5. *Emma*, Gray.

Cells in pairs or triplets; a sessile avicularium (sometimes wanting) on the outer side below the level of the aperture.

Emma, Gray; 'Brit. Mus. Cat.,' p. 27.
Two species.

Family 5. *Cabereadæ*, Busk.

Polyzoary dichotomously divided into ligulate bi-multiserial branches; on the backs of which are vibracula, each of which is common to several cells.

Cabereadæ, Busk.; 'Voyage of Rattlesnake;' 'Brit. Mus. Cat.,' p. 37.

Gen. 1. *Caberea*, Lamx. (*Fig.* 10.)

Cells bi-multiserial, in the latter case quincuncial. Back of branches covered with large vibracula, which are placed obliquely in two rows, diverging in an upward direction from the middle line, at which the vibracula of either side decussate with those of the other.

Caberea, Lamx.; Blainville; Gray; 'Brit. Mus. Cat.' p. 37.
Selbia, Gray.
Crisia (sp.), Audouin.
Cellaria (sp.), Lamarck.
Cellularia (sp.), Fleming; Johnston.
Four species.

Gen. 2. *Amastigia*, Busk.

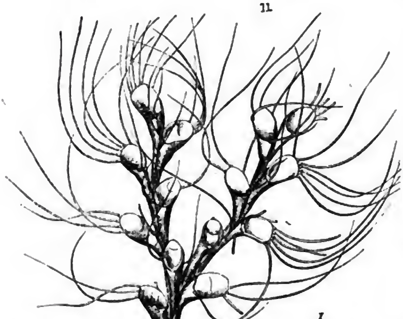
Cells bi-quadriserial; vibracula small, resembling avicularia.

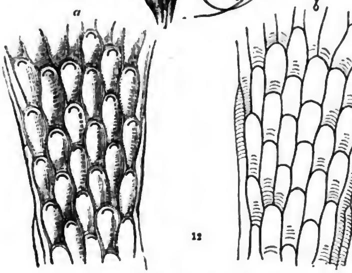
One species.

Family 6. *Bicellariadæ*, Busk.

No vibracula; avicularia, when present, pedunculate.
Bicellariadæ, Busk.; 'Voyage of Rattlesnake.'
Bugulidæ, Gray.

11





11, *Bicellaria ciliata*. 12, *Carbasea elegans*: a, front; b, back.

Gen. 1. *Bicellaria*, Blainville. (*Fig.* 11.)

Cells turbinate, distant. Aperture directed more or less upwards. Several spines, marginal or dorsal.

Bicellaria, Blainville; Gray; 'Brit. Mus. Cat.,' p. 14.
Cellularia, Fleming; Pallas (sp.)
Cellaria (sp.), Oken; Lamarck.
Bugula (sp.), Oken.
Four species.

Gen. 2. *Halophila*, Gray.

Cells contiguous, attenuated downwards; much expanded above, with a large plain aperture unarmed.

Halophila Gray, 'Dieff. New Zealand;' 'Brit. Mus. Cat.,' p. 43.
Bicellaria, Busk., 'Voyage of Rattlesnake.'

Gen. 3. *Bugula*, Oken.

Cells elliptical (behind), closely contiguous, bi-multiserial; aperture very large; margin simple, not thickened.

Bugula, Oken; Gray; 'Brit. Mus. Cat.,' p. 43.
Acamarchis, Lamx.; Blainville.
Crisia (sp.), Lamx.
Cellularia (sp.), Pallas; Johnston (sp.).
Cellaria (sp.), Solander; Lamarck.
Bugulina (sp.), Gray.
Crisularia (sp.), Gray.
Six species.

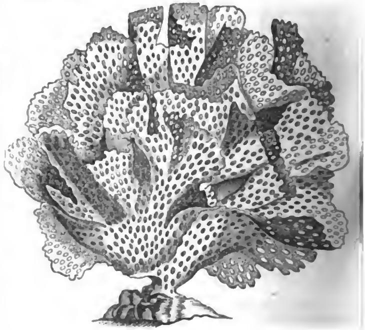
Family 7. *Gemellariadæ*, Busk.

Cells opposite in pairs. Polyzoary continuous.
Gemellariadæ, Busk; 'Voyage of Rattlesnake;' 'Brit. Mus. Cat.,' p. 33.

Gen. 1. *Gemellaria*, Savigny. (*Fig.* 29.)

Cells joined back to back; all the pairs facing the same way.

Gemellaria, Savigny; Van Beneden; Johnston; Gray; 'Brit. Mus. Cat.,' p. 34.
Gemicellaria, Blainville.
Loricaria, Lamx.
Notamia (pars), Fleming.
Loricula, Cuvier.
Crisia (sp.), Lamx.; Lamarck.
Scruparia (β), Oken.
One species.



29, *Gemellaria loricata*.

Gen. 2. *Didymia*, Busk.

Cells joined side to side; no avicularia.
Didymia, Busk.; 'Voyage of Rattlesnake;' 'Brit. Mus. Cat.,' p. 35.
One species.

Gen. 3. *Dimetopia*, Busk. (*Fig.* 9.)

Cells joined back to back; aperture oblique; each alternate pair of cells looking the same way.
Dimetopia, Busk; 'Voyage of Rattlesnake.'
Two species.

Gen. 4. *Notamia*, Fleming.

A pair of tobacco-pipe shaped avicularia, visible above each pair of cells.
Epistomia (sp.), Fleming; Gray.
Dynamena (sp.), Lamx.; Blainville.
Notamia, Fleming; 'Brit. Mus. Cat.,' p. 36; Johnston.
Gemicellaria (sp.), Blainville.

Sertularia (sp.), Gmelin.
Cellularia (sp.), Pallas.
One species.

Family 8. *Flustradæ*, Gray.

Polyzoary flexible, expanded, foliaceous, erect; sometimes decumbent and loosely attached. Cells multiserial, quincuncial, or irregular.

Flustra, Linn; Johnston (pars).
Flustradæ, Gray (pars); 'Brit. Mus. Cat.,' p. 46.
Escharidæ (pars), Johnston; Gray.
Polypiers à Réseau (pars), Lamx.
Flustrées (pars), Lamx.

Gen. 1. *Flustra*, Linnæus.

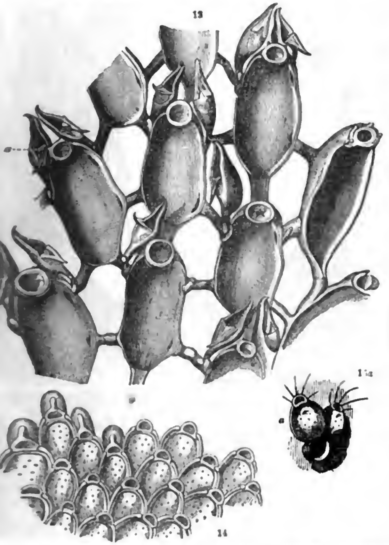
Cells contiguous; on both sides of the frond.
Flustra (sp.), Linn.; Lamarck; Gray; &c.
Five species.

Gen. 2. *Carbasea*, Gray. (*Fig.* 12.)

Cells contiguous; on one side only of the frond.
Flustra (sp.), Linn.; Johnston.
Carbasea, Gray; 'Brit. Mus. Cat.,' p. 50.
Ten species.

Gen. 3. *Diachoris*, Busk. (*Fig.* 13.)

Cells disjunct; each connected with six others by tubular processes.
Diachoris, Busk., 'Voyage of Rattlesnake.'
Three species.



13, *Diachoris magellanica*; *a*, avicularia. 14, *Membranipora coriacea*. 15a, Young state of *Lepralia ciliata*.

Family 9. *Membraniporidæ*, Busk.

Polyzoary membranaceo-calcareous, or calcareous, expanded, encrusting (sometimes foliaceous, contorted, and sub-erect). Cells horizontal, quincuncial, or serial.

Flustra, Dinn. (pars).
Flustradæ (pars), Gray.
Celleporidæ (pars), Johnston.
Membraniporidæ, Busk.; 'Brit. Mus. Cat.,' p. 55.

* Cells more or less open in front, with raised margins.

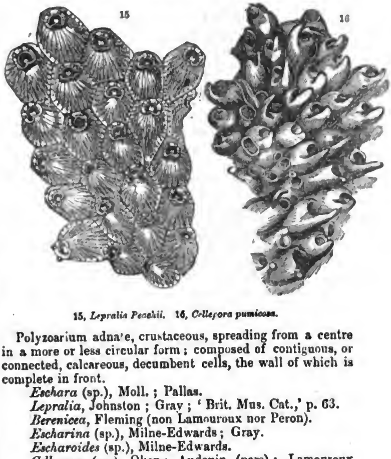
Gen. 1. *Membranipora*, Johnston. (*Fig.* 14.)

Polyzoary encrusting (or suberect, foliaceous, and contorted), spreading irregularly. Cells more or less irregularly disposed or quincuncial, with raised margins; a greater or less extent of the aperture occupied by a thin membrane

Eschara (pars), Pallas.
Flustra (sp.), Linn.; Esper; Berkeley; Lamarck; Grant; Fleming; Risso; Johnston; Lamouroux.
Membranipora, Johnston; 'Brit. Mus. Cat.,' p. 56; W. Thompson; Hassall.
Discopora (pars), Lamarck.
Annulipora, *Conopeum*, *Callopora*, *Amphiblestrum*, *Micropora*, Gray.
Eighteen species.

** Aperture of cells entirely filled in by a convex calcareous expansion. Cells disposed in more or less regularly radiating lines.

Gen. 2. *Lepralia*, Johnston. (*Figs.* 15 & 15*a*.)



15, *Lepralia Peachii*. 16, *Cellepora pumicosa*.

Polyzoarium adnate, crustaceous, spreading from a centre in a more or less circular form; composed of contiguous, or connected, calcareous, decumbent cells, the wall of which is complete in front.

Eschara (sp.), Moll.; Pallas.
Lepralia, Johnston; Gray; 'Brit. Mus. Cat.,' p. 63.
Berenicea, Fleming (non Lamouroux nor Peron).
Escharina (sp.), Milne-Edwards; Gray.
Escharoides (sp.), Milne-Edwards.
Cellepora (sp.), Oken; Audouin (pars); Lamouroux (pars); Hagenow (pars).
Flustra (varior).
Discopora, Lamarck (pars); Gray (pars); Lamouroux (pars).
Cribrillina, *Herentia*, *Escharella*, *Porella*, *Celleporella* (all sp.), Gray.

1. *Armatæ*. Species provided with either avicularia or vibracula.
   A. Species having avicularia.
      α. Median and single.
         * Superior (above the mouth).
         ** Inferior (below the mouth).
      β. Avicularia double, or azygous and lateral on each cell, or only on some cells in the polyzoary.
   B. Species having vibracula.
2. *Inarmatæ*. Species without either avicularia or vibracula.
   α. With oral spines.
   β. Mouth unarmed.

About fifty or sixty species.

Family 10. *Celleporidæ*, Busk.

Polyzoarium composed of cells, standing more or less vertical to its axis or plane, heaped together, or irregularly overlying each other.

Celleporidæ, Johnston (pars); 'Brit. Mus. Cat.,' p. 58.

Gen. 1. *Cellepora*, O. Fabricius. (*Fig.* 16.)

Polyzoarium calcareous, rigid, adnate or erect, composed of urceolate, suberect, contiguous cells, heaped together irregularly, or arranged quincuncially. An ascending rostrum on one or both sides of the mouth usually furnished with an avicularium.

Cellepora (sp.), O. Fabricius; Johnston; Linnæus; Müller; Berkeley; Stewart; Lamarck; Lamouroux; Fleming; Olivi.
Spongites, Oken.
Tubipora (pars), Linn.
Millepora (pars), Pallas; Ellis and Solander (pars).
Eschara (pars), Pallas.

* Adnate, globose, or spreading.

** Erect.

Eight species.

Family 11. *Escharidæ*, Busk.

Polyzoary erect, rigid, foliaceous and expanded, lobate or reticulate. Cells disposed quincuncially in the same plane, on one or both surfaces.

Escharidæ (pars), Johnston.
Lepralianæ (pars), Gray.
Reteporanæ, Gray.

Gen. 1. *Eschara*, Ray. (*Fig.* 17.)

Polyzoarium foliaceous and expanded, or contorted, or branched and sublinear. Cells disposed on both surfaces, back to back, immersed, coalescent, horizontal to the plane of the axis.

Eschara, Ray; Fleming; Johnston; Lamarck; Gray; Pallas (pars); Moll (pars); 'Brit. Mus. Cat.,' p. 89.
Nullipora (sp.), Solander.
Cellepora (sp.), Esper.

* Polyzoary more or less expanded, foliaceous.

** Polyzoary subdivided into branching lobes.

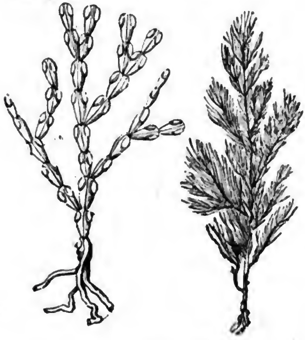
Eleven species.

Gen. 2. *Retepora*, Imperato. (*Fig.* 28.)

Polyzoarium foliaceous, calcareous, reticulated. Cells immersed, opening at one surface only.

Millepora, Linn. (pars); Ellis and Solander; Esper; Marsigli; Cuvier.
Retepora, Imperato; Lamarck; Risso; Fleming; Stark; De Blainville: Couch; Johnston; Goldfuss (pars); Hagenow (pars); 'Brit. Mus. Cat.,' p. 93.
Frondipora, Oken; De Blainville.

Three species.



28, *Retepora cellulosa.*

Family 12. *Selenariadæ*, Busk.

Polyzoary more or less regularly orbicular, convex on one side, plane or concave on the other (probably free). Furnished with large and powerful vibracula, with variously formed setæ (probably locomotive).

Selenariadæ, Busk; 'Brit. Mus. Cat.,' p. 97.

Gen. 1. *Cupularia*, Lamouroux.

(*Fig.* 18; vide also *figs.* in CELLARIÆA.)

Each cell throughout the polyzoary with a vibraculum at the summit.

Cupularia, Lamouroux (proposed); 'Brit. Mus. Cat.,' p. 97.
Lunulites, Lamouroux (pars); Defrance (pars); Deslongchamps (pars); Goldfuss (pars); De Blainville (pars); Gray; Cuvier and Brongniart; Lonsdale (pars); Michelin (pars).
Fenestella (pars), Lonsdale.

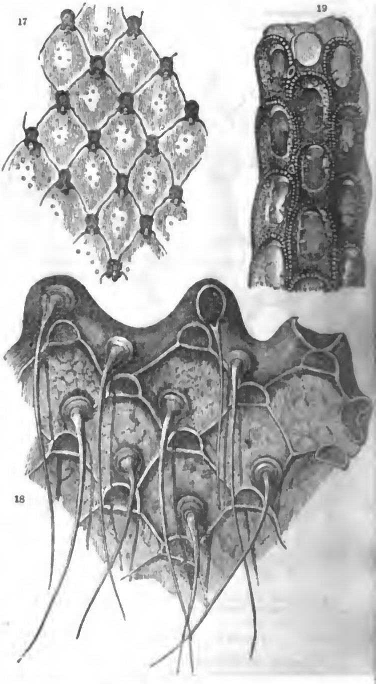
Five species (recent); numerous fossil.

Gen. 2. *Lunulites*, Lamouroux.

Cells arranged in series radiating from the centre and bifurcating as they advance; vibracula in linear series alternate with those of the cells.

As in the preceding species.

Four species (recent); numerous fossil.



17, *Eschara foliacea.* 18, *ria Lowei.* 19, *Vincularia ornata.*

Gen. 3. *Selenaria*, Busk.

Only a certain number of cells, dispersed at uniform dis-

tances apart, furnished with vibracula. The front of each cell furnished, covered by a cribriform calcareous expansion; the others arched above and contracted below.
Lunulites (pars), Busk, 'Voyage of Rattlesnake.'
Selenaria, 'Brit. Mus. Cat.,' p. 101.

Sub-Order II. *Cyclostomata.*

Cells tubular, calcareous, immersed or exserted; mouth terminal, without any moveable appendage or lip.
Tubuliporina, Milne-Edwards.
Tubuliporidæ, Johnston.
Auloporina (pars), Ehrenberg; Johnston.

A. Erectæ.

Polyzoary erect, free, simple or branched, linear or expanded above; branches articulated or continuous.

Family I. *Crisiadæ*, Milne-Edwards.

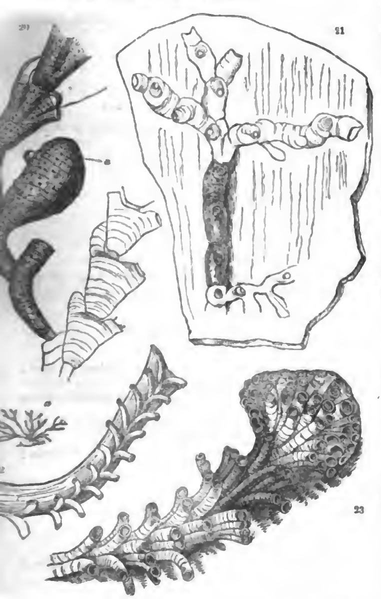
Polyzoarium divided into distinct internodes, connected by a horny substance.

Gen. 1. *Crisidia*, Milne-Edwards.

A single cell in each internode.
Sertularia (pars), Linn.; Berkeley (pars); Esper (pars).
Cellularia (pars), Pallas; Hogg.
Cellaria, Ellis and Solander (pars); Lamarck (pars).
Eucratea, Lamouroux (pars); Risso (pars); Fleming (pars); Templeton.
Unicellaria (pars), Blainville.
Crisidia, Milne-Edwards.
Crisia (pars), Johnston; Hassall (pars), &c.
One or two species.

Gen. 2. *Crisia*, Lamouroux. (*Fig.* 20.)

Two or more cells in each internode.
Syn. as above.
Three species recent; several fossil.



20, *Crisia bicellata*; *a*, ovicell. 21, *Alecto granulata*. 2, *Idmonea radians*; *a*, natural size. 23, *Tubulipora serpens*.

Family 2. *Idmoneadæ.*

Polyzoarium continuous throughout, usually polymorphous.

Gen. 1. *Idmonea*, Lamouroux. (*Fig.* 22.)

Openings of cells disposed in transverse or oblique alternate series on each side of the front of the branches of the polyzoary, on which is a raised line or ridge separating the rows of cells.
Retepora (sp.), Lamarck.
Hornera (sp.), Defrance.
Idmonea, Lamouroux; Blainville.
Three or four species recent; many fossil.

Gen. 2. *Pustulipora*, De Blainville. (*Fig.* 26.)

Openings of cells disposed irregularly, on all sides of the cylindrical or compressed branches or lobes of the polyzoary.
Ceriopora (pars), Goldfuss.
Idmonea (sp.), De Blainville.
Pustulipora, Blainville; Milne-Edwards; Johnston.
Tubulipora, (sp.), Couch.
Five or six species recent; many fossil.

Gen. 3. *Hornera*, Lamouroux.

Openings of cells disposed irregularly, or in more or less regular opposite transverse series, on one side only of the branches or lobes of the polyzoary.
Millepora (sp.), Esper.
Retepora (sp.), Lamarck.
Hornera, Lamouroux; De Blainville; Milne-Edwards.
Several species recent; many fossil.

B. Adnatæ, *s.* decumbentes.

Polyzoarium adnate or suberect above, decumbent and adnate below.

Family 3. *Tubuliporadæ.*

Polyzoarium divided into linear or sublinear branches or lobes, sometimes more expanded and lobate upwards, always decumbent, and closely adnate.

Gen. 1. *Alecto*, Lamouroux. (*Fig.* 21.)

Polyzoarium composed of a single or of multiple series of cells.
Alecto, Lamouroux; Milne-Edwards; Johnston (pars); De Blainville; Fleming.
Millepora (sp.), Linn.
Aulopora (sp.), Goldfuss, &c.
Three or four species recent; several fossil.

Gen. 2. *Tubulipora.* (*Fig.* 23.)

Polyzoarium arising from a contracted base, and expanding above; either simple or irregularly subdivided; decumbent and adherent below, usually free and suberect above.
Tubulipora, Milne-Edwards (pars); Johnston (pars); Fabricius; Turton; Gmelin; Couch (pars); Fleming (pars); Lamarck (sp.); Risso (sp.).
Tubipora (sp.), Linn.; Jameson; Stewart; Bosc.
Millepora (sp.), Ellis and Soland.
Cellepora (sp.), Esper.
Pherusa (?), Lamouroux, &c.
Five or six species recent; several fossil.

Family 4. *Discoporadæ.*

Polyzoarium in the form of a closely adnate, circular, or irregular disc or patch.
Tubuliporidæ (pars), Milne-Edwards, &c.

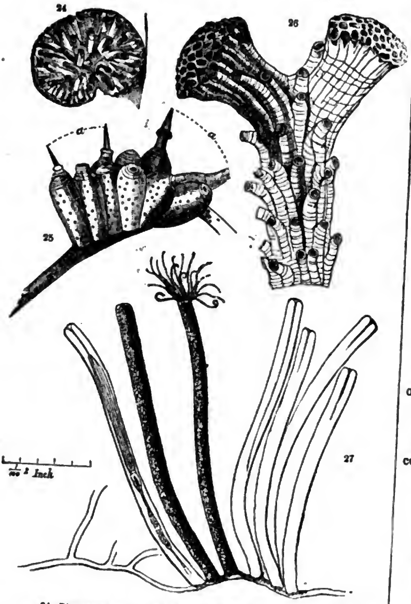
Gen. 1. *Discopora*, Lamarck.

Polyzoarium a circular disc, either flat, concave, or convex in the centre, with the suberect tubes opening irregularly in all parts of the surface, and usually surrounded by a thin calcareous border.
Discopora, Lamarck; Lamouroux; Fleming.
Tubulipora (pars), Johnston.
Melobesia, Audouin.
Obelia, Quoy and Gaimard.
Madrepora, Ellis and Solander; O. Fabricius.

Gen. 2. *Diastopora*, Lamouroux. (*Fig.* 24.)

Polyzoarium more or less depressed, circular, discoid; the cells subalternating, horizontal, immersed; openings elliptical.

Millepora (sp.), Esper.
Mesenteripora, De Blainville.
Diastopora, Milne-Edwards (pars); Johnston (sp.); Hagenow (pars).
Aulopora (sp.), Goldfuss.
Berenicea (sp.), Lamouroux.
Rosacilla, Römer.



24, *Diastopora* (sp.?); 25, *Serialaria lendigera*; *a*, oral setæ. 26, *Pustulipora*, (sp.?). 27, *Farrella prælonga.*

Gen. 3. *Defrancia*, Bronn.

Polyzoary either discoid and adnate throughout, or fungiform and attached by a short stem; openings of tubes disposed in lines or rows radiating from the centre.
Pelagia, Lamouroux.
Lichenopora, Michelin.
Tubulipora, Milne-Edwards (sp.); Johnston (sp.).
Ceriopora (auct., pars).
Defrancia, Bronn.; Hagenow; Renss.

Sub-Order III. *Ctenostomata*.

Cells corneous, or fleshy, tubular or depressed, free or coalescent; mouth terminal or subterminal, contractile, and when the polypide is exserted, surrounded with a fringe or row of setæ, connected by a delicate membrane.
Vesicularina, Johnston.
Polyzoa cornea, Gray, and including—
Halcyonellea, Johnston.
Polyzoa carnosa, Gray.
Alcyoniadæ and *Alcyonidulæ*, Johnston.

Family 1. *Vesiculariadæ*, Johnston.

Cells tubular or ovate, separate, arising from a basal tube common to all or to several; mouth terminal.
Vesiculariadæ, Johnston.

Gen. 1. *Serialaria*, Lamarck. (*Fig.* 25.)

Cells uniserial or biserial, and unilateral, placed in close sets at stated intervals; basal tube divided into internodes.
Serialaria, Lamarck; Risso; Fleming; Templeton; Couch; De Blainville.
Amathia, Lamouroux, &c.
Three or four species.

Gen. 2. *Vesicularia*, J. V. Thompson.

Cells ovate or subtubular, disjunct, uniserial, and unilateral; polypide with a gizzard.
Valkeria (sp.), Fleming.
Vesicularia, Thompson; Farre; Johnst.; Van Beneden; Couch.
One species.

Gen. 3. *Valkeria*, Fleming.

Cells ovate, clustered in whorls at the joints of the basal tube; polypides without a gizzard.
Valkeria, Johnston; Fleming; Farre; Van Beneden.
Vesicularia (sp.), Thompson.
Cuscutaria, De Blainville.

Gen. 4. *Bowerbankia*.

Cells unilateral, irregularly placed, sessile; polypides with a gizzard (armed with two teeth).
Bowerbankia, Farre; Johnston; Van Beneden.
One species.

Gen. 5. *Farrella*. (*Fig.* 27.)

Cells elliptical, scattered; polypide without a gizzard.
Farrella, Ehrenberg; Johnston.
Lagenella, Farre.
Laguncula, Van Beneden.
Two species.

Gen. 6. *Anguinella*, Van Beneden.

Cells tubular, supported on a common stalk, and branching out in a palmate fashion.
Anguinella, Van Beneden.

Family 2. *Alcyoniadæ*, Johnston.

Cells fleshy, immersed, angular; mouth terminal, simple, contractile.
Halcyonelleæ, Johnston.
Polyzoa carnosa, Gray.
Alcyoniadæ, Johnston.
Alcyonidulæ, Johnston.

Gen. 1. *Alcyonidium*, Lamouroux.

Polyzoary variously lobed, massive, fleshy, erect, or adnate.
Alcyonium, Ellis; Baxter; Pallas; Linn.; Olivi; Esper; Müller; Lamouroux; De Blainville; &c.
Alcyonidium, Lamouroux; Gray; Hooker; Johnston; W. Thompson; &c.
Halodactylus, Farre; Van Beneden.
Cycloum (sp.), Hassall.
Sarchochitum (?), Hassall.
Three or four species.

Sub-Order IV. *P. Pedicellinea*, Gervais.

Lophophore produced upwards on the back of the tentacles, uniting them at their base in a sort of muscular calyx.

Family 1. *Pedicellinidæ*, Johnston.

Gen. 1. *Pedicellina*, Sars.

Polypide not retractile within the delicate closely adnate ectocyst, which is produced downwards into a long tubular pedicle, containing muscular fibres, and rising vertically from a creeping radicle tube.
Hydra (sp.), Fleming; Bosc; Lister; Sharpey.
Pedicellina, Sars; Johnston; Van Beneden.
Lusia, Milne-Edwards; De Blainville; Gervais; Hassall.
Crinomorpha, Van Beneden.
Two or three species.
Sertularia (sp.), Müller; Bosc.; Lamarck.
Three species.

Order II. *Polyzoa hippocrepia*, Gervais.

Tentacles disposed on a crescentic or horse-shoe shaped lophophore; eversion of endocyst only partial.
Polypiaria hippocrepia, Gervais.
Polyzoa hippocrepia, Gray.
Lemniades, Johnston; Allman.

Freshwater *Polyzoa*, Allman.
Freshwater *Bryozoa*, Hancock.
Bryozoaires Fluviatiles, Van Beneden.

Family 1. *Cristatellidæ*, Allman.

Polyzoary free, locomotive.

Gen. 1. *Cristatella*, Cuvier.

Polyzoary sacciform, hyaline, with a common flattened disc adapted for locomotion; orifices placed on the surface opposite to the disc, and arranged in several concentric marginal series; ova lenticular, with annular and marginal spines.

One species.

Family 2. *Plumatellidæ*, Allman.

Polyzoary rooted.

A. Lophophore with two long arms.

Gen. 1. *Lophopus*, Dumortier.

Polyzoary sacciform, hyaline, with a disc which serves for attachment, but not for locomotion; orifices scattered; ectocyst gelatinous.

Polype à Panache, Trembley.
Bell-Flower-Animal, Baker.
Naisa, Lamouroux; Deslongchamps.
Plumatella (sp.), Schweigger; De Blainville; Gervais; Lamarck.
Alcyonella, Raspail; Johnston; Allman.
Lophopus, Van Beneden; Allman.

One species.

Gen. 2. *Alcyonella*, Lamarck.

Polyzoary tubular; tubes united by their sides; orifices terminal; ectocyst pergamentaceous.

Tubularia, Pallas.
Leucophra, Müller.
Alcyonium, Bruguière.
Spongia, Schmiedel.
Alcyonella, Raspail; Pallas (sp.); Allman, &c.
Plumatella, Gervais.

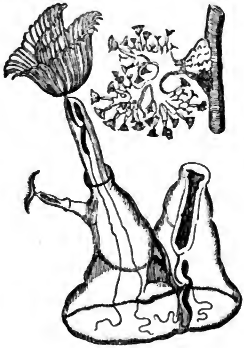
Three species.

Gen. 3. *Plumatella*, Lamarck. (*Fig.* 30.)

Polyzoary tubular; tubes distinct; ectocyst pergamentaceous.

Tubipora, Linnæus.
Tubularia, Müller; Linnæus; Vaucher; Turton.
Naisa, Lamouroux; Deslongchamps.
Plumatella, De Blainville; Carus; Lamarck; Dumortier; Johnston; Gervais; Allman; Thompson; Van Beneden; Dalzell; Schweigger; Risso, &c.

Ten species.



30, *Plumatella cristata.*

B. Lophophore with the arms obsolete.

Gen. 4. *Fredericella*, Gervais.

Polyzoary confervoid, composed of a membrano-corneous branched tube, with the branches distinct and terminated by the orifices; lophophore nearly circular, tentacular crown campanulate; ova bean-shaped, destitute of annulus or spines.

Tubularia, Blumenbach; Gmelin.
Naisa, Lamouroux.
Difflugia, Meyen.
Plumatella, Fleming; Dumortier; Johnston.
Fredericella, Gervais; Van Beneden; Thompson; Allman; Johnston; Hancock.

Family 3. *Paludicellidæ*.

Lophophore orbicular, mouth destitute of valve. (Does not perhaps properly belong to *P. hippocrepia*.)

Gen. 1. *Paludicella*, Gervais.

Polyzoary membrano-corneous, branched; branches composed of a series of claviform cells, placed end to end, and separated from one another by complete septa; orifices tubular, lateral, placed near the wider extremity of each cell; ova lenticular, with a narrow annulus.

Alcyonella (sp.), Ehrenberg; Nordmann.
Paludicella, Gervais; Van Beneden; Allman; Thompson; Johnston; Hancock.

POLYSTICHUM, a genus of Plants belonging to the natural order of *Filices*, the sub-order *Polypodiaceæ*, and the tribe *Aspideæ*. The indusium is circular, attached by the centre; the veins are distinct after leaving the midrib. There are three British species:—

P. Lonchitis, with rigid simply pinnate fronds. Found in Alpine rocks.

P. aculeatum, with linear rigid bipinnate fronds; the pinnules obliquely decurrent. Common in hedge banks.

P. angulare, with the fronds lax, drooping, bipinnate, pinnules truncate below, distinctly stalked. Found in the west of England, on sheltered banks.

(Babington, *Manual of British Botany;* Lindley and Moore, *The Ferns of Great Britain and Ireland*, nature-printed.)

POMPILIDÆ, a family of Fossorial Hymenopterous Insects. They are sometimes included with the *Sphegidæ*. They have the collar either transversely or longitudinally square, with the abdomen more or less oval, and attached to the thorax by a very short peduncle. The legs are very long. The fore wings have two or three perfect submarginal cells, and another commenced at the tip of the wings. The species are called Sand Wasps, and are amongst the most ferocious of the insect tribes. The species of the exotic genus *Pepsis* are amongst the largest of the *Hymenoptera*. The genus *Pompilus* is British. The species are very active, running amongst grass and other plants in hot sandy situations. They are quick in their motions, and their wings are constantly agitated. Their long legs give them the appearance of spiders. (Westwood, *Families of Insects*.)

PONERA (Latreille), a genus of Insects belonging to the family *Formicidæ*. In this genus the neuters and females are armed with a sting. The peduncle of the abdomen is formed of a single knot; antennæ in these individuals thickened at the tip; mandibles triangular; head subtriangular. *P. contracta* is a small species, a native of England.

POOL, or WELSHPOOL. [MONTGOMERYSHIRE.]

POONAHLITE. [MINERALOGY, *S.* 1.]

POOR LAWS. There have been several statutes making slight alterations and amendments in the details of the administration of these Laws, but none calling for particular mention, any analysis or enumeration of their provisions being impossible within the compass of this article.

Under the head of PAUPERISM ['Penny Cyclopædia,' vol. xvii. pp. 327-30], an account was given of the establishment of the new Poor Law in England in 1834, and of its early operation up to the year 1840. Since that time the number of Unions has been increased from 587 to 624, including 14,168 parishes in England and Wales, and leaving only 436 parishes which do not make returns to the General Poor Law Board. The new Poor Law had, on its introduction, effected a large reduction of the expenditure on the poor, but from 1839 a gradual increase took place for several years. In the former article it was shown that there was no connection between the amount of relief required by the poor and the price of corn. As the subsequent returns only confirm the same fact, we shall omit the price of wheat, and give the total amount levied for poor-rates in each year. The years end uniformly at Lady Day. The second column gives the total amount levied for poor-rates, the third the amount expended for the maintenance and relief of the poor.

Years.	£	£	Years.	£	£
1840	6,014,605	4,576,965	1849	7,674,146	5,792,963
1841	6,351,828	4,760,929	1850	7,270,493	5,395,022
1842	6,552,890	4,911,498	1851	6,778,914	4,962,704
1843	7,085,595	5,208,027	1852	6,552,298	4,897,685
1844	6,847,205	4,976,093	1853	6,522,412	4,939,064
1845	6,791,006	5,039,703	1854	6,973,220	5,282,853
1846	6,800,623	4,954,204	1855	7,864,149	5,890,041
1847	6,964,825	5,298,787	1856	8,201,348	6,004 244
1848	7,817,450	6,180,765	1857	8,139,003	5,898,756

In the years above mentioned we may observe that in 1852 the average price of wheat was 39*s.* 4*d.*; in 1840 it was 68*s.* 6*d.*; yet the amount of relief shows but a small difference. The number of persons relieved is an imperfect guide to the amount of distress, as it does not distinguish, except as regards in-door relief, between a single meal or assistance for a lengthened period, but we add a few statements of numbers at different periods. In the quarter ending Lady Day 1840, there were 169,232 persons relieved in workhouses, and 1,030,297 had out-door relief. The number continued to increase till 1843, when the number in the house was 238,560, and receiving out-door relief 1,300,930. The numbers then slowly decreased till 1847, when the in-door numbers mounted to 265,037, and the out-door to 1,456,313, increasing respectively in 1848 to 305,956 and 1,570,585. Until 1848 the quarter ending Lady Day was taken as representing the number of persons relieved in each year. Since then the numbers in receipt of relief on Jan. 1 and July 1, have been taken, being the periods of greatest and least distress. Thus, on Jan. 1, 1849, there were 131,591 persons in the house, and 855,573 receiving out-door relief; on July 1, there were only 102,641 in the house, and 783,096 receiving out-relief. The estimated total for the year, however, including 214,870 for places not included in the returns, was 1,043,886. In 1853 the number similarly calculated had sunk to 857,035. On Jan. 1, 1857, the total number of paupers in receipt of relief, in-door and out-door, in 624 unions and parishes of England and Wales, was 843,340, being a decrease from 1856, in the same number of unions, of 33,225, or 3·8 per cent. Of adult able-bodied paupers relieved, exclusive of vagrants, there were 139,130, a decrease of 13,044, or 8·6 per cent. Of the number relieved, 50,362 were widows, a decrease in the same class of 2291. Of the gross number of able-bodied paupers, 22,368 were in the receipt of in-door relief, a decrease of 1128 only, so that the chief decrease is in out-door relief. The greatest decrease took place in Bedford, Lancaster, Nottingham, Rutland, and Caernarvon, where it exceeded 20 per cent. In Kent, Hereford, Durham, Oxford, Sussex, and Worcester, there was an increase, as also in several of the Welsh counties. Of the in-door adult able-bodied there were 842 married men, 1007 married women, 5952 other males, and 14,567 other females. Of the out-door adult able-bodied, 83 males had been relieved in cases of sudden or urgent necessity; 17,210 males in cases of their own sickness or accident, 6835 males in cases of sickness or accident in their family, or for a funeral; 3784 males for want of work or other causes; 22,839 females were wives of adult males, 50,362 were widows, 5114 were single women without children, 2660 the mothers of illegitimate children; 2018 were wives relieved on account of the husband being in jail, &c.; 1268 were wives of soldiers, sailors, and marines; and 4389 were wives of other non-resident males.

The amount expended in the half year ending Lady Day 1857 for the relief of the poor was 1,979,885*l.*, of which 493,076*l.* was for in-door maintenance, and the remainder for out-door relief.

IRELAND. In consequence of the distress occasioned by the potato rot and bad harvests in previous years, it was considered necessary to provide a poor-law for Ireland. Accordingly, in 1838, an Act (1 & 2 Vict., cap. 56), mainly founded on the reports and recommendations of Mr. (now Sir George) Nicholls, was passed. In its main features it resembled the English poor-law, but the workhouse as a test of need was more stringently enforced. Mr. Nicholls was appointed chief commissioner, and under his direction it came into operation in 1839. The unions were formed gradually, and the expense of erecting workhouses was so great, that loans to a large amount were granted for that purpose by government, a considerable portion of which was subsequently remitted. In 1840 there were but four unions in operation, North and South Dublin, Cork and Londonderry, and on Dec. 31, there were in them 5468 inmates, 10,910 had been relieved in the year, and the expenditure had been 37,057*l.* On Dec. 31, 1841, there were 37 unions in operation, and there had been relieved 31,108 destitute persons, and 15,246 were then in the workhouses; the expense having been 110,277*l.* On Dec. 31, 1842, there were 31,572 inmates in 92 union workhouses, 87,604 persons had been relieved, and the expense had been 281,233*l.* On Dec. 31, 1843, there were 33,510 inmates in 106 workhouses, 87,898 persons had been relieved, and the expense had been 244,374*l.* On Dec. 31, 1844, there were 39,175 inmates in 113 workhouses, 105,358 persons had been relieved, and the expense had been 269,530*l.* In 1845 another period of distress occurred through the failure of the potato, and the number of the destitute continued to increase. On Dec. 31, 1845, there were 42,068 inmates in 123 workhouses (in March 1845 there had been 50,717), 114,205 persons had been relieved, and the expense amounted to 316,026*l.* In 1846 the potato-rot continued, and the distress increased to such an extent that the government was forced to intervene for its relief by providing public works to employ the able-bodied, by reducing the duty on the import of corn, and by furnishing food at a low price to the destitute poor, in which last act it was aided by a general subscription, which amounted to 98,000*l.*, the whole sum contributed amounting to 831,372*l.* The greatest number of persons employed at one time on public works was 97,000. On Dec. 31, 1846, in 130 workhouses there were 94,437 inmates, 243,933 persons had been relieved, and the expense had been 435,001*l.* But the evils arising from the continued failure of the potato continued to operate. Food was scarce, and the public works, instead of alleviating the distress, seemed likely to increase it. Agriculture was abandoned for the 'government work,' the fisheries were deserted, and even artisans left their trades. In October 1846 there were 114,000 men employed; in January 1847 the number had increased to 570,000; and in March to 734,000. It was evident a change of system must be adopted. Exertions were made to apply again the workhouse test, and the number rapidly fell, in April to 520,000, in May to 419,000, in June to 101,000, on the 26th of which month it was reduced to 28,000, and in August the system was discontinued. Cooked food had also been supplied, and in July 1847, 3,020,712 persons received separate rations. The entire amount advanced by government in 1846 and 1847 had been 7,132,268*l.*, and the amount subscribed had been upwards of half a million. It was in these years that the large amount of emigration took place. On Sept. 21, 1847 (the date of making up the accounts had been altered), the number of workhouse inmates was 86,376, and the total number relieved in the house had been 417,139; but the houses were crowded, and the mortality had been great; the expenditure during the year had been 803,684*l.* The harvest of 1847 proved a good one, and the pressure upon the public funds decreased, but not upon the workhouse relief. On Sept. 29, 1848, there were 124,003 inmates in 131 workhouses, 610,463 had been relieved in the house during the year, and 207,683 persons were then receiving out-door relief, while 1,433,042 had received out-door relief in the course of the year; the total expense had been 1,732,597*l.* On Sept. 29, 1849, there were 141,030 inmates, 932,284 had been in the house, and 1,210,482 had been relieved out of the house during the year, the total expense being 2,177,651*l.* On Sept. 29, 1850, the number of unions had been increased to 163, the total number relieved in the house during the year was 805,702, out of the house 368,565, and the expenditure was 1,430,108*l.* On Sept. 29, 1851, the number relieved in the house during the year was 707,443, out of the house 47,914, and the expenditure was 1,141,647*l.* On Sept. 29, 1852, the number relieved in the house during the year was 504,864, out of the house 14,911, and the expenditure was 883,267*l.* On Sept. 29, 1853, the number in the house during the year was 396,436, out of the house 13,232, and the expenditure was 785,718. By the 10 & 11 Vict., cap. 31, 1847, permission had been given to guardians of unions to hire or purchase limited quantities of land, to be occupied as agricultural schools for pauper children. These had gradually been instituted, and in Sept. 1853 the total number of boys in the workhouses of Ireland, between the ages of 9 and 15, was 12,320; of girls, between the same ages, 14,273; of these, 3,873 boys were employed in agricultural labours on land attached to the unions, amounting to 1,506 acres, of which 1,070 were under crop, wholly or partially cultivated by boys; and 3,196 were receiving instruction in trades. Of the girls, 9,166 were receiving industrial education of various kinds. 2,940 boys and 2,425 girls, under fifteen, had obtained employment, during the year 1852, out of the workhouse. On Sept. 29, 1854, the total number of persons receiving in-door relief during the year had been 318,320, out-door 7954, the total expenditure being 746,407*l.* On Sept. 29, 1855, the number relieved in the house during the year had been 269,800, out of the house 35,342, total expenditure 683,596*l.* On the first Saturday of January, 1857, in the 163 unions of Ireland, there were 55,183 persons receiving in-door relief, and 911 out-door relief, showing a total decrease of 16,989 persons—23·3 per cent.—from the Return of the same date in 1856. Less than a third of the workhouse accommodation was in use, provision having been made for 199,667, which is itself a reduction of the provision for previous years. The poor-rate collected in the year ending September 29, 1856, amounted to 723,797*l.*, of which 76,160*l.* were expended for Poor Law purposes, being a decrease on the preceding year of 109.099*l.* For medical charities 89,899*l.* were paid, and 4436*l.* on account of annuities. In the week ending Saturday, January 2, 1857, the amount of out-relief paid throughout Ireland was 44*l.*; in the year ending Sept. 29, 1856, it was 2198*l.*, while emigration expenses amounted to 4170*l.*

In Scotland there had been no effective legal provision for the poor. As early as 1579 power was given to magistrates in burghs and justices in the country, a power afterwards transferred to the heritors and kirk sessions of parishes, to assess the parish for the support of the poor; but no assessment was made under this act for a century after its passing, and when it became necessary in some few parishes it was confined to them alone. Other acts were passed for preventing begging, for providing houses of correction for vagrants, for compelling each parish to maintain its own poor, and for providing work for the able-bodied. But, as a general practice, the wants of the infirm, sick, and impotent poor were relieved by the voluntary contributions received at the kirk, and distributed by the kirk sessions, usually in the form of assistance to the relatives or connections of the destitute persons who undertook their support. This system did not work badly in country districts, except in periods of extreme and general distress. But when, by the extension of manufactures and commerce, the towns increased largely in size, and an influx of strangers took place to them, the necessity of a more perfect system was very shortly felt. This had been experienced in Glasgow, Paisley, and Dundee on various occasions, but temporary expedients and increased voluntary contributions had been the only resort. In 1840, 1841, and 1842, however, the distress in Paisley could not be thus relieved, although it had been in less severe trials in 1819, 1827, and 1837. At the census of 1841 the population of Paisley amounted to 48,416; in January, 1842, the number of persons depending on the relief fund was 12,703, and in the following June it was still 10,417. The inhabitants at a public meeting, agreed to a voluntary assessment of 15 per cent. on their parochial rating, and this produced 574*l.*, only 473 of the rate-payers contributing. Extraneous aid was sought, and subscriptions to the amount of 25,000*l.* were obtained, a trifling alleviation of a suffering that the relief committee described as frightful. The law and the practice had always been in Scotland to refuse relief to able-bodied adults, consequently the unfortunate artisan, deprived of his employment by the commercial difficulties occurring between 1838 and 1843, was not considered as belonging to the class receiving relief from the kirk sessions. The number of this class during the year ending June 1842 had been 700, and the expenditure on them had been 3682*l.*, neither the number nor the amount varying much from the usual average.

In 1843 a government commission was appointed to inquire into the state of pauperism and the mode of managing the poor in Scotland. They reported that the parishes in most large towns had been forced to resort to assessment, but that it was generally disliked, and that the modes of assessment were so various in different places that it was difficult to make one that should be strictly legal. Here and there they found a poor-house of very inadequate accommodation, and the system was almost uniformly one of out-door relief. The report recommended a legislative enactment for a regular system of poor-laws, and accordingly in 1845 the 8 & 9 Vict. c. 83 was passed. It constituted parochial boards of management elected by the rate-payers, a board of supervision; gave the power of levying assessments; the option of combining parishes for the erection of poor-houses; made a more certain provision for relief of the lunatic, casual, and unsettled poor, for medical relief, and for purposes of education; but it still leaves the able-bodied adult without a legal claim on parochial assistance. Each parish is allowed to decide whether the requisite sum for the relief of the poor shall be raised by voluntary contribution or assessment, and if by assessment, how certain properties shall be classed; but having once decided in favour of assessment, they cannot retract such decision without the consent of the board of supervision. The voluntary system had been the custom, and out of 880 parishes in Scotland, only 230 were legally assessed in 1842-43; these have been gradually increased, so that now (1858) there are but few in which a legal assessment has not taken place. Although the Act was brought into immediate operation, it was some time before the registers and accounts could be reduced into proper forms. Officers and inspectors were alike inexperienced. But according to the best returns the commissioners could obtain from the several parishes, the expenditure for the year ending February 1, 1845, was 258,815*l.* From the returns made in 1843 it appeared that from all sources there was raised for the relief of the poor in 1836 the sum of 171,042*l.*, and 218,481*l.* in 1841; the amount having gradually increased in every intervening year. The number of poor in those years is not stated, but on February 1, 1845, there were 63,070 on the poor roll. In the year ending February 1, 1846, there had been raised 306,044*l.*, of which 295,232*l.* were expended in poor relief. In the autumn of 1846 the potato rot visited Scotland, and again in 1847, creating a vast amount of distress, particularly in the Western Highlands and Islands of Scotland. Government aid was offered, and poor-houses and medical relief were strongly recommended, and in most instances adopted, particularly that of medical relief. For the few following years we present the progress in the annexed table. The years end on the 14th of May.

	Registered poor.	Casual poor.	Medical relief.	Poorhouse buildings	Other expenses.	Total.
	£	£	£	£	£	£
1847	336,515	36,340	12,879		48,181	433,915
1848	401,886	53,384	30,340	10,971	47,753	544,334
1849	417,463	51,470	33,011	14,776	60,324	577,044
1850	414,680	31,557	26,574	42,815	65,927	581,553
1851	404,219	25,918	20,311	21,576	63,920	535,944
1852	401,954	25,987	21,436	21,186	65,305	535,868
1853	411,135	24,114	21,737	21,645	65,921	544,552

During these years the highest number of the poor on the register was 82,357 in 1849, the lowest 69,432 in 1846; the greatest number of casual poor relieved was 126,684 in 1848, the lowest 46,031 in 1852. The number of insane or fatuous poor average about 3500; and the number of orphans or deserted children have increased from 4794 in 1847 to 8328 in 1853. The figures for the succeeding years vary little in their details, showing chiefly an increase as the system extends, and we therefore give only the latest published. In the year ending May 14, 1857, the total amount expended in poor-law relief was 629,348*l.*, including 27,277*l.* on buildings, on medical relief 61,553*l.*, on law charges 27,277*l.*, and on management, 7399*l.* The number of registered poor who received relief in the year ending May 14, 1857, was 88,622, a decrease of 10,740 from the previous year; and the casual poor receiving relief amounted to 36,545. The number of poor-houses in 1856 numbered 30, belonging to 120 parishes, either singly or in combination, affording accommodation for 10,443 inmates, and 16 others were in course of erection. The number of registered poor on the 14th of May, 1857, was 69,217. (*History of the Poor Laws. By Sir George Nicholls.*)

POPINJAY (*Picus viridis*). [Woodpeckers.]

POPULIN. [Chemistry, *S.* 1.]

POPULUS. [Salicaceæ.]

PORLOCK. [Somersetshire.]

PORPHYROXINE. [Chemistry, *S.* 2.]

PORPIONE. [Chemistry, *S.* 2.]

PORPOISE, or **PORPESSE**. [Whales.]

PORT HOPE. [Canada, *S.* 2.]

PORT LINCOLN. [South Australia, *S.* 1.]

PORT NATAL. [Natal, *S.* 2.]

PORT PHILLIP. [Victoria, *S.* 2.]

PORTER, ANNA MARIA, born at Durham about 1781, was the youngest child of a family all of whom attained considerable celebrity. Her eldest brother was an eminent physician at Bristol; another brother was Sir R. K. Porter; and her eldest sister was Jane, the subject of the following notice. When only a few months old her father died, and the mother, for the sake of educating her children economically, removed to Edinburgh. Anna Maria was the most precocious; and as a lively and intelligent child attracted the notice of Sir Walter Scott, then a youth, who delighted in relating tales to her, and this probably led to her own early attempts in the same line. While still almost a child she had written 'Artless Tales' in two volumes, which were issued in 1793 and 1795, of which she afterwards regretted the publication. Her mother had before this time removed with her family to London, and subsequently, with her sister Jane, they settled first at Thames Ditton, and finally at Esher. After the death of her mother in 1831, while travelling in hopes of restoring her delicate health, she was attacked by typhus fever, and died on June 21, 1832, at the seat of Mrs. Colonel Booth, Montpelier, near Bristol. Besides many contributions to periodical works, she had published numerous novels, among which 'The Hungarian Brothers,' 'Don Sebastian,' 'The Recluse of Norway,' 'The Village of Mariendorpt,' 'The Fast of St. Magdalen,' and 'The Knight of St. John,' enjoyed and retain considerable popularity. They belong, more or less, to the class of historical novels, and show skill in the management of the story, and some discrimination of character; but her heroes and heroines too often possess a superhuman excellence that becomes palling. 'Tales of Pity,' were published anonymously, and are intended to inculcate kindness to animals. In 'The Barony' she has developed her religious feelings. She also published a volume of poetry, 'Ballad Romances and other Poems,' in 1811, of no great value.

PORTER, JANE, the elder sister of the preceding, was born in 1776. Her life followed that of her sister, with whom and her mother she constantly resided till their deaths. She then, as she described herself, "became a wanderer," living with one or other of her friends till, in 1842, she went with her brother to St. Petersburg. On his death she returned to England, and resided with her eldest brother, the physician at Bristol, where she died May, 24, 1850. Miss Jane Porter did not adventure into the field of literature so early as her sister, and in some respects came better prepared, but she has the same fault in the unmitigated excellence or depravity of her characters. Still, in many of her characters there is a firmer delineation, and perhaps somewhat greater knowledge, though not very rigidly adhered to, of the manners of the times of which she treats. Her first work was 'Thaddeus of Warsaw,' published in 1803, which was extremely popular, and procured for her the admission as a canoness into the Teutonic order of St. Joachim, and a complimentary letter from Kosciusko. In 1809 she published the 'Scottish Chiefs,' a romance of Wallace and Bruce, in which there is considerable vigour of description, some character, but a total misconception of the condition of the time. Wallace and Bruce are depicted as little less than demigods. To these followed the 'Pastor's Fireside' and 'Duke Christian of Luneburgh,' the latter said to have been suggested by George the Fourth. She next joined with her sister in 'Tales round a Winter's Hearth,' and these were succeeded by 'The Field of Forty Footsteps,' founded on a London tradition connected with the spot where now stands University College and Hospital, and which was almost immediately dramatised. After a considerable interval, during which she contributed largely to periodical works, among other things a biography of Colonel Denham, the African traveller, in the 'Naval and Military Journal,' she published anonymously in 1831 'Sir Edward Seaward's Diary,' in which she so successfully imitated the style and adhered so closely to the manners and history of the period, that it was for a considerable time doubted whether or not it was a fiction. This was her last work.

PORTER, GEORGE RICHARDSON, was born in London in 1792. He was educated at Merchant Taylors' school, where he became intimate with the Ricardo family, and subsequently married the sister of David Ricardo. His father, a merchant in London, designed him for his own profession, and he became a sugar-broker. He was unsuccessful in trade; but his commercial knowledge was made available for literary objects. In 1830 he published a work, 'On the Cultivation of the Sugar-Cane.' A paper on 'Life Assurance' was published in the 'Companion to the Almanac for 1831.' In the same year 'A Treatise on the Origin, Progressive Improvement, and Present State of the Silk Manufacture,' was issued in a volume of Lardner's 'Cabinet Cyclopædia,' for which series, in 1842, he wrote a similar treatise 'On the Manufacture of Porcelain and Glass.' His paper in the 'Companion to the Almanac,' of which Mr. Charles Knight was the projector and editor, led to Mr. Porter's official appointment in the Board of Trade. In an article in the 'Gentleman's Magazine,' for October 1852, the circumstance is thus correctly stated:—"Mr. Knight was written to by the late Lord Auckland, then president of the Board of Trade, requesting that he would wait on that minister at his office at his earliest convenience, and was asked at the interview whether he would undertake the task of arranging and digesting for the board the mass of information contained in blue books and parliamentary returns; in short, if he would do for the Board of Trade what Mr. Porter has since done so well, and what Mr. Fonblanque continues to do for the same office, with the same accuracy and success. Mr. Knight hesitated. The engagement, should he accept it, must necessarily interfere in a great measure with his business as a publisher. In this dilemma, he consulted a distinguished friend, and by that friend was advised to wait on Lord Auckland, and decline the office. This he did; and at Lord Auckland's request, he named Mr. Porter, to whom the office was given."

The first appointment of Mr. Porter at the Board of Trade took place in 1832. It was an experimental appointment at a small salary. When the statistical department of the Board of Trade was fully organised, Mr. Porter was placed at its head. In 1840 he was appointed in addition, senior member of the railway department of the board, then newly constituted to meet the growing increase of projects in that direction. His able reports, which were laid before parliament, were of the utmost value, and were properly appreciated by official men and by the public. For his labours in this department he had an additional salary of 200*l.* a-year. On the retirement of Mr. McGregor, as one of the secretaries of the Board of Trade, in 1841, Mr. Porter was appointed to succeed him, at the salary of 1500*l.* a-year. His labours in all these positions were increasing and successful. He had a genius for tabulating the most incongruous materials, and he formed the model, which he was always improving, of the returns which are now periodically issued from the Board of Trade with so much advantage to the commerce of the country. But his active mind was not confined to his official duties. In 1833 he published 'The Tropical Agriculturist.' In 1834 he exerted himself in the founding of the Statistical Society, of which he was for a considerable time one of the vice-presidents, and on the resignation of Mr. Hallam in 1841, he was chosen treasurer. To the 'Journal' of the Society he was a frequent contributor. In 1836 he published 'The Progress of the Nation, in its social and commercial relations, from the beginning of the Nineteenth Century to the Present Time. Sections I. and II., Population and Production.' Sections III. and IV., 'Interchange, and Revenue and Expenditure,' followed in 1838; and the work was completed in 3 vols. 12mo, by Sections V. to VIII., including 'Consumption, Accumulation, Moral Progress, Colonial and Foreign Dependencies.' This valuable work necessarily admits of constant correction and new matter, and other editions were issued each in a large 8vo volume, in 1847 and 1851. The mass of information clearly set forth in this work presents the best and most complete picture of the progress and state of the country for the period of which it treats. On the establishment of the British Association for the Advancement of Science, he became one of its most active members, always attended its annual meetings, and usually read a paper to the statistical section. Mr. Porter had been ever a firm and unwavering advocate of the doctrines of free-trade, and in 1849 he published a translation, with notes, of F. Bassiat's 'Popular Fallacies regarding General Interests,' in 16mo. In the same year he wrote the Fifteenth Section of the 'Admiralty Manual of Scientific Inquiry,' edited by Sir J. F. Herschel, which was subsequently published alone in 1851. In 1850, in conjunction with Mr. George Long, he wrote the 'Geography of Great Britain. Part I., England and Wales,' published by the Society for the Diffusion of Useful Knowledge. This was his last unofficial labour. Sedentary pursuits had induced a bad habit of body, and the sting of a gnat produced inflammation of the leg, from the consequences of which he died on September 3, 1855, at Tonbridge Wells, whither he had gone in hopes of relief.

PORTSEA. [PORTSMOUTH.]

PORTUGAL. The political divisions of the Kingdom of Portugal, with the area and population of each, are as follows :—

Provinces.	Districts.	Area in Square Miles.	Population in 1851.
Alemtejo	Portalegre	2,382	86,175
	Evora	2,609	88,617
	Beja	4,991	123,107
		9,982	297,899
Algarve	Faro	2,140	143,851
Beira — Beira Alta	Viseu	1,291	302,070
Beira — Beira Baixa	Guarda	2,128	206,736
	Castello Branco	2,474	139,042
Beira — Douro	Porto	1,087	369,583
	Aveiro	1,458	247,103
	Coimbra	1,327	261,856
		9,765	1,526,390
Entre Douro e Minho	Viana	954	184,359
	Braga	1,086	297,969
		2,040	482,328
Estremadura	Leiria	1,312	140,114
	Santarem	2,315	161,342
	Lisbon	3,615	423,705
		7,242	725,161
Tras os Montes	Bragança	2,374	126,617
	Villa Real	1,646	184,779
		4,020	311,396
Total		35,189	3,487,025

In addition to the above political divisions, each of the sub-provinces or districts is subdivided into comarcas (or judiciary divisions), cancelhos (or communal divisions), and parishes. The total number of comarcas is 111; of cancelhos, 379; of parishes, 3774.

PORTUMNA, Galway, Ireland, a market-town and the seat of a Poor-Law Union, is situated at the head of Lough Derg, in 53° 6′ N. lat., 8° 12′ W. long., 41 miles E.S.E. from Galway, and 94 miles W.S.W. from Dublin. The population in 1851 was 1542, besides 147 in the Union workhouse. Portumna Poor-Law Union comprises 15 electoral divisions, with an area of 77,046 acres, and a population in 1841 of 30,714; in 1851 of 19,731. The town has been much improved by the increased trade of the Shannon. It contains the parish church, a handsome structure in the perpendicular style; a large Roman Catholic chapel; a dispensary; Union workhouse; and bridewell. The Shannon is here crossed by a causeway and wooden bridge 820 feet in length. Quarter and petty sessions are held in the town. Saturday is the market-day; fairs are held six times a year. Portumna Castle, a fine baronial mansion, the seat of the Marquis of Clanricarde, was destroyed by fire in 1826.

POST OFFICE. In the 'Penny Cyclopædia,' vol. xviii. p. 453, there was given under this head an account of the Post-office up to and inclusive of the improvements introduced by Mr. Rowland Hill. All that remains is to notice what has been done in the way of extension of the advantages derived from rapid and cheap intercommunication, and a few figures to show the enormous increase which has taken place. In 1838, as stated in the previous article, the total number of documents transmitted by post, including franks, public statutes, and newspapers (of which there were 44,500,000), was 126,423,836. In 1839 the new system was introduced, but 1840 was the first entire year of the penny postage, but then letters might be paid, or stamped, or were charged double. In that year 191,931,365 of letters only passed through the post-offices of the United Kingdom. The revenue derived from the post-office had been 1,649,088*l.* in 1839; in 1840 it only amounted to 495,514*l.* In 1845 the number of letters had reached 329,161,811, and the revenue 760,588*l.* The number of letters and the amount of net revenue continued to increase rapidly. In 1848 the additional advantage was given of a book-post, by which single books could be sent, open at the ends, at an uniform rate of 6*d.* per pound. This privilege was gradually extended to the British Colonies. In 1855 the rate of postage for printed sheets was reduced to one penny for a quarter of a pound, twopence for half a pound, and twopence extra for each fraction above half a pound; but if fourpence or upwards were paid, the packet might contain any number of sheets written or printed, except that the writing must not be of the nature of a letter. The last regulation in 1857 is that the packet may contain, in every case, any number of sheets, written or printed, but the written matter must not be of the nature of a letter, and may consist of bound books, or maps or prints on rollers, or whatever is necessary to the safe transmission of literary or artistic matter, such packets, however, not to exceed two feet in length, depth, or width, and all must be open at the ends or sides. Such packets may also be sent to all the British Colonies at the rate of 3*d.* for 4 oz., 6*d.* for 8 oz., and then proceeding at the rate of 6*d.* for every 8 oz., or portion thereof, except to Ascension Island, the East Indies, Hong Kong, Australia, New Zealand, and the Gold Coast, to all of which the rates are one-third more, and the weight is restricted to three pounds. By various conventions the foreign postage of letters has been materially reduced, in some cases 50 per cent., and in others varying from 17 to 20 per cent. The rates to all the British Colonies were in 1857 reduced to an uniform rate of 6*d.* per half ounce, payable in advance.

The fourth annual return of the Post-Office for 1857 states that the total number of letters delivered in the year was 504,421,000, of which 410,003,000 were in England and Wales, 42,806,000 in Ireland, and 51,612,000 in Scotland. These numbers give an average, in England, of 21 letters for each person of the population (in London it amounts to 43 for each), in Ireland to 7 for each, and in Scotland to 16 for each person. The number of newspapers passing through the Post-Office was 71,000,000, about three-fourths of which bore the newspaper stamp. The number of book-packets was about 6,000,000. There were 580,000 newspapers, and 1,700,000 letters that from various causes could not be delivered, chiefly from illegible or erroneous directions. The gross revenue was 2,928,858*l.*; the cost of management 1,720,815*l.*; the net revenue 1,322,237*l.* The cost of management includes the following items:—Salaries, pensions, &c., 948,573*l.*; buildings, 29,367*l.*; conveyance of mails by railways, 420,000*l.*; by coaches, carts, &c., and wages of mail-guards, 165,000*l.*; by mail-packets (when paid for by the Post-Office) and private ships, 12,298*l.*; for manufacture of postage-stamps, 28,566*l.*; miscellaneous, including conveyance of mails in the Colonies, under the postal direction of the postmaster-general, the conveyance of the mails through Egypt, clothing for letter-carriers and guards, rents, taxes, law expenses, &c., 109,672*l.*

The business of the Money-order Office has also greatly increased; and, while it affords great advantages to the public in the transmission of small sums, has become a source of profit to the establishment. In 1857 the total number of money-orders issued in the United Kingdom was 6,389,702, to the amount of 12,180,272*l.*, an increase of 3½ per cent. over 1856. Of the total number 5,417,203 orders, to the amount of 10,410,863*l.*, were issued in England; 459,625, to the amount of 818,537*l.*, in Ireland; and 512,874, to the amount of 950,872*l.*, in Scotland. The commission gave a profit, after deducting expenses, in England, of 23,613*l.*, and in Scotland of 1180*l.*; in Ireland there was a loss of 618*l.* The number of orders gives an average of 1 for every 4 persons in England, for every 6 in Scotland, and for every 14 in Ireland. Money-order offices have also been established at Malta and Gibraltar.

In 1855 some important improvements in matters of detail were introduced with great success. Country letters to London, or passing through London, were either sorted at the provincial offices or during their transmission, and this expedited the morning delivery in London by nearly an hour. Pillar letter-boxes were also erected in London, Edinburgh, Dublin; they have been since extended to most considerable places in the United Kingdom, and of these there are now 703. London was also divided into 10 districts, each having a district head-office, by which letters posted in a district for a neighbouring place, are spared the loss of time incurred by transmission to the chief office, and thus a more speedy delivery is attained; and this division also greatly facilitates the sorting of inland letters; but to effect this the initial letters of East Central, West Central, North, East, South, West, North East, North West, South East, and South West, must be distinctly placed at the end of the direction after 'London.' A book, price one penny, has been published, distinguishing all the streets and places within the different districts.

Nearly every town of any size throughout the three kingdoms has at least two deliveries a day from and to its metropolis and the larger provincial towns. In 1856 there were 52 such towns added to the list; for instance, in 1858 Manchester has four mail communications daily with London, Birmingham, Oldham, Bradford, Ashton-under-Lyne, Halifax, Sheffield, Wakefield, and Cheetham; seven with Liverpool; and five with Leeds, Stockport, Rochdale, and Bolton; twenty-nine mails are despatched from, and the same number received at, the Manchester post office every day. In 1856 the mails within the United Kingdom were conveyed daily over 129,480 miles of way; of this 30,172 miles are by railway at an average rate of 9¼*d.* a mile; 32,997 by coaches, mail-carts, &c., at an average of 2⅓*d.* a mile; 63,432 by carriers on foot, at an average rate of 1¼*d.* a mile; and 2879 miles by packets and boats between different places in the United Kingdom, at rates varying from 5*s.* 6¼*d.* a mile to ⅛*d.*

The total number of persons engaged in the service of the Post-Office for the United Kingdom was 23,731 on December 31, 1857, including 1 postmaster-general; 5 secretaries, assistant secretaries, and secretaries for Ireland and Scotland; 15 surveyors; 19 other superior officers, such as heads of departments, chief clerks in the Metropolitan offices, &c.; 11,101 postmasters; 1610 clerks (exclusive of some employed temporarily); 204 guards; 10,427 letter-carriers, messengers, &c.; 8 marine officers; 125 postmasters, clerks, &c., in the Colonies; and 51 agents in foreign countries. Of this number about 2000 are attached to the London staff, and (including this number) about 3200 are employed in the London district.

The third annual report of the postmaster-general for 1856, in an Appendix, states that "in no part of the United Kingdom has more been done for the welfare of the people by the use of railways for carrying mails and by the penny postage system than in Ireland." In 1784 there were posts six days a week on only four lines of road; letters to all other places being conveyed only twice or thrice a week. Now there are daily posts to almost every village, and but one important town that has not two daily mails both with London and Dublin. In 1784 the whole expense of the office in Ireland was 15,000*l.*, including salaries of provincial postmasters and the conveyance of mails. Out of this, 5500*l.* only was allotted to the provinces; the sum now (1856) allotted for the like service is 134,000*l.*, divided thus:—conveyance of mails by railways, 65,505*l.*; by coaches and cars, 27,168*l.*; by foot-messengers, 10,334*l.*; and salaries and wages paid in provincial offices, 31,122*l.* In 1829 the cost of conveying the mail by mail-coaches was nearly four times the average rate of England; this excess has now disappeared, and in 1856 the average rate per mile was for England 2⅓*d.*, for Scotland 3*d.*, and for Ireland 2*d.*

The same paper pays the following just tribute to the exertions of Mr. Bianconi for the improvement of intercommunication in Ireland, particularly in reference to the transmission of letters:—

"In 1815, Mr. Bianconi first carried his Majesty's mails in Ireland; but he did so for many years without any contract. He commenced in the county Tipperary, between Clonmel and Cahir; and he then made his own bargain with the postmaster, as he did for many subsequent years. The postmaster usually retained one moiety of the sum allowed, as his own perquisite, and Mr. Bianconi performed the work for the remainder. What Mr. Bianconi received was thus very small; and he could not and would not therefore run at any hours inconvenient to his passenger traffic, or faster than was convenient to him. From 1830, when the English and Irish offices were amalgamated under the Duke of Richmond, the public, as Mr. Bianconi says, got something like fair play; and he and others were allowed to carry the mails by direct contract with the Post-Office. From that time till 1848 Mr. Bianconi continued to increase his establishment; and in the latter year he had 1,400 horses, and daily covered 3,800 miles. The opening of railways has, however, so greatly interfered with this traffic, as to expel his cars from all the main lines. But Mr. Bianconi has met the changes of the times in a resolute spirit. He has always been ready at a moment's notice to move his horses, cars, and men to any district, however remote, where any chance of business might show itself; and now, in the winter of 1856-57, when nearly the whole of that district in which he was working ten years since has been occupied by railways, he still daily covers 2250 miles, and is the owner of about 1000 horses; working in the four provinces, from the town of Wexford in the south-east, to the mountains of Donegal in the north-west. Mr. Bianconi has done the State good service. By birth he is, as is well known, an Italian, but he is now naturalised, and England, as well as Ireland, should be ready to acknowledge his merits. It may perhaps be said that no living man has worked more than he has for the benefit of the sister kingdom."

The amount of postage collected at different towns in the United Kingdom (including the postage-stamps sold by the Post-Office and by the Board of Inland Revenue) shows some curious results. London, of course, through which passes nearly one-half of the total correspondence of the kingdom, attains a great predominance, the amount in 1857 being 833,952*l.*; Liverpool, with 255,000 inhabitants, contributes 104,865*l.*; while Manchester, with 316,000 inhabitants, only contributes 89,765*l.*; and Birmingham, with 232,000 inhabitants, but 42,107*l.* Bristol, with about 100,000 inhabitants (including Bedminster), furnishes 31,264*l.*; and Leeds with 172,000 inhabitants, only 23,844*l.*; and Sheffield, with 135,000 inhabitants, no more than 16,565*l.* In Ireland the contributions are more in accordance with the size of the towns:—Dublin contributes 60,391*l.*; Belfast, 15,547*l.*; Cork, 11,915*l.*; and Limerick, 7115*l.* In Scotland:—Edinburgh, with 160,000 inhabitants, contributes 59,177*l.*; and Glasgow, with 358,000 inhabitants, only 68,877*l.* It must be recollected, however, that in many cases some towns are used as a sort of depôt, from whence postage-stamps are distributed over a wider district than others.

POTATO, SWEET. [BATATAS.]

POTTINGER, RIGHT HON. SIR HENRY, BART., G.C.B., was born in 1789, of an English family which had been long settled in Ireland. He was the fifth son of the late Edward Curwen Pottinger, Esq., of Mount Pottinger, county Down, by Anne, daughter of Robert Gordon, Esq., of Florida Manor, in the same county. He went to India as a cadet in 1804. At an early age he attracted the attention of the civil and military authorities of that country by his energy and administrative capacity, as well as his ready store of information bearing on his profession. Rising by gradual steps, he became successively judge and collector at Ahmednugger in the Deccan, political resident at Cutch, and president of the regency of Scinde. For his services in these capacities he was raised to a baronetcy, when General Keane was rewarded with a peerage after the Afghanistan campaign in 1839. He had scarcely returned to England when war broke out between England and China on account of differences relating to the opium trade. In this emergency he was sent out to China as ambassador extraordinary and minister plenipotentiary, and superintendent of the British trade in that country; and in this two-fold capacity he took very decisive measures. Having warned the British residents against the perfidy of Chinese officials, he proceeded to concert his measures with Admiral Sir W. Parker, the result of which was the capture of Amoy. The effect of this step was to throw open to English vessels a commerce with upwards of 300,000,000 natives, and the terms of the treaty were thought to be such as to afford a guarantee against the necessity of the repetition of offensive measures. For these services Sir Henry Pottinger was made a Knight Grand Cross of the Order of the Bath, and governor and commander-in-chief of the island of Hong Kong. Having returned to England in 1844, he was sworn a member of the Privy Council, and a pension of 1500*l.* a year was settled on him by a vote of the House of Commons. In 1846 he was again sent upon active service as successor to Sir Benjamin Maitland in the governorship of the Cape of Good Hope; this office he held until the September of the following year, when he returned to India as governor and commander-in-chief of the presidency of Madras. He returned to England in 1854, having previously been raised to the local rank of lieutenant-general in India. He died at Malta, on the 18th of March 1856, leaving behind him the reputation of an able and upright administrator of public affairs, and an officer who had rendered great services to his country.

POTTON. [Bedfordshire.]

PRADIER, JAMES, was born at Geneva in May 1792. While quite young he was sent to Paris, and placed in the studio of the popular sculptor Lemot. His first public success was gained in 1812, when, through a technical informality, his model being pronounced unqualified to compete for the first prize of the Academy, an extra gold medal was awarded to him for its unusual excellence. The next year he obtained for his group of Philoctetes the first prize, and with it the privilege of proceeding as Academy student to Rome. In that city he remained five years, and produced during that time several original works. Although he is said to have there diligently studied the antique and formed his own style upon it, there can be little doubt that the influence of Canova was much more powerful, and that the softness, finish, and elegance, for which that eminent sculptor was so celebrated, were what Pradier most anxiously endeavoured to realise; but whilst in these qualities he at the least rivalled Canova, he went far beyond him in that tendency to the sensuous and the voluptuous which was no less decidedly characteristic of the great Italian. The countrymen of Pradier are enthusiastic in their admiration of his nude forms so "delicatement voluptueuses;" but to a colder English critic the delicacy often seems wanting, and while he cannot but admire the exquisite modelling of the form, he is constrained to turn with regret from what seems the perverse meretriciousness of the sentiment.

From his return to France in 1819 down to his death, M. Pradier enjoyed a career of unbroken Parisian popularity; and during his later years, while all admitted him to be one of the most accomplished, by many he was regarded as the greatest of living French sculptors. Of the works by which he achieved and maintained his high position the following are some of the more celebrated—the dates are those of the years in which they appeared at the Exposition:—'Bacchante and Centaur,' 1819, now in the Museum at Rouen; 'The Children of Niobe.' 1822; 'Psyche,' 1824; 'The Three Graces,' 1831, now at Versailles; 'Venus and Love,' 1836; 'An Odalisque,' 1841; 'Cassandra,' 1843; 'Phryne,' 1845, well known in this country from having been placed in the Great Exhibition of 1851; 'Sappho,' 1848, a favourite subject with him—there was a statue of Sappho in the Exposition the year of his death; 'Spring,' 1849: Hebes, Amazons, Pandoras (one of these is in the possession of Queen Victoria), Satyrs and Bacchantes, Venuses and the like, make up the list of that class of subjects in which he chiefly excelled, and which was most characteristic of his chisel. He also produced a large number of religious pieces, and many of them of considerable size, but out of France they have found few admirers. Among these are a colossal figure of 'Christ on the Cross,' executed for Prince Demidoff; a 'Pietà,' executed in 1847, and now at Toulon; a 'Marriage of the Virgin' for the Madelaine, four 'Apostles,' a 'Virgin' for the cathedral of Avignon, &c. Of portrait-statues he sculptured Gaston de Foix, Marshal Soult, General Damremont, Vendôme, Rousseau (for Geneva), Jouffroy (for Besançon), the Duc d'Orleans, &c. He also executed busts of Louis XVIII., Charles X., and other persons distinguished by their rank or social celebrity. Among his other works may be mentioned the Tomb of Napoleon I., some fountains, vases, &c. He likewise modelled numerous small statues of a very meretricious character.

Pradier was made a Chevalier of the Legion of Honour in 1822. In 1827 he was elected Member of the Institute on the death of Lemot. He died somewhat suddenly on the 5th of June 1852. There are two or three casts after Pradier among the modern sculptures in the Crystal Palace at Sydenham.

PRAED, WINTHROP MACKWORTH, son of Mr. Sergeant Praed, was born in 1802. In 1820 a monthly magazine appeared, entitled 'The Etonian.' George Canning, while at Eton, wrote some clever essays in 'The Microcosm.' Rennell and the nephew of Canning (the present Lord Stratford de Redcliffe) subsequently produced 'The Miniature.' These publications were regarded as exhibitions of youthful talent, were admired in a small circle, and forgotten. But 'The Etonian' aimed at something higher than school-boy essays; it paid slight regard to the 'microcosm' of Eton, and presented no 'miniature' of its scholastic life; it gave vivid pictures of general society; it was bright with wit and poetry, with fun and satire. There was little of the boyish about it but the freshness of boyhood. The principal writer in 'The Etonian' was Winthrop Mackworth Praed. From Eton he went to Trinity College, Cambridge. His career at the university corresponded with the expectations that had been formed of his brilliant talents. In 1822 he was a Browne's Medallist both for Greek ode and epigrams; in 1823, for Greek ode; in 1824, for epigrams. In 1823 he obtained the Chancellor's prize for an English poem, 'Australia;' and in 1824 the same prize for 'Athens.' He was one of the chief speakers in the Union—the famous Cambridge Debating Society—his most formidable rival being Thomas Babington Macaulay. 'The Etonian' was printed at the office of Mr. Knight, then editor of the 'Windsor Newspaper,' and the intimacy that consequently arose led to the publication of 'Knight's Quarterly Magazine' in 1823, to which Mr. Praed was one of the chief contributors, both in prose and verse. His poems are amongst the most original in our language; their wit and pathos are as remarkable as their finished elegance. A collection of some of these poems was published at New York in 1844, but it is far from complete; and those who desire that justice should be done to the memory of one of the most remarkable writers of his time, regret that these works, so often announced, should be so unaccountably delayed.

Mr. Praed took his degree of B.A. in 1825. In 1829 he was called to the Bar; and in 1830 and 1831 was returned to Parliament for St. Germans. In the earnest and protracted conflicts that preceded the passing of the Reform Bill, he took a decided part in opposition to the Reformers. His speeches, as reported, exhibit a readiness of debating power rather than the flashes of wit which were expected from him. He was a most ardent opposer of the Whig administration, though we can trace in him a generosity of feeling and a hatred of mere party calumny, which was to be expected from the nobility of his nature. In the election of 1832 he unsuccessfully contested St. Ives; but in 1835 he was returned to Parliament for Great Yarmouth. In that year he married. During a short time he was Secretary to the Board of Control. He was subsequently member for Aylesbury, was Recorder of Barnstaple, and Deputy High-Steward for the University of Cambridge. Had Mr. Praed's life been longer spared, there can be little doubt that some of the most important offices of the state would have been within his reach; and his contributions to literature, like those of his friend Macaulay, might have carried forward the promise of his youth into new fields of excellence. He died on the 15th of July 1839, in his thirty-seventh year.

PRASCOLITE. [Mineralogy, *S.* 1.]

PRASILITE. [Mineralogy, *S.* 1.]

PREROGATIVE COURT. One effect of the transfer of the jurisdiction of all the Ecclesiastical Courts to the Court of Probate [Probate, Court of, *S.* 2], is that the doctrine of *bona notabilia* has ceased to exist. This court, whose jurisdiction arose from the possession of *bona notabilia* by the deceased person in two dioceses, has consequently, although without formal abolition, altogether disappeared from our judicial system.

PRESCOT. [Lancashire.]

PRESCOTT. [Canada, *S.* 2.]

PRICE, REV. THOMAS, one of the most distinguished Welsh scholars of his age, was born on the 2nd of October 1787, at Pencaerelin, in the parish of Llanafan Fawr, near Builth, in Brecknockshire. His father, the Rev. Rice Price, had originally been a stonemason, but having at the age of seventeen formed an attachment to Mary Bower, the descendant of a long line of clergymen, had acquired by incessant diligence and frugality the means of attending the college-school at Brecknock, and finally obtained ordination from the Bishop of St. Davids, and in 1784 the hand he sought, after a courtship of twenty years. He was so fortunate as afterwards to be presented to three livings, but his income, like that of some other Welsh pluralists, was never believed to exceed fifty pounds a year. He had two sons, both of whom were brought up to the church; the elder taking his degree at Oxford, while the second, Thomas, was obliged to finish his studies at the college of Brecknock. Welsh was the language the two boys heard constantly in the family, English they acquired at their second school, the elements of Latin and Greek were learned subsequently, and from some French officers, who were prisoners of war at Brecknock, Thomas acquired an excellent knowledge of

French. In 1812 he received holy orders, and in 1825, after performing for thirteen years the duties of various curacies near Crickhowel, he was appointed to the vicarage of Cwmdu. This was his last preferment. The rest of his life was passed in his professional labours, and in a great variety of voluntary pursuits. Mr. Price carved in wood, modelled in wax and cork, etched with some skill, could play on the Welsh harp by ear, and had the honour of presenting a harp from his own design to the Queen at Buckingham Palace in 1843. He made a great number of drawings, some of which were engraved as early as 1809, in his friend Theophilus Jones's 'History of Brecknockshire.' He was a great promoter of the Eisteddfods, or meetings for the cultivation of Welsh poetry, literature, and music, and frequently bore off the prizes. He was looked up to by most of his countrymen with enthusiastic admiration as an accomplished champion of his country's language and literature. His health began to fail somewhat early, and he died at Cwmdu on the 7th of November 1848.

The best of his English works are collected in the 'Literary Remains of the Rev. Thomas Price, with a Memoir of his Life by Jane Williams, Ysgafell,' 2 vols, 8vo, Llandovery, 1854-55. The first volume contains an account of a 'Tour through Brittany,' made in the summer of 1829, written in a lively and agreeable style, and peculiarly interesting as containing the observations of one familiar with the language and literature of Wales on the kindred language and literature of Brittany. 'An Essay on the Comparative Merits of the Remains of Ancient Literature in the Welsh, Irish, and Gaelic Languages;' 'An Essay on the Influence which the Welsh Traditions have had on the Literature of Europe;' 'A Critical Essay on the Language and Literature of Wales from the time of Gruffydd ap Cynan and Meilyr (in the eleventh century) to that of Sir Gruffydd Llwyd and Gwilym Ddu' (in the fourteenth), make up the remainder of the first volume. The second is entirely occupied with Miss Williams's memoir, which is enlivened with some interesting correspondence, and presents the fullest picture that has yet been drawn of a Welsh literary life. By far the greater part of Mr. Price's literary labours were in his native language: he was a contributor to fifteen Welsh periodicals, for one or the other of which he made it a rule to write an article once a month, and under such a variety of signatures, that it would now be impracticable to form a collection of the whole. His favourite signature however was 'Carnhuanawc' ('Man of the Sunny Mound'), which was familiarly known to every magazine-reader in Wales. His great work in Welsh was the 'Hanes Cymru a chenedl y Cymry ór Cynoesoedd hyd at Farwolaeth Llewelyn ap Gruffydd' ('History of Wales and the Welsh Nation from the Early Ages to the Death of Llewelyn ap Gruffydd'), when the country was united with England. It was published in numbers, sometimes with long intervals, the first of the fourteen of which it consisted appearing in 1836 and the last in 1842, the whole forming a volume of about 800 pages. It has been pronounced by competent judges the best history of Wales extant in any language, and it is somewhat singular that no translation has yet appeared in English. The omission may serve in some degree to justify the complaint which Mr. Price was accustomed to make "of the extraordinary neglect of Welsh literature and total ignorance of British History prevailing in England, and the consequent contempt evinced by the English for everything relating to Wales, in contradistinction to the high appreciation of Welsh literature shown on the Continent, especially in Germany, and the superior knowledge and desire for information on all subjects connected with the principality by German scholars."

On the subject of his native language Mr. Price was so enthusiastic that his feelings sometimes outran his judgment. At the Eisteddfod at Welshpool in 1824, he exclaims, in an oration in the Welsh language, "We are told our language cannot last; but let them inform us what language will last, and we will instantly adopt it. When we are chafed and goaded to it—when we are taunted with the extinction of our native tongue—shall we not reply! shall we not say that we likewise perceive the seeds of decay in the English? Who can tell but that when the present English sleeps with the Latin, the Saxon, and the Norman-French, the accents of our mountain tongue may yet rouse some remains of the Britons to patriotism and glory." Most Englishmen, we believe, who have urged the adoption of the English language in Wales, have supported the measure not on the ground of its supposed superior duration in the future, but of its evident superior usefulness in the present.

A notion of Mr. Price's, to which he appears to have attached considerable importance, was, after communicating it to the 'Athenæum' and the 'Allgemeine Zeitung,' made the subject of a separate publication, 'The Geographical Progress of Empire and Civilisation' (Llandovery, 1847-48). Every one is familiar with the idea of the 'westward progress of empire,' which the Americans are so fond of quoting from Bishop Berkeley's fine stanzas; but Mr. Price fancied he had made a discovery, "that the average rate of progress corresponds with that of the retrogradation of the equinoctial points, which is 50 seconds and a fraction in a year, or a degree in 72 years, something short of a British mile, subject to periodical retardations and accelerations." "The focus, or pole, was in 1847," according to his speculations, "located in the northern portion of this island, near the Frith of Forth in Scotland, moving in the direction of the Solway Frith at the rate of four miles a year." On the whole, Mr. Price's works are more remarkable for vigour, animation, and learning, than for sound judgment.

PRICHARD, JAMES COWLES, an eminent ethnologist, was born at Ross in Herefordshire in the year 1785. He was educated for the medical profession, and took his degree of M.D. at Edinburgh. He chose for the subject of his inaugural thesis the physical history of mankind. This seems to have determined the current of his thoughts throughout life, for he subsequently became distinguished as one of the most laborious ethnologists of his day. He commenced the practice of his profession at Bristol, and in 1810 was appointed physician to the Clifton Dispensary and St. Peter's Hospital. He also had a private dispensary, to which he devoted considerable attention. Although much engaged with his professional duties, he still kept the subject of his inaugural thesis before his mind, and in 1813 he published his 'Researches into the Physical History of Mankind.' This work, which was originally published in one volume, reached a second edition in two volumes in 1826, and a third edition was finished in 1849, extending to five volumes. From the period of the first publication of this work it took the first rank amongst ethnological works, and the last edition is undoubtedly the most important systematic work that has hitherto appeared upon the physical history of man. Dr. Prichard, whilst an anatomist and physiologist, was one of the first to avail himself of the study of philology as a means of arriving at the history of the various races of men. His contributions to ethnology took a variety of forms. In 1832 he read an elaborate paper to the British Association, then assembled in Bristol, 'On the Application of Philological and Physical Researches to the History of the Human Species.' In 1843 he published a more popular resumé of his labours on the physical history of man under the title of 'The Natural History of Man.' A second edition of this work appeared in 1845, and it has been translated into the French and German languages. He has likewise written many papers and minor works on the same subject. In the twelfth volume of the proceedings of the Zoological Society is a paper 'On the Crania of the Laplanders and Finlanders.' He also published a work 'On the Eastern Origin of the Celtic Language,' in which he pointed out the relations between the Celtic language and the great group of Indo-Germanic languages derived from the east. Another work also arose out of his ethnological researches, which was entitled an 'Analysis of Egyptian Mythology.'

Although thus occupied with a great and important department of science, Dr. Prichard was not inattentive to professional studies. His ethnological and philological reading naturally led him to contemplate man psychologically, and we find him addressing himself successfully to the study of the nervous system, and the results of its deranged condition on the mind of man. In 1822 he published a work on 'The Diseases of the Nervous System.' This was followed by a 'Treatise on Insanity.' In this work he displayed great power in analysing mental phenomena, and speedily became recognised as one of the first authorities on the subject of mental derangement. He was appointed visiting physician to the Gloucestershire Lunatic Asylum. He subsequently published a work 'On the Different Forms of Insanity in Relation to Jurisprudence.' His labours connected with insanity led to his appointment as one of the Commissioners of Lunacy in 1845. On this occasion he removed from Bristol to London, where he continued to reside till his death. Besides the works already mentioned, Dr. Prichard enlarged an essay which he read before the Philosophical Society of Bristol into a work entitled 'A Review of the Doctrine of a Vital Principle.' He was also an extensive contributor to the 'Cyclopædia of Practical Medicine.' He was made M.D. of Oxford on the occasion of the installation of the Duke of Wellington as chancellor of that university. He was president during one session of the Provincial Medical and Surgical Association, now the Bristol Medical Association. He was president of the Ethnological Society, and published an anniversary address delivered before that society. He was a Fellow of the Royal Society of London, and of many other scientific societies in this country and on the Continent. He died in London, December 22, 1848, of an attack of rheumatism complicated with pericarditis.

PRIESSNITZ, VINCENZ, the founder of Hydropathy, or Water-Cure (Wasserheilkunde), was born on the 4th of October 1799, at Gräfenberg, in Austrian Silesia, where his father was a farmer. He received only a small amount of ordinary education at the town-school of Freiwaldau; for his elder brother having died, and his father become blind, he was obliged at an early age to assist his mother in managing and working the farm. He continued in this employment several years; but one day, when he was taking some sacks of barley to the fields for sowing, the horse became restive, seized Priessnitz with his teeth, threw him down, and dragging the loaded cart over him, broke two of his ribs. A medical man, after examining him, expressed an opinion that the injuries sustained were so great that, even if he recovered, he would be a cripple for life. Priessnitz, however, by placing his body in a certain position, which allowed him to expand his chest to the utmost extent, replaced his ribs, and by the free use of cold water kept down inflammation; so that in a short time he was enabled to return to his work. The process of cure by cold water, which had been so beneficial in his own case, was successfully used in other cases of inflammatory disorder. His reputation gradually extended; he studied medical books, formed a sort of system of medical treatment, established cold-water baths at Gräfenberg, and about the year 1826 patients began to resort to him from distant parts of Germany. In 1829 his system may be said to have been in full operation, and from the first of January of that year till the 1st of January 1844 the number of his patients had amounted to 8573. The total number of his patients in 1843 was 1050, and the number of both sexes and all ages generally present at Gräfenberg was about 360. No particle of medicine, vegetable or mineral, no tonic, no stimulant, no emetic, no purgative, was ever administered in any form whatever. No bleeding, blistering or leeching was employed. Water variously applied, externally as well as internally, the process of sweating, fresh air, out-door exercise, plain diet, regulated clothing, early hours, and cheerful society, constituted the only remedies. This system continued in successful operation till the death of Priessnitz, which occurred on the 28th of November 1851, at Gräfenberg. The disease of which he died is stated to have been dropsy on the chest. Hydropathic establishments are now in operation in various places on the continent of Europe, in the United Kingdom of Great Britain and Ireland, and on the continent of America.

Priessnitz did not write any medical work himself, but accounts of his system have been published in German and English. Captain R. T. Claridge in 1849 published 'The Water-Cure, or Hydropathy, as practised by Vincent Priessnitz, at Græfenberg, Silesia, Austria,' 8vo, London; and 'Every Man his own Doctor: the Cold Water, Tepid Water, and Friction Cures, as applicable to every Disease to which the Human Frame is subject, and also to the Cure of Diseases in Horses and Cattle,' 8vo, London.

(*Vincenz Priessnitz, eine Lebensbeschreibung*, von Dr. J. E. M. Selinger, 12mo, Vienna, 1852.)

PRINCE'S RISBOROUGH. [BUCKINGHAMSHIRE.]

PRINTING, INVENTIONS IN. Since our account of Cowper and Applegath's machine for printing 'The Times' newspaper [PRINTING MACHINE, vol. xix. p. 18], a number of improvements have been introduced. Steam power has also been applied to flat machines, which are a modification of the Stanhope press, in which the table, with a form of type at each end, moves backward and forward, under the platen, which gives the impression to one form while the other is being inked by the rollers. This description of press was for a time supposed to be best adapted for the finer sorts of book-work; but the process was very much slower, and the belief in their superiority of work was not universally admitted. Cylindrical machines were frequently used, not only for newspapers, where rapidity of production was required, but for books containing engravings on wood, where excellence of workmanship was demanded. Several of these machines were exhibited at the Paris Universal Exhibition in 1855, the French printers having devoted much attention to the improvement of cylindrical machines. In his report as juryman on 'Class XXVI.—Drawing and Modelling, Letter-press and Copper-plate Printing, and Photography' Mr. Charles Knight says—"In the Paris Exhibition several machines, offering the advantage of more perfect inking, and of preventing what is called 'setting-off' [that is, the sheet becoming blurred by the moist ink being pressed upon], showed that the attention of the French printers had been more directed, than with us, to the practicability of producing the finest work by the machine instead of by the hand-press. Some of our artists, who have watched the dependence of the wood-engraver on the printer, have long been of opinion that the equal operation of the cylinder is superior to the irregular force of the hand-press. But the heads of our printing establishments have generally considered that the cylindrical machine was only calculated to save labour, and not to produce fine work. Our machine-makers have, therefore, made various labour-saving machines upon the principle of flat-pressure; which, as it is the principle of the hand-press, at which the most expensive work was produced, was thought to be the only principle for a more perfect machine. The French, on the contrary, have turned their attention to the perfection of the cylindrical machine, knowing that it had natural advantages which could not be obtained by flat-pressure. When a sheet of paper is brought into contact with an inked surface of types, by being laid flat upon that surface, a large body of air has to be expelled by the heavy platen, operating at once upon the whole surface. The cylinder, on the contrary, touches the type, and produces the impression on the paper, line by line, and there is no atmospheric resistance to be overcome. The French printers have, therefore, sought for the improvement of the cylindrical machine. The single cylinder-machine of M. Dutartre produces work which cannot be excelled by the most careful operations of the press. It prints only on one side [the process having to be repeated to 'perfect' the sheet]; and the form passes under a double set of inking-rollers, at each end of the table, before it receives the impression. In the double-cylinder machine of the same inventor, a waste sheet of paper is interposed so as to prevent setting-off; and thus both sides of the paper may be printed at once, without leaving that blurred impression of one side which so commonly disfigures machine-printing. The French printers now do their finest work by the cylindrical machine, and much of their common work by the hand-press." The report goes on to say that, on the whole, the average work of the French printers is superior to that of the English. It attributes this, partly to the better quality of their paper, which is farther improved by being passed through powerful rollers, thus creating a more even surface, partly by using dry paper instead of wet, partly by the use of silk instead of parchment for tympans in their hand-presses and flat-pressure machines; and other little niceties, the results of long practice based upon scientific investigation. M. Dutartre's double-cylinder machine has been introduced into England; and a patent has been taken out for an improvement in the manufacture of paper, by which the necessity of wetting it to enable it to receive the ink will be removed; we believe, as far as this experiment has been carried out, that it has been successful.

M. Dutartre also exhibited a machine for printing in two colours—for which he received the silver medal; others were exhibited for printing newspapers, but their rapidity was not equal to ours as it appears from the report, 6000 sheets perfect being the highest number stated, but several ingenious adaptations and movements are noticed in Mr. Fairbairn's report.

In England, however, the demands of the newspaper press had not been met by even such improved machines as above described. The 'Times' could not be produced sufficiently early at the rate of 5000 or 6000 an hour. Mr. Applegath again employed his inventive faculty and produced a printing-machine on the vertical cylindrical system, which could produce, on one side, from 10,000 to 13,000 copies an hour. With two such machines the 'Times' has been worked since 1848; and it has been used for the production of the

'London Illustrated News,' and other newspapers having a large circulation.

In this machine a central drum 200 inches in circumference, or 64 inches in diameter, turns on a vertical axis. We copy the following description from C. Tomlinson's 'Cyclopædia of Useful Arts and Manufactures.' "The inking-table and the columns of type are secured to the surface of this drum; the columns of type are placed vertically, not conforming to the curve of the drum. This is contrived in the following manner. A slab of iron is curved on its under side, so as to fit the large cylinder, while its upper surface is fitted into facets, or flat parts, corresponding in width and number to the width and number of the columns of the newspaper; between each column there is a strip of steel, with a thin edge, to print the 'rule,' the body of this strip being wedge-shaped, so as to fill up the angular space left between the columns of the type, and to press the type together sideways, or in the direction of the lines; the type is pressed together in the other direction by means of screws, and is firmly held together. The surface of the type thus forms a portion of a polygon, as already noticed; and the regularity of the impression is obtained by pasting slips of paper on the paper cylinder. The large central drum is surrounded by eight cylinders, each about 13 inches in diameter, also with vertical axes. They are covered with cloth, and upon them the paper to be printed is carried by means of tapes. Each of these cylinders is so connected with the central drum, by means of toothed wheels, that the surface of each must move with the same velocity as the surface of the drum. It will thus be evident that if the type on the drum be inked, and each of the cylinders be properly supplied with a sheet of paper, a single revolution of the drum will cause the eight cylinders to revolve also, and produce an impression on one side of each of the sheets of paper. But for this purpose, it is necessary that the type be inked eight times during one revolution of the drum. This is accomplished by means of eight sets of inking rollers—one for each paper cylinder. The ink is held in a vertical reservoir (supplied from above), formed of a ductor-roller, against which rests the two straight edges connected at the back, so as to prevent the ink running out. It is conveyed from the ductor-roller by one of the inking rollers in the following manner:—As the inking-table on the revolving drum passes the ductor-roller, it receives from it a coating of ink, and then coming immediately in contact with the inking rollers, it inks them, the types next follow and receive from the inking rollers their coating of ink, and the drum still revolving brings the inked type into contact with the paper cylinders, and the sheet is printed. It must not be forgotten, as one of the distinguishing features of this machine, that the various processes which have just been enumerated for one set of inking rollers, and one paper cylinder, are repeated eight times for every single revolution of the central drum, so that in this period eight sheets are printed, and turned out of the machine. For this purpose it is necessary to supply the eight cylinders each with a sheet of paper. Over each cylinder is a sloping desk, upon which a number of sheets of white paper are placed. The layer-on stands by the side of this desk, and pushes forward the paper a sheet at a time towards the tape-fingers of the machine. These tapes seize it and draw it down in a vertical direction, between tapes, in the eight vertical frames, until its vertical edges correspond with the position of the form of type on the drum. When in this position its vertical motion is arrested for a moment, it then moves horizontally, and is carried towards the printing cylinder by the tapes. Passing round this cylinder it is instantly printed. It is then conveyed horizontally, by means of tapes, to the other side of the frame, and is moved along to another desk, where the taker-off pulls it down. As soon as one sheet is thus disposed of, accommodation is made for another; and as each layer-on delivers to the machine two sheets every five seconds, sixteen sheets are thus printed in that brief space, and this is continued for any length of time, supposing no accident occurs, such as a sheet going wrong, in which case it is the duty of the taker-off to pull a bell-handle, and the machine is instantly stopped by the engine-man. As the type-form on the central drum moves at the rate of 70 inches per second, and the paper to be printed moves at the same rate, if by any error in the delivery and motion of a sheet of paper it arrive at the printing-cylinder 1-70th of a second too soon or too late, the relative position of the columns on one side as compared with those on the other side of the paper will be out of register by 1-70th of 70 inches, viz., one inch; in which case the edge of the printed matter on one side will be an inch nearer to the edge of the paper than on the other side. . . . . All the layer-on has to do is, to draw forward the sheets so as always to have the edge of one ready for the machine to take in. If the steam-engine which works the machine be put on a greater speed, the central drum, and all the attendant apparatus, would work with greater rapidity; and such a speed might easily be obtained as to render it impossible for the layers-on to present the paper fast enough to satisfy the improved appetite of the machine; but in any case the machine would not take in the sheets *as* the layers-on chose to present them; but only at those periods, rapidly recurring though they be, which are provided by the peculiar functions of the machine."

This machine, with certain modifications to adapt it for printing wood-cuts of a large size, has been used for the 'Illustrated News,' and was shown at work during the Exhibition of 1851; it has also been adopted in other instances where rapidity of production was necessary. Another machine, likewise on the vertical principle, has been invented by the Messrs. Hoe, of America, and several of these have been brought into use in London.

The inventive faculty has also been applied to methods for facilitating the arrangement of the type, though with far less success. In the Report on Printing, &c., of the Paris Exhibition of 1855, Mr. Knight says:—"During the last twenty years there have been various attempts to produce a machine that will, to some extent, supersede that portion of manual labour in printing which is called 'composition.' Without attempting to describe the various contrivances by which a more rapid method of arranging moveable types was to be effected than by the ordinary method, it may be sufficient to say that by keys, like those of a pianoforte, some force might be applied to remove a single letter from its proper receptacle, and arrange it in a combination of words and sentences. In the ordinary method, the various types which are necessary for the usual language lie in separate cells before the compositor, those most in use being nearest his hand. In his left hand he holds a little iron frame, in which, picking up letter by letter, he forms words, putting spaces between each word. As he approaches the end of his line, he finds that the next word is too long to come within the line, and he therefore divides it by a hyphen, or carries it over to the next line. He then spaces out the words, so as to make the line fit closely, but not tightly. Now it is evident that if the most perfect instrument could be made to pick up the letters and spaces, the intelligence of the workman is absolutely necessary to make this 'justification' as it is called of each line. Hence every composing-machine must be an imperfect instrument.

"But, nevertheless, it may in some cases be of the utmost importance to have the type picked up, and placed in order more rapidly than by the fingers. In a trial of comparative expedition between the logographic system of Major Beniowski, and the common mode (in which trial Mr. Rennie was referee), it was found that a compositor at Mr. Clay's printing-office picked up and 'justified' 6000 letters in two hours and twenty minutes. He distributed or returned the same when used, to the case in fifty-one minutes. There were several composing and distributing machines in the French Exhibition, but the most remarkable one, and that which appears to me, as it appeared to M. Didot and other competent judges, to approach nearer than any other invention to the accomplishing of this long sought for object, is thus entitled—'Machine à composer et mettre bas pour l'usage de l'imprimerie, composée et executée par Christian Sörensen.' It was stated that a Copenhagen newspaper, of which a copy was shown, had been printed for some time by this method. It would be impossible to convey an adequate notion of the details of this machine without drawings. I will endeavour briefly to state the principle:—The types are of the usual thickness and height. In the centre of each type, in the front, is a deep nick of a dovetail shape, which fits upon a metal edge, so that the type cannot be displaced. But of 111 letters which are required in the fount, each letter has two, three, or four nicks cut at right angles, the nicks of no one letter being the same as another. A cylinder, which may be described as a large basin, has a number of metal edges placed vertically in its sides, upon which the types without any regard to order, being the matter for distribution, are rapidly slid by the dovetail nick.

When the basin is filled, it is inverted upon a cylinder of corresponding size below. Upon the rim of this cylinder is a separate opening for the reception of each of the 111 letters, but no one opening is like another. The distributing and the composing go on at the same time. The compositor is seated; with a treddle he moves the upper cylinder, which, as it slowly revolves, finds in the lower cylinder, which is stationary, a fit place for every separate letter as it descends by its own gravity to the bottom of each metal edge. The *n* having two broad nicks, one about $\frac{1}{8}$ of an inch from its top, the other at the same distance from its bottom, falls into the *n* opening, which having points corresponding, alone can admit it from its similarity of form, while the *u* having four nicks, two broad and two narrow, passes into its own division, and cannot be confused with the *n*.

"But whilst this process of distribution is steadily proceeding, without any care but to keep the upper cylinder occasionally supplied with new material for its operation, the process of composition is rapidly going on. The compositor sits before a compact little frame of keys, each key having a connecting wire for each division of the lower cylinder. He strikes a key and the lower letter is instantly detached and falls into a funnel-shaped receptacle below, where, without being inverted in any way, it runs into a groove, and arranges itself in its proper order, in the line of its fellows. This is a long line of several feet. By an ingenious contrivance each such line is passed on one side, as it is completed, to another workman, who takes up as many letters as will fill the due width of his page or column, and spaces out the words in the ordinary way. I saw 1000 letters thus placed in line in the short space of four minutes, and the spelling and punctuation appeared as correct as in most matter of common composition before it is read. When the necessary loss of time in refilling the cylinders, and through other hindrances, is taken into account, it was stated by the exhibitor that 50,000 types are set up and distributed each day. This gives a rate of about 6000 an hour, which is treble that of the ordinary compositor's rate."

The interest connected with the question of 'Types for the Blind,' to which considerable impetus was given by the Society of Arts for Scotland at Edinburgh, who offered their gold medal for the best alphabet for the blind, has tended greatly to bring about a change in the intellectual education of the blind. The publication of the article BLIND in the 'Penny Cyclopædia,' at a time when the minds of many were thus directed, and the strictures therein contained on the absence of intellectual training in most of the asylums, also rendered essential benefits on this point. Dr. S. G. Howe, of Boston in the United States, in 1833 contrived an alphabet, founded upon that of Haüy, of a very compact form, in which the New Testament was printed in 1834, and is now in general use in America. The late Mr. John Alston, the treasurer of the Glasgow Asylum, than whom no man connected with the blind deserves more honourable mention, contributed greatly to this educational movement. He saw that, by adopting any character more or less arbitrary, the evil would necessarily follow of isolating the blind by putting them in a position to require special teachers. He therefore adopted the plain Roman characters deprived of their small extremities—the *sans-serif* of type-founders; and, finding that it could be easily read, that it would also enable any seeing person who could read to be a teacher of the blind, he at once procured founts of type, and published several works in raised letters; the success of these for their special object established the pre-eminence of his alphabet. Having thus laboured for several years, he visited more than once the principal asylums for the blind in the kingdom. In his work 'Statements,' &c., published in 1846, he says, that after the introduction of his system, "I found a considerable improvement. Subsequently I visited the English institutions a third time, and found a very great number who could read with ease and intelligence; and I have reason to know that there are some hundreds reading these books, and that many families are in possession of the whole of the Bible in raised types: thus in a short time showing the sufficiency of the system placed before the public." It may be added, that Mr. Alston also brought out some beautiful embossed music and maps, and that he published the Old and New Testament in 19 vols., super-royal 4to. The paper used for these works is strongly sized, to retain the impression. In order to account for the great extent of the Bible, it must be borne in mind that the paper can only be printed on one side, and that the letters require to be of considerable size in order to be distinct to the touch. The printing is effected by a copper-plate press. The types being strongly relieved, and liable frequently to give way under the heavy pressure required, it was necessary to have them re-cast four times during the progress of the work. The whole of the works were completed within the walls of the Glasgow Asylum, a man and a boy acting as compositors, there being one pressman, and the ordinary teacher acting as corrector of the press. These books are now used in most of the British asylums for the blind, and also in America. The success which has attended Mr. Alston's exertions was a new assurance to the Society of Arts for Scotland that they had acted wisely in regarding the stenographic and all other arbitrary characters, as well as the angular modifications of the Roman alphabets, unfavourably.

An invention by Aloys Auer, of Vienna, called 'Naturselbstdrück,' deserves mention. By it impressions are taken from the natural objects themselves, and by an ingenious process brought into a form fitted for printing from. Some of the specimens produced, such as the veins and markings of agate-stones, are of remarkable clearness and beauty. The invention, with some improvements in the process, has been patented by Mr. Henry Bradbury, and the 'Fern Flora of the United Kingdom,' produced by him in a folio volume, with 51 plates, is a proof of its capabilities of affording all the advantages of a herbarium, without the defects; as well as to its being available for many other branches of natural history.

In type-founding also an ingenious machine has been invented. In this, by turning a crank-wheel, the metal is injected with considerable force into the type-mould, brought by the machinery in front of a reservoir of metal kept fluid by a gas-fire beneath it, and by a continued movement is delivered out of it, at a rate varying from six to ten times the rapidity with which the operation can be performed by hand. Both in casting by hand, and in the machine, the mould is liable to become obstructed by particles of the metal remaining, when it has to be brushed clean. When this happens to the machine, it ceases to act, and thus at once informs the operator of the defect.

PRIVY COUNCIL. [JUDICIAL COMMITTEE, *S.* 2.]

PROBATE, COURT OF. The right of granting letters of administration of the effects of persons dying intestate, and probate of the wills of testators, which was formerly the prerogative of the Ecclesiastical Courts [ECCLESIASTICAL COURTS, *S.* 1. p. 509.] has by a recent statute (20 & 21 Vict. c. 77) been vested in a newly established court, called the Court of Probate. The functions of this court are confined entirely to deciding upon the authenticity of wills, and upon the proper persons to whom administration is to be committed, when no will exists. With the distribution of the property of deceased persons, and the rights of the various parties who claim it beneficially, the court has nothing to do. These matters must be decided by the courts of law and equity, as before the passing of the Act. The duties of executors and administrators remain the same as formerly. A central registry of wills and administration is established in London, and district registrars are established in forty of the principal towns of England. The office or registry in which probate or letters of administration are to be sought, is no longer determined by the locality of the *assets* of the deceased person, but by the place where the deceased had a fixed abode at the time of death. Should the testator or intestate have a permanent place of residence in one of the registry districts at the time of his decease, probate or letter of administration may be obtained at the registry of the district. The executors or parties claiming administration may, if they think fit, apply to the principal or metropolitan registry for probate or administration, and this may in some cases be found more convenient than to apply to the district registry. Original wills proved in the country will be preserved in the district registries; but copies of them will be transmitted to the principal registry in London, so that in future the metropolitan registry will be the most convenient office of search for any will whatsoever.

The practice of the Court of Probate in all contentious matters is thrown open to the whole legal profession, so that the monopoly of testamentary business enjoyed by advocates and proctors is now at an end.

The court is presided over by a single judge, who sits at Westminster. An appeal from his decision lies direct to the House of Lords.

In cases where a person dies in one of the forty districts, leaving personal property under 200*l.*, and real property under 300*l.*, the County Court of the district has jurisdiction should any contention arise. From the decision of the County Court judge, an appeal, which is final, lies to the Court of Probate.

One principal advantage of the new system lies in the removal of all difficulty as to the question where a will ought to be proved, and the old question of *bona notabilia*, on which the necessity of obtaining prerogative probate or administration was founded. The rules of evidence in the Court of Probate are to be the same as those in courts of law and equity, while its proceedings are likewise assimilated to those of the courts of common law.

PRODUCTIDÆ, a family of Brachiopodous *Mollusca*, including the genera *Producta*, *Strophalosia*, and *Chonetes*. The shell is concavo-convex, with a straight-hinge line; valves rarely articulated by teeth; closely adpressed, furnished with tubular spines; ventral valves convex; dorsal concave; internal surface dotted with conspicuous funnel-shaped punctures; dorsal valve with a prominent cardinal process; brachial processes (?) subcentral; vascular markings lateral, broad, and simple; adductor impressions dendritic, separated by a narrow central ridge; ventral valve with a slightly-notched hinge-line; adductor sac central, near the umbo; cardinal impressions lateral, striated.

Producta has the shell free, auriculate, beak large and rounded; spines scattered; hinge area in each valve linear, indistinct; no hinge-teeth; cardinal process lobed, striated; vascular impressions simple, curved; ventral valve deep, with two rounded or subspiral cavities in front.

The species are all fossil. There are about sixty species. They are found ranging from the Devonian to the Peruvian rocks of North and South America, Europe, Spitzbergen, Tibet, and Australia.

Strophalosia has its shell attached by the umbo of the ventral valve. There are 8 species.

Chonetes contains 24 species, which are found fossil from the Silurian to the Carboniferous rocks.

(Woodward, *Treatise of Recent and Fossil Shells.*)

PROME. [Birma; Pegu, *S.* 2.]

PRONGBUCK. [Antelope.]

PROPOLIS. [Bee.]

PROPYLE. [Chemistry, *S.* 2.]

PROTECTION ACTS. The object of these statutes is to enable a debtor in insolvent circumstances to avert or forestall the impending danger of imprisonment; for any person not a trader within the Bankrupt Acts, or who, being a trader, owes less than 300*l.*, whether in prison or not, may apply in London to the Insolvent Court, in the country to the County Courts, for protection from process. A *schedule* of debts, and of the names of his creditors, must accompany the petition; which must set forth an account of his whole estate and liabilities, and be verified by affidavit.

On the petition being filed, the court makes an *interim order*, which protects the petitioner from all civil process until his *examination*, but he may still be arrested under a judge's order, to hold him to bail. If in prison, the order effects the petitioner's discharge. The presentation of the petition vests all the petitioner's effects in the registrar, who, as *official assignee*, proceeds to possess himself of all that can be obtained without suit. Notice of the petition is given to the creditors, and inserted in the 'Gazette' and local newspapers, a public sitting of the court being at the same time appointed for the first examination of the petitioner. If it appear that the allegations in the petition and the matters in the schedule are true, and that the debts have not been contracted fraudulently or improperly, and do not arise from any of the acts of misconduct enumerated in the statutes, a day is fixed on which a *final order* shall be made, unless cause be shown to the contrary. If made, its effect is to permanently protect the petitioner from all process, in respect of the debts due, at the time of filing the petition, to the creditors named in the schedule. On the other hand, if cause is shown, the court may adjourn the consideration of the final order *sine die*, or dismiss the petition.

At any time *after* the final order, the assignees of the estate may claim property since acquired by the insolvent, which claim may be summarily enforced by the order of the court. So that under the Protection Acts, as in the case of an Insolvency, the *future* as well as *present* property of the debtor may be applied in payment of his debts. In this consists the great distinction between the relief afforded by the bankrupt laws to a *trader*, and that obtainable by an *insolvent debtor*, or a petitioner under the Protection Acts. (Blackstone's 'Commentaries,' Mr. Kerr's edition, vol. ii. p. 516.)

PROTEIN. [Chemistry, *S.* 1; Tissues, Organic, *S.* 1.]

PROTOZOA, a term applied by Oken to the lowest forms of animal life. *Protophyta* has been applied to the same forms of vegetable life. As employed at the present day it embraces the group of *Infusoria* termed by Ehrenberg *Polygastrica* [Infusoria], the *Rhizopoda* of Dujardin embracing the *Foraminifera* [Foraminifera, *S.* 2] and the Sponges. [Spongiadæ.] The *Acrita* of M'Leay, and the *Oozoa* of Carus, correspond to this section of the animal kingdom.

PROUT, SAMUEL, was born on the 17th of September, 1783, in Plymouth—the birthplace of so many English painters. From earliest childhood he was noted for an irrepressible fondness for drawing the various objects around him, and the passion increased with his years. His associate in his early artistic studies was Benjamin Haydon, but instead of yielding to the eager impulses after an unattainable grandeur of his enthusiastic friend, young Prout contented himself with unceasingly sketching from nature "the ivy-mantled bridges, mossy water-mills, and rock-built cottages, which characterise the valley scenery of Devon." Whilst uncertain as to his future course, he had the good fortune to be introduced to Mr. John Britton, the antiquary, then at Plymouth on his way to collect materials for an account of Cornwall, which he was preparing for the 'Beauties of England.' [Britton, John, *S.* 2.] Mr. Britton, pleased with his sketches, proposed that he should accompany him into Cornwall to make some drawings, and Prout gladly accepted the offer. The portfolio of Cornish drawings which he afterwards transmitted to Mr. Britton, excited by their boldness of style considerable notice, and the young artist was easily persuaded to remove to London.

He arrived in the metropolis in 1805, and found an adviser and patron in Palser the printseller, then residing in the Westminster-road and afterwards in Fleet-street, who used readily to purchase his water-colour drawings, and dispose of them among his customers. Palser gave but low prices for these works, but Prout had the good sense, on comparing his pictures with those of the established artists, to recognise his own deficiencies; and he was well pleased to be thus enabled, by means of unambitious drawings, to support himself whilst making a resolute effort to extend his artistic knowledge and executive skill. During these years he painted marine views, especially coast-scenes with fishing-craft, more than architecture, for which a very decided inclination had not yet developed itself. He also devoted a good deal of time to teaching, and he etched some lessons and studies for the use of teachers and pupils; but perceiving the capabilities of the newly-introduced art of lithography for yielding fac-similes of the painter's pencil-sketches, he began early to draw on stone, which, from his singular skill in the use of the lead-pencil, he did with great facility. He published in 1816 a series of 'Studies' which met with great success, and was followed by 'Views in the North and West of England,' 'Progressive Lessons,' 'Rudiments of Landscape,' and other drawing-books, which by their vigour of drawing and brilliancy of effect raised that class of publication far above the estimation in which it had been previously held, and did much to extend the reputation of the artist.

Mr. Prout had already secured a high position when he was led in 1818—partly in the hope of restoring his health, which had become much enfeebled, but also with a view to turning to professional account the taste for foreign scenery engendered by the facilities for continental travel opened by the return of peace—to make a tour in France. The quaint street-architecture of Rouen, and the civic and ecclesiastical structures of other Norman towns, seemed to reveal in him an entirely new sense. From this time he gave himself, with undivided zeal and unapproached success, to the delineation of the weather-worn and mouldering remains of mediæval architecture. Year after year he continued to journey through the fairest parts of France and Switzerland, of Germany and Italy; but still it was the old southern or northern gothic buildings that attracted his pencil, or those tumbledown heavy-gabled domestic houses which, though hardly ranking among any of the architectural divisions, had in his eyes an equal attraction in their antique picturesqueness. The remarkable popularity of his pictures induced him to publish a handsome folio of lithographic 'Fac-Similes of Sketches made in Flanders and Germany.' This was the first of the numerous series of lithographic copies of painters' finished sketches which have added so greatly to the enjoyment of all lovers of art, and done so much towards the extension of a sounder taste; and notwithstanding the many beautiful volumes which have since appeared, it remains in many respects the best—the most marked by a vigorous sketch-like simplicity of means and fidelity, and a happy boldness and playfulness of execution, combined with striking originality and brilliancy of effect. Mr. Prout subsequently published a series of 'Sketches in France, Switzerland, and Italy,' fol., 1839, more finished in style, but scarcely so brilliant or interesting as the former series Besides these he published various works intended to facilitate the progress of the student in art. Of these the first was entitled 'Hints on Light and Shade, Composition, &c., as applicable to Landscape Painting,' fol., 1838, in which he explains very clearly, by precept and example, the principles which regulated his own practice: another and extended edition was published several years later. He also published 'Microcosm: the Artist's Sketch-Book of Groups of Figures, Shipping, and other Picturesque Objects,' fol., 1841; 'Hints for Beginners,' &c.; besides making the drawings for several volumes of the 'Landscape Annual,' and for some other works.

During all this time, and to his death, Mr. Prout continued to be one of the most prolific contributors to the annual exhibitions of the Society of Painters in Water-Colours, where his pictures never failed to form a prime attraction. Yet, many and beautiful as were his works, they were produced amid much suffering. When a child of four or five years old, having wandered into the fields alone, he was found lying under a hedge insensible from the effects of a sun-stroke, and from that day forward he was subject to the frequent recurrence of sudden attacks of pain in the head; to this was added injuries received from protracted exposure to damp and cold in his earlier sketching excursions; so that, till towards the close of his life, as is mentioned in a memoir of him by Mr. Ruskin, from materials furnished by Prout himself ('Art-Journal' for 1849, p. 76), "not a week passed without one or two days of absolute confinement to his room or to his bed." He died on the 10th of February, 1852.

Samuel Prout was undoubtedly one of the greatest and most original of our old school of painters in water-colours. His style was entirely self-formed, and singularly effective. To a great extent it was conventional; but it was the result of prolonged working from the actual objects, and it therefore forcibly conveyed the artist's own idea. His drawing was very uncertain and confined: to the last he remained utterly incapable of drawing a tree, or representing foliage with the least approach to natural truth. His colouring was unequal, but often very beautiful and harmonious. He painted, with rare exceptions, wholly by washes of transparent colours, the outlines and details being made out by the skilful use of the reed-pen, with a few dexterous touches of which he produced effects never equalled by any other manipulator. His chiaroscuro was broad, simple, and so nicely adapted as always to have a true and natural appearance, which was greatly aided by the singularly clever introduction and arrangement of his figures, ill-drawn as these often were. In a word, Prout may fairly be regarded as the founder of a new school of architectural painting. He first showed what a world of picturesque capability lay in the quaint streets and market-places of Normandy, Flanders, and Germany, and the grander palaces of Venice; and no less did he show how to render the broad features and deep sentiment of the old ecclesiastical gothic, without being lost in a multitude of petty details.

PROUT, WILLIAM, distinguished as a chemist and physician. He was brought up to the medical profession, and took his degree of Doctor of Medicine at the University of Edinburgh. On establishing himself in London he connected himself with the Royal College of Physicians, of which body he ultimately became a Fellow. He early directed his attention to chemistry, and was amongst the first in this country to attempt to apply this science to the explanation of the phenomena of life, and he published many papers in reference thereto in the 'Philosophical Transactions.' All his researches and discoveries on this subject were combined in a great work entitled 'On the nature and treatment of Stomach and Renal Diseases, being an inquiry into the connection of Diabetes, Calculus, and other affections of the Kidneys and Bladder with Indigestion.' However brilliant the discoveries which have been made subsequently to the publication of this work, there can be no doubt that Dr. Prout had correctly appreciated the importance of chemistry, in explaining the functions of living beings, and that he was the first physician who sought to apply the doctrines of modern chemistry to the explanation of the phenomena of disease. He was an exceedingly careful and accurate experimenter, and with regard to some of his conclusions, which were at one time brought into doubt, a more careful investigation has confirmed the truth of his views.

Dr. Prout was one of the gentlemen chosen to write the 'Bridgewater Treatises.' The subject of his essay was 'Chemistry, Meteorology, and the Function of Digestion considered with reference to Natural Theology.' This work abounds with evidence of his profound knowledge of the laws of chemistry. Although principally occupied with chemistry in relation to his profession, he took an interest in all sciences which the discoveries in his favourite science affected. He was one of the first to analyse the so-called Coprolites, and to discover the large quantity of phosphate of lime they contained. This he did in a paper published in the third volume of the 'Transactions' of the Geological Society. The paper was entitled 'On the Analysis of the Fossil fæces of Icthyosaurus and other Animals.' Dr. Prout was a Fellow of the Royal Society, and many other learned societies. He died at his house in Sackville-street, London, on the 9th of April 1850, in the sixty-fourth year of his age. He was a man of exceedingly retiring habits, and greatly respected by those who knew him intimately.

PRUSSIA. The area and population of Prussia and its Provinces are as follows:—

Provinces.	Square Miles.	Population in 1852.
East Prussia	14,946	1,531,272
West Prussia . . .	9,981	1,073,476
Posen	11,353	1,381,745
Pomerania	12,153	1,253,904
Silesia	15,695	3,173,171
Brandenburg . . .	15,534	2,205,040
Prussian Saxony . .	9,747	1,828,732
Westphalia	7,786	1,504,251
Rhenish Prussia (Rhein-Provinz), and Hohenzollern	10,759	2,972,130
Total . .	107,954	16,923,721

PSAMMA, a genus of Grasses belonging to the tribe *Arundineæ*. It is known by its flower being enveloped in long silky hairs, the lower glume shorter than the upper, and its panicle being spike-like.

P. arenaria, Sea-Reed, Marram, is the only British species. It is found on sandy sea-shores, where its roots assist in binding the shifting sands.

PSOLIDÆ, a tribe of *Echinodermata*, in the order *Holothuriadæ*. The only British genus included by the late Professor E. Forbes in this tribe, is *Psolus*, which is thus characterised:—Body irregular, ascidiform; suckers in five rows, three only of which are developed and placed on a soft foot or disc; tentacula ten.

P. phantapus (*Holothuria phantapus*, Linnæus), the Snail Sea-Cucumber, is an inhabitant of the British Seas. It is of a brown colour, has the head reddish-white with orange spots and orange tentacula, the body covered with pectinated scales, or rugæ. It adheres to substances with great firmness by means of its ventral disc. "So powerfully does it adhere," says Professor E. Forbes, "that I have known the head of the animal carried away by the dredge when it brought up entire every other fixed animal which it came in contact with." It is found in European seas, and the genus ranges to the Indian seas. Professor Forbes says, "the *Psolus ternaria* of Jäger and Lesson, should form the type of another genus, distinguished by its twenty tentacula. The genus *Cuvieria* of Peron should be united with *Psolus*." (Forbes, *History of British Star-Fishes.*)

PUBLIC HEALTH. The general interest taken by all classes in whatever concerns the public health, and the still-growing desire for the adoption of measures of sanitary improvement, which form so marked a characteristic of the present age, may be said to have received their earliest impetus from the 'Inquiry into the Condition of the Working Classes,' which resulted in the passing of the Poor Law Amendment Act of 1834, and the proceedings of the Poor Law Board called into existence by that Act. The Commissioners appointed to conduct the preliminary inquiry were made conscious of a state of things connected with the dwellings of the working classes, their social circumstances, and their physical condition generally, far more unfavourable than they had previously formed any conception of; and the statements which appeared in their Report produced a strong impression on the public mind, already startled by the dread march of Cholera. When the Poor Law Amendment Act was brought into operation, the information obtained from the various Unions, and published in the Annual Reports of the Commissioners, deepened and strengthened this impression, and led to a desire for a fuller and more specific investigation. Such an investigation the Poor Law Board determined to undertake; the inquiry, in the first instance confined to the metropolis, being entrusted to Dr. Arnott, Dr. Kay, and Dr. Southwood Smith. The Reports of these gentlemen, which were printed in the Fourth and Fifth Annual Reports of the Poor Law Commissioners, disclosed an appalling extent of vice, misery, and disease, as the direct and almost inevitable result of the neglect of the plainest and most rudimentary sanitary laws. The statements of the Commissioners, as might be expected, excited a very painful sensation, and the then Bishop of London (Dr. Blomfield) moved in the House of Lords (Aug. 19, 1839) an address to her Majesty, praying that a further inquiry might be made as to the disease and destitution prevalent among the labouring classes in certain districts of the metropolis; how far the same prevailed in other populous parts of England and Wales; and what measures would be necessary for the removal of those evils. By a subsequent vote the inquiry was extended to Scotland.

The Inquiry was placed in the hands of the Poor Law Commissioners. The general scheme having been organised by the Board, the local investigations were carried on mainly through the medium of the Assistant Poor Law Commissioners, and the medical officers of Unions, but much assistance was derived from the medical profession generally, the clergy, and others; and a large body of information was brought together of a kind similar to that previously obtained by the Metropolitan Commission. This information was arranged and digested by Mr. Edwin Chadwick, then Secretary to the Poor Law Board. His 'Report on the General Sanitary Condition of the Labouring Classes in Great Britain,' printed in 1842, presented not merely the fullest and most complete view that had been brought before the public eye of the physical and social condition of the labouring classes throughout the country, the causes of the prevalence of endemic and epidemic diseases, and the clearest and most comprehensive suggestions for remedying the evils shown to be so widely prevalent, but from it may be dated the origin of those important measures of sanitary reform which we shall presently have to notice, and the broad outlines of which were in fact here firmly sketched. We must not, however, omit to mention, in noticing these pioneers of sanitary improvement, the very important statistical researches of Dr. Farr and the Registrar-General, commenced and carried on simultaneously with the inquiries just described, which have been continued to the present day, and which have served, and still serve, to give precision and specific direction to the observations of other inquirers.

In the Report of Mr. Chadwick, it was shown that whilst in each there were local and peculiar causes of mischief, in all the great towns there were common sources of danger and disease, in the existence of close and confined localities where the over-crowded houses were badly constructed, undrained, or insufficiently drained, damp, dirty, and ill-ventilated, and surrounded with numerous sources of malaria; the seats of almost constant fever and sickness, and that, as a consequence of their enfeebled physical condition, the inhabitants were the earliest and most certain victims of cholera and other epidemics. So evident indeed was the influence of locality on disease, that Mr. Chadwick was able to show that, whilst the mean rate of mortality in a town would be represented as 1 in 42 annually of the whole population, in one district the mortality may be (as in St. George's, Hanover Square, London) only 1 in 57; in another district of the same town (Whitechapel) as much as 1 in 28 annually; or to take another illustration, that whilst in one street, and among a particular class, the average chance of life is sixty years, in another street of the same town, amongst a different class, the average duration of life is only fifteen years. But it was further shown, that although almost necessarily owing to their rapid increase and greater density of population—sanitary considerations having been equally disregarded in all—the evils particularised were, so to speak, intensified in towns like London, with its miserable purlieus inhabited by thousands of wretched wanderers and outcasts; Liverpool, with its 8000 damp cellars, and its 2000 close courts, each with an opening only at one end; Manchester, with whole quarters of narrow lanes and alleys, without any main sewer, unvisited by the scavenger, unpaved, almost impassable from mire, and reeking with filth and stench; the smaller towns, whether agricultural or manufacturing, were all more or less obnoxious to similar charges—all were insufficiently drained and ill supplied with water; all had their St. Giles's, their pestiferous lodging-houses, their fever-nests, their labourers' dwellings, where comfort and cleanliness were impracticable, and where sickness and mortality were greatly in excess. Looking at these statements in the mass and in detail, it was impossible not to agree with the report that this was a state of things discreditable to the intelligence and civilisation of the country, and that immediate and comprehensive remedial measures were imperatively required. For, as Mr. Chadwick forcibly observed, it was incontestible, from the facts deduced, that "noxious physical agencies depress the health and bodily condition of the population, and act as obstacles to education and to moral culture; that in abridging the duration of the adult life of the working classes, they check the growth of productive skill, and abridge the amount of social experience and steady moral habits in the community; that they substitute for a population that accumulates and preserves instruction, and is steadily progressive, a population that is young, inexperienced, ignorant, credulous, irritable, passionate, and dangerous, having a perpetual tendency to moral as well as physical deterioration." And happily he was also able to show that, by the adoption of proper remedial measures, not only might the more palpable and offensive evils be removed, but that "it is probable that the full insurable period of life indicated by the Swedish tables, that is, an increase of thirteen years at least, may be extended to the whole of the working classes."

The remedial measures pointed out as of primary importance were the providing of a sufficient supply of good water to every house, an ample supply being at the same time furnished for the cleansing of the streets, for sewerage, and for protection against fire; the enforcement of improved drainage by the adaptation of drains and public sewers, and the construction of water-closets in houses of every class; the preservation of the natural streams flowing near towns from the pollutions caused by the influx of the contents of the public sewers, and the employment of the sewage for agricultural purposes; the adoption of measures for securing a better class of labourers' dwellings; the licensing of common lodging-houses, and placing them under strict sanitary and police regulations; the establishment of baths, &c., and the appointment of district medical officers, "independent of private practice, and with the securities of special qualifications and responsibilities, to initiate sanitary measures, and reclaim the execution of the law." By careful estimates he was able to show that, whilst the expenses of executing these various improvements would in fact be a pecuniary saving, "by diminishing the existing charges attendant on sickness and premature mortality," those expenses might be met with facility by means of loans, on the security of the rates, the charge being spread over 30 years, during which the original outlay as well as the interest should be repaid, and thus be avoided "the oppressiveness and injustice of levies for the whole immediate outlay on such works, upon persons who have only short interest in the benefits." These suggestions have since for the most part been embodied in the Health of Towns Act, and other sanitary measures passed by the Legislature. The subject of intra-mural interment was considered by Mr. Chadwick in a special report in the following year.

But, searching as had been the investigation, and undeniable as appeared to be the facts, and urgent as seemed the necessity for combating the wide-spread evil, so large an aggregate expenditure was requisite for executing the works, and so extensively would the suggested administrative organisation interfere with existing interests, and, as some might conceive, with local management and individual freedom of action, that the government deemed it prudent not to initiate any legislative enactment without instituting still further and more formal inquiries. A Royal Commission, consisting of eminent members of both houses of parliament, civil engineers, and scientific men, was accordingly appointed, in 1844, to investigate, in a systematic manner, the entire range of questions connected with the public health. The evidence collected entirely corroborated that of the former commissions, and the conclusions arrived at were in effect the same as those of Mr. Chadwick. In their Reports, dated June 1844 and February 1845, the Commissioners entered fully into all the great questions bearing on the sanitary regulation of populous places — sewerage, drainage, paving, cleansing, removal of nuisances, consumption of smoke, supply of water, public baths and washhouses, ventilation, arrangement of buildings and streets, and interment in towns—and found, almost universally, all of them in an extremely unsatisfactory condition; and having examined the existing law with regard to those subjects, expressed their opinion that it would "be necessary to have recourse to the aid of the legislature for further enactments, before the improvements so much desired can be fully accomplished."

Thus fortified, the ministers framed a bill embodying many of the recommendations of the Health of Towns' Commissioners, which was laid before the House of Commons in 1845 by Lord Lincoln, then Chief Commissioner of Woods and Forests; but it was explained that it was introduced mainly with a view that its provisions might be carefully considered during the recess, and no attempt was made to carry it further. A change of ministry interfered with its progress in the next session. In 1847, however, Lord Morpeth, who had succeeded Lord Lincoln as Commissioner of Woods and Forests, introduced an amended bill, but though, in consequence of the strong opposition of powerful local interests, he consented to withdraw the clause which included the metropolis within its provisions, he failed to carry the measure that session. In the next session it was again brought forward, and, its urgency having been pressed on the attention of parliament in the speech from the throne, it was passed by both houses; and, on the 31st of August, 1848, it received the Royal Assent.

The object of the Public Health Act of 1848, as stated in its preamble, is to make "further and more effectual provision for improving the sanitary condition of towns and populous places in England and Wales" [the metropolis being excepted from its operations]; for which purpose it is declared to be "expedient that the supply of water to such towns and places, and the sewerage, drainage, cleansing and paving thereof, should, as far as practicable, be placed under one and the same local management and control, subject to the general supervision" of a 'General Board of Health,' consisting of the First Commissioner of Woods and Forests for the time being, and two commissioners appointed by royal warrant, to whom the superintendence and execution of the act are to be entrusted. The Act is of great length, containing no fewer than 152 clauses; but as it is an Act of the greatest public importance, as forming the basis of all subsequent sanitary improvement, it seems advisable to indicate briefly its leading provisions—as, for a similar reason, we have entered at some length into its history.

And first, as to the application of the Act. It was in no case to be applied without a public preliminary inquiry, which the General Board had the power to order on the petition of one-tenth of the ratepayers of any such place as came within the cognisance of the Act, or where the average deaths for seven years should appear, from the Registrar-General's Returns, to be above 23 in a thousand. In either of these cases a superintending inspector may be sent—14 days' notice by advertisement, &c., having been given in such locality—to examine personally and by witnesses into the sewerage, drainage, water supply, burial grounds, &c., and report thereon to the Board. If the General Board now deem it expedient to apply the Act, the Queen may, if there be no local act, by an Order in Council order the Act, or any part of it, to be put in force in such place: where there is a local act, the Privy Council may make a provisional order for its application, such provisional order to be afterwards sanctioned by parliament. In every such case the carrying out the provisions of the Act is entrusted to the Local Board of Health created by it, who are to appoint a surveyor, an inspector of nuisances, and a medical officer, with other necessary officers. In a corporate town the members of the Corporation are to constitute the Local Board of Health, in other places the members are to be elected by the ratepayers; in all cases the entire sanitary government is vested solely in the Local Board of Health.

As to the powers of the Local Board,—it is imperative on them to provide for the effectual drainage of their locality, by the construction of new, or the repair of existing sewers; and for house drainage by causing sufficient drains to be constructed in all new houses, or in any house which may be without a proper drain communicating with a main sewer; they may also cause due provision to be made as to privies, water-closets, &c., public and private; and they must at all proper times cause a thorough surface cleansing and watering of all streets; provide for the storing and taking away of dust, &c.; and cause nuisances to be removed, and filthy and unwholesome dwellings, &c., to be purified and whitewashed. The board may also provide a constant supply, at pressure, of pure water, for the purposes of the Act; but not construct new water-works if a Company is able and willing to provide a sufficient supply on reasonable terms; and in any case the local board must obtain the sanction of the General Board before contracting to purchase old, or to construct new water-works or gas-works. The office of surveyor of highways is vested in the local board, who must see that the highways are properly paved and lighted; that new streets are formed, and that all new buildings are constructed in accordance with the terms of the acts of parliament. The local board may also, subject to the control of the General Board, close any surcharged burial ground, and provide general cemeteries for persons of all religious denominations. Also, subject to like control, form, or contribute to the forming, of public walks, pleasure grounds, &c. Slaughter-houses are in future to be registered and regulated by the local boards; as are likewise common lodging-houses. To provide the means for the purposes of the Act, the local board may levy taxes, and for the construction of any permanent work may—but only with the sanction of the General Board—borrow money, to be repaid with interest, by means of a special rate, within a period not exceeding 30 years. Provision is made for appeal, in various cases, to the General Board, on the part of persons who regard as excessive the assessments or charges made upon them for private improvements, and also against various orders of the board which may lie open to the appearance of being partial or oppressive to individuals.

The intention of the Act in respect of local management and central control has been, in short, to cast upon the inhabitants of a town the duty of making provision for the public health, and of carrying out local improvements, by means of a local agency elected by, and responsible to, the rate-payers; while, in order to ensure the efficiency of the more costly and permanent works and their economic construction, the due qualification of the sanitary officers, the security of individuals from local bias and oppression, and the assuring of future rate-payers from the burdens arising out of an unthrifty mortgaging of rates, a General Board is provided with a certain well-defined power of supervision and control. Mr. Chadwick, who, beside the Reports noticed above, had taken a leading part in inquiries embodied in two other reports on the water-supply and the drainage of towns—in the former of which he strenuously advocated the adoption of the constant service system, and in the latter gave an elaborate and lucid exposition of the advantages of drainage by glazed earthenware pipes—was one of the members of the General Board appointed under the new Act; and to his intimate acquaintance with the whole subject, and well-directed energy, its early success must mainly be attributed. Subsequent acts, continuing, and in certain minor points amending, the original Act, have been passed; and in 1854 one by which the General Board was re-constituted, under the provisions of which the Board now consists of a President, the principal Secretaries of State, and the President and Vice-President of the Board of Trade.

There appears, however, a probability that the great principle of the Health of Towns Act, local agency combined with well-defined central supervision and control, is about to be abandoned; a bill having been introduced (April 22, 1858) by the present government, with the declared intention to "decentralise the whole system." It proposes to allow the General Board of Health to expire in September 1858; and to enable the ratepayers of towns to constitute local boards, which, as well as the existing local boards, "shall have the amplest powers of self-administration, and shall no longer be subjected to the necessity of referring to a Central Board in London." Individuals feeling themselves to be aggrieved are to have a power of appeal to the Secretary of State for the Home Department. In its present crude shape the bill is unlikely to become law, but as it is a concession to a popular delusion against centralisation, it is not improbable that it may, in its main features, be adopted; and thus the accumulated experience and scientific information of the officers of the General Board will be lost, and the door opened wide for a return to the old apathy, mismanagement and negligence, to local inefficiency, waste, peculation, and favouritism. The "general medical functions of the Board of Health" are to be dealt with in a separate measure, "they being distinctly central and governmental functions."

Since the passing of the Health of Towns Act, applications have been made by several hundred places for a 'preliminary inquiry' into their sanitary condition by the inspectors of the General Board. How much such an act was needed—how little had been accomplished by mere local effort, notwithstanding the appalling disclosures of the Poor Law Board Reports, the Reports of the Royal Commission, the Returns of the Registrar-General, and the teaching of cholera and fever—has been shown in the most convincing manner by these 'preliminary inquiries,' ranging in time from the passing of the Act to the present day, and extending over almost every district of England and Wales. We had selected from recent reports of the superintending inspectors a few special instances as illustrating the present state of too many 'towns and populous places,' not yet brought under the cognisance of the Health of Towns Act, including sea-side and inland watering-places and resorts of invalids; mining and manufacturing towns and villages in the north of England and of Wales; rural towns of the eastern, southern, and midland counties, &c.; but our space is limited, and they, after all, but tell, with variations, the same sickening story of wretched quarters—often in close, though scarce-suspected proximity with the open and airy dwellings of the affluent—dark, close, crowded, loathsome, undrained, and without the commonest appliances for decency, with an insufficient supply of water, and, what is to be obtained, hard and impure; many of the streets where fever is never absent; lodging-houses where men, women, and children are huddled together by the score in low filthy dens; slaughter-houses, with all their abominations, in the very midst of the most densely populated localities; burial grounds surcharged, and the like—all seemingly continued in defiance of sanitary principles the most obvious to the commonest understanding, but, in truth, usually continued through sheer ignorance on the part of the influential classes that such things exist, and the absence of any responsible officer whose duty it is to make himself acquainted with their existence and to apply the remedy. And, unhappily, it now needs no reference to our towns and populous places, where every one has been left to do as he likes with himself and his own, to illustrate the evil consequences of neglect of sanitary regulations. For the miserable loss of health and life among our soldiers at Scutari and in the Crimea, where—as military authorities themselves admit—the arms of the enemy slew but few in comparison with the ravages of disease, and the recent astounding disclosures respecting our barracks at home, more than sufficiently prove all that the most earnest advocate of sanitary reform has asserted of the necessity for constant and judicious watchfulness, and authoritative control. Happily, too, in the same quarter we have a striking illustration of the benefit of sanitary regulations. For, both in the hospitals of the Bosphorus and in the camp in the Crimea, no sooner had the remedial and precautionary measures of the Sanitary Commissioners, sent out from England in January 1855, been brought into operation, than the number of deaths, and the amount and violence of the sickness, were abated; and ultimately the very remarkable fact was established, that notwithstanding all the hardships, exposure, and fatigue attendant on a state of warfare, the actual mortality was lower than in the barracks in England—a fact which renders the more strange and indefensible the state in which those barracks should afterwards have been suffered to continue.

Up to the end of 1857 about 250 places had been brought under the operation of the Health of Towns Act. In a fair proportion of these places sanitary works of an efficient order have been executed. The sanitary works have of course been chiefly those of drainage and water supply, and in both these matters some of the works have been on a scale of considerable magnitude. By the earthenware pipe drainage system, which adapts itself readily to any size of place or peculiarity of site, the local boards have in most instances been enabled to effect thorough drainage with comparative readiness and economy. The utilisation of the sewage has not however yet been brought into general successful operation; and in some places complaints have been made that the successful drainage of the town has resulted in the pollution of the natural streams—a necessary consequence of such works where the outfall is into the water courses, and no sufficient measures are taken for the utilisation of the sewage, and the purification of the waste water. The means adopted for obtaining and distributing an ample supply of pure water have proved very generally satisfactory, and now in numerous places where only a scanty supply of hard and impure water was obtainable, every house is abundantly provided with water of excellent quality. And wherever these sanitary works have been judiciously planned and properly carried out, there has followed a marked improvement in the general health and comfort, while the expenditure and attendant taxation have been for the most part far less burdensome than where very inferior works have been executed under the old local improvement acts.

To the improved health and decreased mortality in several of these towns the Registrar-General has in his Reports borne testimony; and still more striking testimony has been borne by the Local Boards of Health themselves. Thus the Macclesfield Board say, in a Report addressed to the Town Council, that the death tables of the borough show that the mortality, which before the application of the Act averaged 33 in a thousand, has during the three years of the operation of the Board been reduced to 26 in a thousand; that infantile mortality—always a trustworthy test of sanitary condition—has been reduced 13 per cent.; that in the "old haunts of fever" not a single fatal case has occurred; and that the mean duration of life in the town has been lengthened. The application of sanitary measures has not however been confined to the towns under the Health of Towns Act. Several of the largest towns are carrying on similar works under their local acts. At Liverpool and Manchester, for instance, vast and very costly works have been constructed for bringing to those places a supply of pure water from a considerable distance; and at Glasgow a similar supply has been obtained, at a great expense, from Loch Katrine.

We stated that the metropolis was exempted from the operations of the Health of Towns Act. Several Acts were indeed passed to meet particular evils, but notwithstanding that the necessity for stricter sanitary supervision was admitted on all hands, so strong was the feeling of the civic corporation and the parish vestries against centralisation of authority, that it was not till 1855 that a measure intended to secure to London the same sanitary improvements as the Health of Towns Act offered to the rest of the country, became law. The Metropolis Local Management Act is however a far longer and more cumbersome measure than the former (it contains 251 clauses and several schedules), and its machinery is larger and more complex; it must suffice therefore to say that its objects and scope are very similar, however different in some respects are its modes of operation. The executive body created by it is entitled the 'Metropolitan Board of Works,' and consists of a president, with a salary of 1500*l.* a-year, and 45 members elected by the vestries of the metropolitan parishes, and the common council of the city. To this board was transferred the powers of the former Commissioners of Sewers, the supervision of all metropolitan buildings, the laying out of new streets, and the entire sanitary regulations of the metropolis. But within certain limits a controlling power was entrusted to the Chief Commissioner of Works and Buildings. The great work which was cast upon the new board was the purification of the Thames, by the interception of the sewage of London, which the board was ordered by parliament to accomplish. In this it has however made little progress, not having been able to satisfy the government (or the public) of the sufficiency of its plans. In other great matters, as the laying out of new main thoroughfares, the formation of parks, &c., it has also been content to discuss and to plan. In small matters its officers have found sufficient occupation. But on the whole, as from its constitution might have been anticipated, it has hitherto proved rather a board of discussion than, as it claims to be, a board of works.

The Health of Towns Act, and special Acts similar to the Metropolis Local Management Act, would pretty well suffice, if properly carried out, for the sanitary regulations of the towns in which they are brought into operation. But as there are many towns in which such acts have no force, general measures have been, and still continue to be, required to meet particular sanitary evils. We cannot enumerate all of these, but it may be convenient to mention the chief sanitary laws enacted during the last ten years. The Act to encourage the establishment of Baths and Washhouses, passed in 1846, is noticed under another head, [BATHS AND WASHHOUSES, *S.* 2]; and as the Towns Improvement Act of 1847, which consolidates previous acts respecting paving, draining, cleansing, and improving towns, and contains many valuable new clauses, created no new machinery for carrying its provisions into effect, and accomplished much less than its framers anticipated, we may pass at once to the measures passed subsequently to the Health of Towns Act.

The Nuisances Removal Act (1848) was intended to effect with respect to the removal of nuisances, and the enforcement of regulations for the prevention or mitigation of epidemic, endemic, or contagious diseases, the same end in places not subject to the Health of Towns Act, as in such towns would be accomplished under its powers. Like that Act this has been more than once amended. In 1849 the only sanitary enactment was an extension of the Metropolitan Sewers Act.

In 1850 was passed an important "Act to make better provision for the Interment of the Dead in and near the Metropolis." Recognising the great truth that all interment within the boundaries of a city is in opposition to sanitary principles, it provided that when the General Board of Health, who were appointed to carry into effect the provisions of the Act, should see fit, they might report to her Majesty that interment in any church, chapel, or burial ground, ought to be discontinued; whereupon the Privy Council was empowered to issue an order directing burials to be wholly discontinued therein after a certain fixed period. The Act also empowered the General Board to purchase existing, or to form new cemeteries at convenient distances from the metropolis. This Act was repealed in 1852, and a new one substituted for it; but to this Act may be ascribed the abolition of intra-mural burial, and the construction of spacious and neat cemeteries on all sides, but at some distance from the metropolis, though the actual accomplishment of these good objects was left to its successor. By the Act of 1852 parishes or districts willing to construct new burial grounds were empowered to elect Burial Boards, to which were entrusted the construction and management of the burial grounds, subject to the approval of the Secretary of State for Home Affairs. An Act was passed the following year amending the Burial Act of 1852, and extending its provisions to any city or town in England. Another emendatory Act was passed in 1857.

In 1850 was also passed an Act bearing on the health of young persons and females working in factories,—by which, as amended in 1853, the period of labour of such persons was restricted to between the hours of six in the morning and six in the evening, or during winter from seven to seven, and on Saturdays only to two in the afternoon.

A much needed Act was passed in 1851 for the Well-ordering of Common Lodging Houses; and in the same session one for encouraging the establishment of such houses of a superior kind. These Acts did not apply to the Metropolis or to Scotland. The former of these Acts was much improved, and extended to all common lodging-houses, by an additional Act in 1853. How much such a measure was required, what has been already said will have sufficed to show; but as the power of entry and of regulation is still by some regarded as oppressive, an instance or two, exhibiting in detail the true character of such places immediately before the passing of the first Act, from the reports of the superintending inspectors of the Board of Health, may not be superfluous. But we shall only give one or two instances; for such details, though it is unwise to shut one's eyes to their reality, are too painful and humiliating to dwell on; and we select them not from the great centres of population, where their condition is pretty well understood, but from smaller places, where their existence might hardly be anticipated. In Bacup, Lancashire, Mr. Lee found the common lodging-houses "hot-beds of disease and vice. . . . Men, women and children, and frequently dogs, form a promiscuous herd, all sleeping in the same room, from which every breath of pure air is excluded. . . . Most of the lodgers sleep in a state of absolute nudity, and decency, with the greater portion of them, has long ceased to be thought of." In one house he found, in a single room, six beds, in which were "4 females, 9 males, and a dog." In another he found in one room 7 beds, containing 7 females and 9 males. But bad as this seems it is purity itself in comparison with what has been found in other parts of the country. Thus at Cardiff Mr. Rammell, another Superintending Inspector, describes and gives plans of a street (Stanley-street), several of the houses in which are common lodging-houses. One, No. 17, is larger than most others in the same street. Like the rest it has but a single living room, which is 15 feet 10 in. long, 17 feet 2 in. deep, and 8½ feet high. This room the Superintendent of Police visited by Mr. Rammell's desire. On the first visit he found in it "54 persons, men, women, and children; they live, eat, and sleep all in this one room." He visited it again the following week in the day time, and "found 45 inmates, but many more came in to sleep at nights. . . . There are no bedsteads, but all the lodgers lie on the ground or floor. . . . Each party had with them all their stock, consisting of heaps of rags, bones, salt-fish, rotten potatoes, and such things. The stench was hardly endurable." This living room opened into a small outer court, in one corner of which was an open privy. On a third visit, seven days later, he found on the floor of the crowded room a woman who had been confined there two days before. Who shall say that places such as these did not need "well-ordering," even at the risk of some little infringement on the owner's right over his castle? The "well-ordering" Act has everywhere operated good; and as far as it has been realised the other has been extremely beneficial.

The Smithfield Market Removal Act of 1851; and the Metropolis Water Supply Act of 1852 (by which the water companies taking their supply from the Thames are, with the exception of the Chelsea Company, prohibited from taking any water for such purposes from any part of the Thames, or its tributary streams below Teddington lock), are sufficiently referred to in the following article. [Public Improvements, *S.* 2.]

In 1853 was passed an Act which, as amended by the Act of 1857, renders it compulsory to have all furnaces employed for manufacturing purposes within the limits of the metropolis, and the furnaces of all steam-boats plying on the Thames, so constructed or altered as to consume their own smoke, a measure which has already produced an appreciable influence on the London atmosphere. In the same year the legislature rendered the practice of vaccination compulsory.

In 1854 was enacted the Board of Health Reconstitution Act, and amendments of the Metropolitan Burials Act, and the Metropolitan Sewers Act, which have been already referred to. In 1855 were passed—an extremely useful Act for the Inspection of Coal Mines, which may be expected eventually to effect important sanitary improvements in such places; an Act for the better Prevention of Diseases, which gives the General Board of Health additional and stringent powers in case of the recurrence of any formidable epidemic, endemic, or contagious disease; an Act for the amendment and consolidation of previous Nuisances Removal and Diseases Prevention Acts—of considerable importance, as in fact repealing all previous acts and more strictly defining the powers of the various bodies appointed to enforce its provisions; an Act to amend the Laws relating to the construction of Buildings in the Metropolis and its Neighbourhood; and an Act for Facilitating the erection of Dwelling-houses for the Labouring Classes. Subsequent acts of a sanitary character have been chiefly emendatory.

Our review has been confined to England and Wales, and it is there that the greatest progress has undoubtedly been made. But in Scotland, by the very important 'Act to make more effectual provision for regulating the police of towns and populous places in Scotland, and for paving, draining, cleansing, lighting, and improving the same' (1850); the Burial Grounds Act (assimilating the system to that of England), and the Act to Facilitate the Erection of Dwelling-houses for the Working Classes (1855); and the Smoke Nuisance Abatement Act of 1857; and in Ireland by the Towns Improvement Act of 1854; the Act to encourage the providing of Improved Dwelling-houses for the Labouring Classes (known as the Cottier Tenant's Act), and the Burial Grounds Act (similar to the English Act) of 1856, very much has been done towards placing those portions of the empire on a level with England in reference to its sanitary provisions. Much doubtless remains to be accomplished in and for our populous places—indeed sanitary improvement can but be regarded as in its early stage of progress—but it is impossible to look thus cursorily over what has been accomplished within the last few years without thankfulness, or forward without hope.

All that we have said has had reference to 'towns and populous places,' and it is in them that sanitary laws are most needed, and sanitary legislation most applicable. The average excess of mortality in town districts is at least 8 in the thousand over that of the country districts of England. Yet even in country districts, as was well observed by the

Registrar-General in one of his valuable reports (1856), "there is room for immense improvements in the sanitary condition of the population." And we cannot perhaps better conclude a paper on the Public Health, in which the sanitary state of the town population has been almost exclusively dwelt on, than by quoting what he—speaking with the authority derived from a knowledge unrivalled in extent and accuracy of the sanitary state of the whole of England and Wales—whilst asserting his belief that the mortality of England as a whole is lower than that of any other country in Europe,—says of the sanitary condition of the rural districts:—

"The germs of insalubrity are scattered about in every village; for the rational laws of health are violated alike in the cottage and in the farmhouse. The dwelling-houses sometimes rest on damp undrained ground; they lie often at the bottom of pit-like depressions of the earth, instead of standing on the sides of the higher grounds, from which the water flows away naturally, and the decaying organic emanations are dispersed and decomposed by the winds. The farmhouse is often close to the farmyard, on a low part of the farm, and is surrounded by buildings, ricks, and trees. In the yard, or near it, the refuse of the house, and of all the animals, is kept month after month undergoing fermentations, and giving off noxious vapours. Into the pond, out of which the cattle drink, the ammoniacal liquor falls that should find its way over the land. And it happens that if the air is stagnant for some days, if the temperature is high, if some sick person or diseased animal enters the place which is surrounded by salubrious fields, the farm becomes a scene of suffering, the cattle perish by pleuropneumonias, the children are attacked by scarlatinas, the wife has low fever, or the farmer himself dies, and his name, at a premature age, is enrolled in the register of deaths. About 6,426 English farmers die in a year, and of them many are young; 2,605 are under 65 years of age.—In the dairy, a little dirt spoils the milk, butter, or cheese; unless the vessels of the brewery are clean the ale is injured; and farmers have hence learnt by experience the importance of cleanliness in the interior of their houses. From them the taste for household cleanliness has been diffused through the surrounding population. They have only to render the air which they breathe about their houses pure, to become, with those around them, the halest people in the world.—To place any of the new farmhouses and cottages to be built on certain elevations is the first point; to carry out and to cover with earth all the refuse of the house and yards daily would prevent the escape of the ammonia, the most precious part of the manure, and at the same time rid the atmosphere of the fatal malaria that surrounds the farmhouses and cottages of the country.—These matters well deserve the attention of English landed proprietors, as they are generally much better informed in sanitary matters than their agents, and can at once give effect to improvements beyond the reach of the small proprietors of other countries."

PUBLIC IMPROVEMENTS. The present article is intended to indicate broadly the progress of architectural and other public works of an important character in the metropolis since the publication of the 'Penny Cyclopædia,' and, though with less particularity, similar progress in provincial towns.

Since that date London has been greatly altered. If there have been no such rapid or extraordinary architectural transformations as in Paris, there has been continuous and steady improvement. New streets have been opened, and obstructions removed in many old streets. New towns almost of so-called 'villas,' have been added to the suburbs on nearly every side. New parks and public places have been formed. The drainage of the vast area which is now included within the metropolitan boundaries, has come to be regarded as a question of general concernment, and while the existing system has been greatly improved, a scheme of metropolitan drainage, of a magnitude unrivalled in the capitals of ancient or modern Europe, by which the entire sewage of London and its environs will be carried some miles below the metropolitan limits before it is discharged into the Thames, only seems to wait for its adoption by the government a decision as to certain subsidiary points on which the representative of the government and the representatives of the London parishes hold different opinions. Intra-mural interment has been declared illegal, and numerous convenient cemeteries, some of them of great extent, have been formed at a due distance from the City. The water-supply has been increased and purified; and many other sanitary reforms have been accomplished. New museums and other educational institutions of a national character have been established. A vast legislative palace has been reared; a new Royal Exchange, numerous churches and chapels, and many other public buildings of considerable size and costliness, as well as many great commercial works, have been constructed; and street architecture has assumed an entirely new character and consequence. And in all these matters the larger provincial towns have in their proportions kept pace with the metropolis. It would indeed be scarcely an exaggeration to assert that more and greater public works have been constructed, and more public improvements have been effected during the last twenty years, than during any previous hundred years.

New Streets.—The new streets in the metropolis have added much to the public convenience, and greatly improved the appearance of certain quarters; but much more might have been easily accomplished had the improvements been carried out as part of a well-considered general plan, instead of being disconnected and local expedients. In the City, however, something like a general plan has been observed. The erection of the new London Bridge led to the formation of new lines of approach, and the opening of these showed the necessity of still greater changes; and the civic authorities have since kept that necessity steadily in view. The erection of the new Royal Exchange afforded an opportunity for opening the area surrounding that building. By the removal of the south side of Cannon Street, and the houses westward to St. Paul's, an excellent street—New Cannon Street—has been formed from King William Street to the east side of St. Paul's Churchyard. This street has been for the most part lined with large and lofty warehouses, many of them of considerable architectural pretension: it is greatly to be hoped that the corporation will not allow the fine view of St. Paul's Cathedral opened by New Cannon Street to be obstructed by the erection of a building on the triangular space at present left unoccupied at the north-western corner of the new street. To render New Cannon Street as serviceable for traffic as from its width and position it ought to be, it will be necessary to make very extensive alterations in the area surrounding St. Paul's Cathedral—and such alterations are equally desirable for the architectural effect of that edifice. Another, though less important new line of thoroughfare, is Gresham Street, extending from Lothbury to the Post Office. More recently a wide street has been formed as a continuation northward of Farringdon Street. It is called Victoria Street, and extends from the foot of Holborn Hill to Clerkenwell Workhouse. It passes through a very poor neighbourhood, and as yet no buildings have been erected along it.

Beyond the limits of the 'City,' the first place among the new lines of street must be assigned to New Oxford Street, which connects Holborn with Oxford Street by a straight and wide road, which passes to the north of the old mean and circuitous way by St. Giles's Church. On the north side of New Oxford Street a few good houses have been built, but much less has been done for the architectural aspect of the street than could have been wished. In the same vicinity Endell Street has opened a way from Long Acre to Bloomsbury, and thus formed a tolerably broad though somewhat awkward and indirect thoroughfare from the Strand by Waterloo Bridge to New Oxford Street and Tottenham Court Road. Cranbourne Street at the west end of Long Acre and New Coventry Street, between Leicester Square and Coventry Street, have in like manner afforded a somewhat better outlet eastward from Piccadilly, but further improvement is still greatly needed in that quarter. At Westminster a fine line of road has been formed from the Abbey to Pimlico, but the greater part of it remains uncovered with buildings; at present only a few blocks of lofty houses, intended to be let out in flats, have been built, and of these the larger part are unlet or unfinished—the system of separate floors, or flats, appearing to be by no means congenial to English tastes or habits. At Pimlico considerable improvements have been effected by the removal of the large mass of houses about Buckingham Gate which formed so great an obstruction to the road-way, and so unsightly an appendage to the royal abode, the grounds of which have thus been somewhat extended; and at Chelsea by the continuation of Sloane Street, and by the formation of some streets as approaches to the new suspension bridge. At the east-end of London the most important new line of street is one called Commercial Street, extending from Whitechapel

High Street (opposite Leman Street) to Spitalfields Church, whence it is continued by New Commercial Street to Shoreditch, near the terminus of the Eastern Counties Railway; thus, with certain improvements at the other extremity, opening a direct thoroughfare from the London Docks to Shoreditch. A new line of street on the Surrey side of the water, from High Street Southwark to the Waterloo Road, and others on the Middlesex side have been approved by the Metropolitan Board of Works, but the execution of neither of them has been commenced.

Parks.—The oldest of the new parks is *Victoria Park*, on the eastern side of London, which was commenced in 1842. Its area is about 290 acres; it stretches east and west from Bethnal Green to Hackney Wick, and is bounded on the south by Duckett's Canal. Victoria Park was laid out with more regard perhaps to convenience than to picturesque effect, but it is yearly increasing in attractiveness as the trees with which it is planted increase in size and vigour. A portion of this park has been appropriated as a free cricket and play-ground, and a free gymnasium has also been formed—both of which have proved, as well as the park itself, invaluable sources of enjoyment to the poorer classes of the extreme east of London. *Battersea Park*, occupying the marshy tract on the right bank of the Thames, of which the notorious Red House may be taken as the centre, was commenced, after much delay, in 1854, and was thrown open in 1857. The works here have been of a more ornamental character than in Victoria Park, and altogether it already wears much more the aspect of a pleasure-ground. Its area is about equal to that of Kensington Gardens. It contains a large sheet of ornamental water; and a portion of the park is set apart as a sort of garden, and well stocked with shrubs and flowers; a noble river esplanade, 120 feet wide, extends the whole length of the park; and the park itself is well provided with broad walks and convenient approaches. A handsome suspension-bridge gives the inhabitants of Chelsea ready access to the park. As in Victoria Park, it is proposed to build villa residences along its borders. Like Victoria Park, it has provided an agreeable and much-needed place of open-air recreation to a very poor and densely populated locality. Its total cost has been about 313,000*l.* Kennington Common, which had been permitted to fall into a very disreputable state, has by government assistance been enclosed and planted. It has been somewhat absurdly dignified with the title of *Kennington Park*, but, though it has no claim to such a designation, it forms an agreeable pleasure-ground. The model cottages erected by Prince Albert near the site of the Exhibition of 1851, have been re-erected as an entrance lodge to Kennington Park. *Primrose Hill* has also been secured for public use, and a level piece of ground at its foot has been appropriated as a play-ground. As in Victoria Park a gymnasium has been formed here, and is much resorted to during the season. An Act has been obtained for the formation of a park between Highbury and Stoke Newington to be called Finsbury Park, but its construction has not yet been commenced (May, 1858). Another park has been projected for the use of the inhabitants of the south-eastern extremity of the metropolis, to be formed in the meadows between Rotherhithe and Deptford; but it is at present only a project. In the old parks many improvements have been made by better draining, the formation of new walks, the erection of new lodges and gates, the addition of numerous seats, &c. The most extensive improvements have been perhaps effected in St. James's Park, where a new broad entrance has been made between Marlborough House and St. James's Palace, and in a line with it a suspension-bridge for foot passengers (by no means a favourable specimen of that kind of bridge, however) has been thrown across the ornamental water, new approaches being at the same time formed on the other side. The lake has also been cleared, and a new bottom constructed of thick concrete, thereby at once increasing the facilities for cleansing the water, and affording greater safety for skaters.

Architecture.—The most important building erected in London during the period of which we are treating—the most important indeed which has been erected in London since St. Paul's Cathedral—is the new Palace at Westminster. The old Houses of Parliament were destroyed by fire on the 16th of October 1834. In July 1835 the government advertised an open competition for a new building in the 'Gothic or Elizabethan style.' Ninety-seven designs, comprising above eleven hundred drawings, were sent in, and the Commissioners who had been appointed to adjudicate, decided in favour of a design by Mr. Charles Barry, R.A., then best known as the architect of the Travellers' and Reform Club-Houses. After the usual preliminary inquiries Mr. Barry was instructed to carry out his design. The first portion of the works undertaken was the river wall, which was constructed by means of a coffer dam, under the joint superintendence of the architect and Mr. Walker, the celebrated civil engineer. On the completion of the river wall, the foundations of the building having been simultaneously proceeded with, the first stone of the building was laid, without any ceremony, by the architect's wife, April 27, 1840. From this time the works have been prosecuted with only such interruptions as were necessitated by the appointment and proceedings of committees of the two Houses of Parliament, royal and parliamentary commissions, commissioners of works, ventilation directors, and other principal and subordinate authorities, and the alterations they at different times made in the plans of the architect and of each other. The House of Peers, with its libraries and offices, was opened on the 15th of April 1847. The House of Commons, with its offices, was opened on the 3rd of February 1852; and on the same day all the public entrances, the great Central Hall, and St. Stephen's Hall, were thrown open—all, like the laying of the first stone, being done without any public ceremony: but about the same time the architect was knighted. "Since that time," says the architect's son, Mr. E. M. Barry, (in a paper descriptive of the new palace, read before the Royal Institute of British Architects, Feb. 1, 1858, and of which, as it may be regarded as semi-official, we have made free use) "most of the remaining portions of the edifice have been completed, and at this moment very little remains to be done. The Speaker's House is all but finished, and will be occupied after Easter. The residences in the south wing will be completed in a few months, and before long the main towers, the royal gallery, and the royal staircase will be ready for occupation, so that by the close of the year the present works at the new palace will be brought to a close. Much has been said," continues Mr. Barry, "about the time the edifice has taken to construct, . . . but when the difficulties of all kinds which have beset the work are duly considered, and it is borne in mind that the public business of the country has never been interrupted for an hour, but has always possessed temporary accommodation on the site, which has only been handed over piecemeal to the builders—architects, at any rate, will not think the time that has elapsed between the laying of the first stone in 1840, and the completion of the building in 1858, has not something to show in the work that has been done." In this we quite agree with the writer. Whatever else there may be to complain of, the time that has been spent on the building, the extent, character, and complexity of the works, even had there been no extraneous hindrances, would have amply explained and justified; indeed it is probable that no other building at all approaching it in size, solidity of construction, and richness and extent of ornamentation, has ever been erected in anything like so short a time.

The style of architecture adopted for the new palace is that commonly known as the perpendicular Gothic of the reign of Henry VII., but that style is chiefly known from the ecclesiastical and collegiate buildings erected in or about the reign of that monarch, whereas the architect himself says of the new palace, "it has been my aim to avoid the ecclesiastical, collegiate, castellated, and domestic styles, and to select that which I consider better suited to the peculiar appropriation of the buildings." The east, or river front, which stretches along the Thames a length of upwards of 900 feet, and contains the libraries and committee-rooms, was the first portion of the exterior completed. Of this façade the central portion is a story higher than the rest, and two towers with high roofs flank each extremity. Except that the end towers project somewhat, the river front is not only uniform in character but unbroken by projecting or receding parts, "reliance being placed," says Mr. Barry, "on breaking up the sky-line to avoid monotony." Throughout this front, as indeed with scarcely an exception throughout the building, the wall-surface is covered with panelling and profusely enriched with carving. "The carving between the stories of the river front was intended as a record in stone of English history. There are thirty-five bays exclusive of the two oriel bays; each of these thirty-five bays contains the arms of an English sovereign, beginning with William I. and ending with William IV. The oriel bays bear the present Royal

Arms of England, with the motto, 'Victoria Regina feliciter regnans.'" Examined closely the effect is extremely rich, though somewhat monotonous; but the enrichment is almost entirely lost when the façade is looked at from a sufficient distance to be viewed as a whole, and this is almost necessarily the case as, being turned to the east, it is never varied or invigorated by the play of light and shadow. It is impossible not to regret that, by the adoption of bold breaks in the outline, a more picturesque combination has not been presented to the river.

The western front is much more varied, and promises to be much more satisfactory. But for its full effect it must wait for the removal of the present most unsightly law-courts, and the completion of the architect's design by the erection of the great public entrance gateway with flanking turrets at the corner of Palace Yard. The great feature of this front is the Victoria Tower, which occupies the south-western extremity of the building. This magnificent structure is 70 feet square, and rises to an altitude of 345 feet to the top of the turrets, being the loftiest tower in existence. It forms the royal entrance to the palace, the basement being a noble arch 60 feet high and 22 feet wide, under which the royal carriage passes. Triple windows of very rich and beautiful design occupy the chief wall-space of the two principal stories. The entire unpierced wall-surface of this vast tower is covered with panelling, with canopied niches containing statues of the monarchs of England, and with the arms and supporters of the different sovereigns. A pierced parapet 16 feet high terminates the walls. Four turrets rise from the angles to a height of 85 feet above the cornice. From the summit of the roof will float on state occasions the royal standard; and the scale on which the whole is contrived may be conceived from the statement that the flag-staff will be "of rolled sheet iron firmly bolted together, 110 feet long, 3 feet in diameter at the base, and weighing between 16 and 18 tons," while the flag, which will be 60 feet long and 40 feet wide, will have to be hoisted to its place by machinery. The Victoria Tower may fairly rank with the very finest tower of mediæval date for beauty and grandeur as well as for mere size. Two other towers form equally important features in the design—the Central Tower, less lofty in itself than the Victoria Tower, but surmounted with a light and elegant spire, which rises to a height of upwards of 300 feet, in many points of view grouping admirably with the main features of the palace; and the Clock Tower at the north-western angle, by Bridge-street, which though little lower than the Victoria Tower, is much less ornate, it being the architect's object "in designing this tower to make the clock the predominant feature: all else was to be pedestal or roof."

In the interior, the chief interest of course centres on the 'Houses of Parliament.' These are placed pretty nearly in the midst of the building. In the very centre is the Central Hall, a noble octagonal chamber covered by a stone groined roof 70 feet in span, which forms the principal floor of the Central Tower. From this hall a corridor and lobby on the south lead to the House of Peers, and a similar corridor and lobby on the north to the House of Commons. The House of Peers, as the chamber in which the sovereign delivers the royal speech in the presence of the members of both houses of parliament, as well as the members of the diplomatic corps and of the royal household, is the larger and more splendidly fitted apartment. But knowing its purpose, the first emotion of the stranger is usually surprise at its apparent smallness. Its proportions are—length 90 feet, breadth and height 45 feet. It has six windows, filled with stained glass, on the east, and the same number on the west side, and three compartments corresponding to them in shape, but filled with paintings in fresco, at the south, or throne end, and three similarly shaped and gilded compartments at the north, or bar end. The ceiling is flat, and divided by longitudinal and transverse beams into 18 compartments, which are subdivided into panels, and these, as well as the wall panels, are richly gilt and emblazoned; indeed every portion of the wall-surface which is not occupied by carved work or statuary, is decorated with gilding or colour; and in respect of its decoration the room is probably the most elaborate and gorgeous which has been constructed since the decline of mediæval architecture. The House of Commons is 69 feet long, 45 feet broad, and 44 feet to the centre of the present ceiling, the original ceiling being concealed by one of a different form, with a view to remedy certain acoustic defects. In character this apartment bears a general resemblance to the House of Lords, but it is much less ornate. Still more than that room, it wears a close and confined appearance. Indeed, though capacious enough for ordinary occasions, it is incapable of containing the entire body of members in their proper places, while the accommodation for strangers is almost ludicrously insufficient, persons who have obtained the necessary tickets of admission being under the necessity, on a debate of any importance, of being in attendance hours before the time for opening the doors in order to have a chance of gaining admission to the gallery. Modern architects have too often designed their buildings with a view rather to certain architectural effects, or to the exigencies of some particular order or style, than to their perfect adaptation to the purpose for which they were erected; but rarely has there been so remarkable an instance as this, where the House of Commons—the very heart and centre of legislation—is, in a legislative palace covering an area of some eight acres and costing upwards of two millions sterling, provided with a chamber too small to hold all the members, yet so ill-adapted for its object that the members can with difficulty hear each other speak, and the public reporters have constantly to note that "the hon. member was quite inaudible in the gallery." The room is however a very handsome one, though less handsome than before the alterations; and for its faulty form and insufficient size the architect is said to be not to blame, the shape and proportions having been imposed upon him by the instructions of his employers.

Connected with the houses are libraries for Lords and Commons, conference rooms, nineteen committee rooms (admirably adapted for their purpose), refreshment rooms, &c.; and it may be mentioned as showing the singular completeness of arrangement which modern appliances permit, that in all the rooms resorted to by the members of the Commons bells are fixed, which are connected with a galvanic battery, "so that the principal doorkeeper is enabled to make contact and ring all the bells at once, by pressing his hand on a button attached to the arm of a chair," and thus announce to the inmates of some thirty rooms that a division is about to take place. These rooms where the business of the country is carried on are approached and connected by numerous corridors—some of extreme richness and splendour, and all very effective architecturally. The old Westminster Hall has been preserved and worked into the edifice, to which it serves as the grand public entrance, and now opens at its northern end into a remarkably fine vestibule and a splendid apartment designated respectively St. Stephen's Porch and Hall. The old crypt of St. Stephens is to be the chapel of the House of Commons. A royal robing room of singular magnificence has been provided by the state entrance, and from it her Majesty passes through the Royal Gallery—another stately chamber—to the House of Lords. The Speaker's House, with its noble reception rooms, occupies the north end of the structure, and there are seventeen other official residences in the building.

Of the fine arts decorations which have been employed with a liberality unknown in any other English edifice we must be content to borrow Mr. Barry's brief summary: "Frescoes have been painted in the House of Lords by Messrs. Dyce, Cope, Maclise, and Horsley. In the upper waiting hall, river front, by Messrs. Cope, Watts, Herbert, Horsley, Tenniel, and Armitage. The Queen's robing room is now in the hands of Mr. Dyce, and the Peers' robing room is committed to Mr. Herbert. Mr. Ward is also engaged on a series of pictures for the corridors leading from the central hall, some of which have already been exhibited. Bronze statues have been placed in the niches of the House of Lords by Messrs. J. Thomas, J. C. Thomas, MacDowell, Woodington, Timbrell, Westmacott, Thornycroft, Thrupp, and Ritchie. Large white marble statues have also been erected in St. Stephen's Hall by Messrs. Foley, Bell, Marshall, MacDowell, Baily and Carew;" a colossal marble group of her Majesty, by Gibson, in the prince's chamber; and Mr. Maclise is engaged in painting the walls of the royal gallery. The whole of the statues and carving of the exterior, were executed by and under the superintendence of Mr. Thomas; the wood carving of the interior, the brass fittings and the furniture, under the superintendence of the late Mr. Welby Pugin, which may account for their excessively ecclesiastical and mediæval character. "The total cost of the structure up to February 1858, as far as the architect is concerned, has been 1,768,978*l.* 8*s.* 1*d.*" (Barry). The entire expenditure has, however, probably already reached two millions. And this expenditure has not been ill-bestowed. In mere extent the building is one of the most spacious of modern structures, covering as it does an area of upwards of eight acres, and comprising eleven hundred apartments, above a hundred staircases (some of them of grand proportions), and more than two miles of corridors and passages; while as a specimen of constructive skill it is in the highest degree honourable to the architect and to the country. We have spoken freely of what we regard as its defects as a work of art, but we gladly record our conviction that, with all its defects, it is by far the most satisfactory, as well as the most magnificent great public building which has during the present or the last century been erected in England, and we believe it to be the finest which during the same period has been erected in any part of Europe.

A year or two back it appeared likely that another building, or series of buildings, would be erected in contiguity with the new palace, and worthy of that edifice, the government having in 1856 offered premiums to the amount of 5000*l.* to the architects of all nations, without restricting them as to style or cost, for a block plan which should exhibit "the best scheme for the concentration of the principal Government Offices, on a site lying between Whitehall and the New Palace at Westminster; and also designs for two buildings which her Majesty's Government have determined to erect forthwith, as parts of such general scheme,—one for the department of the Secretary of State for Foreign Affairs, the other for the Secretary of State for War." By the specified time 218 designs, embracing nearly 2000 drawings, were sent in, and 17 of them, by French and German as well as British architects, received the promised premiums. The premiated block-plans proposed the most extensive, and in fact impracticable, re-arrangements of the site: the designs extremely magnificent but quite practicable buildings. On all hands it was allowed that the successful (and some of the unsuccessful) architects had displayed a very unusual amount of professional knowledge, taste, and power; and that the competition was by far the most successful of any of recent years. In the House of Commons, however, there appeared a very natural disinclination to provide at once funds for so large and costly a scheme, and without any public intimation, the Lords of the Treasury have cast aside the designs which they had induced the profession to prepare on the implied understanding that the work should be given to the successful competitors, and in spite of the earnest protest of Sir Benjamin Hall as commissioner of public buildings, directed a non-competing architect to design a new War Office on a more limited scale. Happily the transaction has been made public before the works have been actually commenced, and it is hardly conceivable that so flagrant a breach of faith can be persisted in, now that its real character is understood. We therefore still have hope that whatever be the size and character of the buildings decided on, it will be referred to the premiated competitors to prepare new designs, and to superintend their execution unless they be found unsuitable.

Next to the new palace at Westminster, the most important recent architectural work is the British Museum, of which the architect was Sir Robert Smirke R.A. This building was in progress when the article LONDON was written: and the portico was completed in April 1847; it was not however opened throughout till 1851. The building itself is the largest and most imposing example in the metropolis of the Grecian Ionic order, and the exterior has a certain monumental grandeur of character not inappropriate to its purpose. The interior few have been found to admire, either æsthetically or for its adaptation to the object for which it was designed. Even before it was completed it was found to be too confined in size, and not sufficiently elastic in plan for its purpose. As early as March, 1837, in an article on 'The New Buildings at the British Museum,' which appeared in the 'Mechanics Magazine,' vol. xxvi. p. 45, the question how best to obtain more room than the new buildings would afford, was discussed, and it was pointed out that "the space thus unfortunately wasted [by the great inner quadrangle] would have provided accommodation for the whole library, much superior to what is now proposed to afford it. A reading-room of ample dimensions might have stood in the centre, and been surrounded on all four sides by galleries for the books, communicating with each other, and lighted from the top:" and the writer, Mr. Thomas Watts (now one of the superior officers of the Museum Library), goes on to show in detail the many advantages which this arrangement possesses over Sir Robert Smirke's arrangements for the library and reading-room in the new building. But as so much care and money had been expended on the architectural features of the great quadrangle "that it might seem barbarous to propose filling up the space," Mr. Watts suggests as another, and perhaps more practicable plan, for obtaining the requisite additional room, to remove one side of Montague Street and Montague Place and make an extension of the building on the eastern and northern sides, on a grand scale, the works to be executed "as occasion shall arise." This latter plan is the same in principle as that officially proposed to the Treasury on the part of the Museum Trustees in March 1848, but first made public in the Reports of the House of Commons for 1852 (except that Mr. Watts proposed to afford accommodation to the chief learned societies, on condition of their collections being opened to the Museum visitors); as the former is in principle the plan which was proposed on the rejection of the other in 1852, and has been carried out in the new Reading Room. Some years later Mr. Hawkins of the antiquarian department in the British Museum proposed to erect a Board-room for the trustees, with studies for the chiefs of departments, offices for clerks, &c., in the centre of the quadrangle, connecting them by corridors with the galleries of the building itself. Mr. Hosking, the first professional architect who appears to have taken up the subject—laid before the Commission of Inquiry into the constitution of the British Museum in 1848, and before the Museum Trustees in November 1849, a plan for erecting within the quadrangle a modified or somewhat reduced copy of the Pantheon at Rome, or in other words a cupola-covered rotunda, 120 feet in diameter, and 120 feet high, "to form a grand central hall for the exhibition of the finer and more important works of sculpture, and of such other objects proper to the purposes of the museum as most require that steady and equable light which is so well obtained from the eye of a cupola, with connected corridors and galleries;" but the project did not meet the approval of the Trustees. In 1849 Mr. Fergusson published a plan of a building within the quadrangle to be used as a reading room and for library purposes; and in 1853 Sir Charles Barry, by direction of the government, designed very extensive alterations in the museum buildings, the chief feature of his design being a grand central hall within the inner quadrangle: but neither the voluntary, nor the commanded design was destined to be carried into execution. Mr. Panizzi, now principal librarian, then keeper of printed books at the museum, had in 1851 pressed on the trustees the necessity for providing additional room for the library, and laid before them a plan for obtaining a reading room and space for a large number of additional bookshelves within the quadrangle. In 1852 he produced a more elaborate scheme, and this on the recommendation of the trustees, the government sanctioned. His plan, as put in working form by Mr. Sydney Smirke, was to erect within the inner quadrangle of the museum a Reading Room, circular in plan, crowned by a hemispherical dome, and to provide space for a large portion, if not the whole, of the printed books in galleries surrounding this great central apartment. This building, of which Mr. Sydney Smirke was the architect, was commenced in March 1854, and opened for the use of readers in May 1857. It is constructed principally of iron,—the supports being cast-iron piers, which carry girders of wrought iron strongly tied together, and these bear the dome. Between the main ribs are brick arches, but the frame-work is of iron, and hence an immense saving of space is effected. The Reading Room is 140 feet in diameter, and 106 feet high: exceeding therefore in diameter every other dome in Europe, except that of the Pantheon at Rome, which is 142 feet in diameter. But it differs from the Pantheon greatly in its proportions and general character; and also in its manner of lighting, the Pantheon being entirely lighted by a circular opening at the top 28 feet in diameter, while the Reading Room has a similar light at the top 40 feet across, and 20 large windows in the base of the dome. Little is seen of the exterior, but the interior proportions and general effect are very pleasing, and it answers the purpose for which it was erected admirably. It affords ample accommodation for 300 readers, for whose comfort and convenience abundant provision is made. In the Reading Room itself the book-shelves hold 80,000 volumes: in the connected galleries and passages there is shelf-room for above a million volumes: and the whole arrangements afford an example of ingenious contrivance, as the building itself is a fine example of constructive science.

Buckingham Palace has been greatly altered both externally and in the inside within the last few years. The front of Nash's Palace is now concealed from the public eye by a new façade designed by Mr. Blore. In magnificence it is however greatly inferior to Nash's façade, bad as that was in most respects. The new front merely suggests the idea of a 'terrace' of a rather superior class of private residences: and the original poverty of character has been increased owing to the circumstance that the stone selected was of so friable a kind that it has been deemed necessary to cover it with paint. The Marble Arch too, which, however incongruous with the palace, assisted in imparting to it a certain dignity of appearance, has been removed; and now forms the Oxford-street entrance to Hyde Park.

The Treasury Buildings, Whitehall, have likewise undergone transformation. By some strange misconception the original building, erected in 1833, was so set out by the architect (Sir John Soane) that it could not be completed according to his design, and it accordingly was left unfinished. About 1845 Mr. Barry received directions to complete it according to a design he had prepared. Soane's façade was consequently made to give place to one of a much more florid character, which was completed in 1847, and which is a rich and elegant example of Italianised Corinthian. Chambers's Somerset House has been as far as possible completed by the erection of a west wing—the construction of a correspondent east wing being rendered impracticable by the erection of King's College. The west wing of Somerset House has been built in a manner in every respect satisfactory: the architect was Mr. Pennethorne. The same architect has also erected several other buildings for the government. One of the most pleasing of these is the Museum of Practical Geology, Jermyn Street and Piccadilly—the back of the building being, for some occult reason, turned towards the leading thoroughfare, the front towards the narrow bye-street. The building is a neat example of the Venetian palatial style; and it has a well constructed lecture-theatre: but the exhibition part of the edifice is not remarkably effective or convenient. Mr. Pennethorne is also the architect of the fragment of the General Record Repository, Fetter Lane; of the additions made to the Ordnance Office in Pall Mall; and of the extensive range of offices for the Duchy of Cornwall erected (1857) in Pimlico. The only other government building which requires notice, and that rather from its extent and massiveness than from its architectural merits—for it is in the most vulgar style of builder's castellated—is the new building at the Tower.

Of civic buildings the chief is the new Royal Exchange by Mr. William Tite. The old exchange was destroyed by fire on the 10th of January, 1838, but the first stone of the new building was not laid till the 17th of January, 1842: it was opened by the Queen in person on the 28th of October, 1844. As in the old exchange there is an open central area appropriated to merchants (110 feet by 53) which is surrounded by a spacious corridor or merchants' walk. The eastern end is chiefly appropriated to 'Lloyd's,' and contains some fine apartments—one being 100 feet long and another 80 feet by 40. The principal feature of the exterior is a Corinthian portico, at the west end, of eight columns with two intercolumniations. This portico is of noble proportions, the diameter of the columns being above 4 feet, their height 41 feet; and the pediment is filled with sculpture by Mr. Westmacott. The other parts of the building display considerable picturesqueness of character, but the southern side has been a good deal marred by the vandalism of the authorities, who have caused the granite piers to be cut away in order to give a little more room to the windows of the shops with which, from motives of economy, the architect had been compelled to disfigure his design. Another corporation building may be noticed here, the Coal Exchange by Mr. Bunning, which was opened with some ceremony by Prince Albert in 1849. Architecturally however it is rather peculiar than beautiful, but it is said to be well arranged: both the Royal Exchange and the Coal Exchange were somewhat freely decorated with arabesques and other designs in fresco by Mr. Sang, but in both the painting has failed to withstand the test of the civic atmosphere.

London has fully participated in the general revival of Gothic church architecture. Churches have sprung up with surprising celerity everywhere beyond the limits of the city proper, but with greatest profuseness in the outskirts. Most of the new churches we had occasion to refer to in the article LONDON were Greek or pseudo-Greek; now not only is every new church belonging to the Establishment as a matter of course Gothic, but almost invariably every dissenting place of worship and every Roman Catholic chapel is also in strict conformity with one of the three 'periods' of pointed architecture. That this has been a great gain cannot well be doubted. Instead of grim caricatures of temples of Jupiter or Venus, or at best Minerva, we have fanes which can only suggest associations of Christian worship—though it may not be at its purest period; and which as architectural features serve to diversify the general monotony of our streets, and by their towers and spires to break the formality of what architects call the 'sky line.' But hitherto there has been, as was the case with the so-called Greek churches, by far too constrained an adherence to mere precedent. The nineteenth century Gothic architects—forced thereto probably in many instances by their clerical employers—have sought chiefly to produce a building which should faithfully accord in general form, as well as in the window-tracery, carvings, and other details, with some supposed type of the 'Early English,' 'Decorated,' or 'Perpendicular' period; and it is not too much to say, with very little regard to the actual forms of worship and requirements of a church whose peculiar system of prayer and preaching was modelled after the latest of those styles of architecture had not merely ceased to exist as a vigorous living reality, but had perished with the season and the order of things to which it belonged. The merit of the majority of recent churches lies therefore in their picturesqueness of external form, and, in the best of them, in the sober 'religious' splendour and impressiveness of their interior. There is abroad however a longing for a more perfect adaptation of ecclesiastical buildings to their actual use, a more thorough application of the discoveries of modern science in their construction, and on the part of architects a growing desire to cast off the merely servile adherence to mediæval precedent: the return, in a word, to the mediæval spirit—to earnestness and truth of purpose, and freedom of thought. And this has already effected much improvement, and we believe will lead to a still greater advance; and if it fail to create for this nineteenth century an architectural character of its own, it will at any rate save it from the condemnation of being purely mimetic. So numerous are the recent London churches and chapels, that it would be impossible, were it even desirable, to particularise them, and it will be sufficient, in order to avoid invidious distinctions, to refer as characteristic examples to the church of St. Stephen, Rochester Row, Westminster (by Mr. Ferrey) erected at the expense of Miss Burdett Coutts; to that at Highbury, by Mr. Allom, which is noteworthy for its effective, though not costly interior; and to the very remarkable one of red and black brick by Mr. Butterfield, in Margaret Street, Langham Place, which will when finished exhibit probably the most perfect illustration in London or its vicinity of the views and anticipations of the 'ecclesiologists;' to Pugin's Roman Catholic cathedral of St. George, Southwark; to the cathedral of the Catholic and Apostolic church, Gordon-square; to the Independent Chapels at Clapham, and at Avenue-road, St. John's Wood; and to the Baptist Chapel, Bloomsbury.

Of recently erected places of public entertainment, the principal is the new Opera House, Covent Garden. Covent Garden Theatre, built by Sir Robert Smirke in 1808-9, after various reverses of fortune was finally abandoned by the English drama, and in 1846 the interior was entirely remodelled by Mr. Albano, to adapt it to the service of the Italian opera. But it met with the usual fate of theatres, being destroyed by fire March 5, 1856. For a time it seemed probable that it would not be rebuilt, but the obstacles were ultimately removed, and a new theatre is rapidly advancing towards completion, which has been designed by Mr. E. M. Barry with special reference to the requirements of the opera, but with various novel arrangements, which are intended to render it easily available for the regular drama, or for concerts, public meetings, &c. In size the new theatre is about one-fifth larger than its predecessor, being 240 feet long, 122 feet wide, and nearly 100 feet high, which is nearly equal to the dimensions of La Scala at Milan, the largest theatre in Europe. The proscenium is to be 50 feet by 40; the stage will be 90 feet deep and 50 feet high. In form the audience part will be nearly a semicircle instead of a horse shoe, as in the late theatre; in size it will be 75 feet deep, 65 feet broad, and 80 feet high; and there will be only three tiers of boxes. (The proportions of the old building will be found under THEATRES, vol. xxiv., p. 299.) In the construction iron has been much more freely used than in any former building of a similar kind. The roof formed of nine immense wrought iron lattice girders, each 90 feet long, 1 foot 6 inches thick, and 9 feet 6 inches deep, and weighing 18 tons. The chief feature of the exterior—about which we regret to see a great deal too much flimsy 'compo' ornament—is a Hexastyle Corinthian portico, 82 feet wide, and 80 feet high: the columns being 3 feet 8 inches in diameter, and 37 feet high. Flaxman's bassi-relievi, which were saved at the fire of the old theatre, have a place in the new portico, and his statues of tragedy and comedy in niches on either side of it. The basement or lower story of the portico is intended to serve as a carriage porch, while the principal story will serve as a promenade, the entrance to it being from the crush room. It is announced that the theatre will be opened in May 1858. A kind of conservatory or 'floral arcade,' of glass and iron, 240 feet long, 80 feet wide, and 60 feet high, is proposed to be built alongside of it, to be employed as a market for choice flowers by day, and as a promenade for the audience on opera nights.

The increasing passion for music has also led to the erection of three or four large music halls—to say nothing of as many 'music and supper halls' for a less refined auditory, but which in size and style of decoration would a few years back have excited no little admiration if constructed for more aristocratic circles. The first of the former kind, St. Martin's Hall, Long Acre, built primarily for the use of Mr. Hullah's music classes, was first opened in 1850, but only fully completed in 1853. The great hall is 121 feet long, 55 wide, and 40 feet high; and there are smaller halls beneath. The architect was Mr. Westmacott. In form and general appearance it has been modelled on the old baronial hall, but though a handsome and well proportioned room, it wears too sombre an aspect for a music hall. Its acoustic properties are respectable, though far from perfect, and the floor being level, and the stage low, only those of the audience who have front seats can see the singers; moreover, it has the usual lack of sufficient, safe, and ready outlets. The exterior makes no architectural pretensions. The Surrey Music Hall, in what used to be the Surrey Zoological Gardens, is a more pretentious structure both externally and internally; and though rather fantastic than pure in style, the exterior wears a certain festive air which goes some way towards atoning for its solecisms. The interior is light, gay, and lofty; and though it will, it is said, contain 10,000 persons, it is so well planned for its specific use, that when most crowded every person is able to hear perfectly: there being neither absorption of sound nor reverberation in any part. Its dimensions are—length, 155 feet; width, 66 feet; height, 72 feet. The architect was Mr. Horace Jones. St. James's Hall, between Regent Quadrant and Piccadilly, the most recent of these erections, as far as it has yet been tested, also appears to have been constructed on sound acoustic principles, but it has some orchestral defects. In size the great room is inferior to Exeter Hall and the Surrey Hall, being 140 feet long, 60 feet wide, and 60 feet high: there are two lesser halls, 60 feet square and 25 feet high. Little of the exterior is seen, but the interior is more splendid in its emblazoning than any previous edifice of the kind in this country; the architect, Mr. Owen Jones, having here carried out to the fullest extent his well-known views of decorative colour. The ceiling especially glows with the most brilliant hues, the unbroken primary colours being combined with gold in elaborate Alhambresque patterns, but the whole is admirably subdued and harmonised in effect under the novel and very effective system of lighting adopted. Great pains have also been taken with the ventilation; and the outlets are, if not all that could be desired, at least superior to those of either of the other metropolitan halls. Another building, originally called the Panopticon, in Leicester Square, should perhaps be mentioned in this connection, since, though erected for a purpose similar to that of the Polytechnic Institution, it has been lately employed for concerts. Constructed in what is called the Saracenic style, with minarets, &c., it presents a sufficiently incongruous exterior, but the interior has many excellences, and with little change would perhaps form a good lecture hall, if it should not be found adapted for music. The architect was Mr. T. H. Lewis. The Crystal Palace—the most magnificent place of entertainment for London, though not in it, has been referred to elsewhere. [Exhibition of 1851, *S.* 2.]

To our former list of club-houses we have now to add some of a still more costly character. First of these in point of time was the Conservative, in St. James's Street, a stately Italian edifice, erected in 1844, from the designs of Messrs. G. Basevi and Sydney Smirke. The front of the old Carlton, by Sir Robert Smirke, has been made to give place to a much more ornate façade by his brother Sydney. This, however, has no claim to originality, it being an almost exact reproduction of the Library of St. Mark at Venice by Sansovino. Its chief novelty consists in the use of polished red granite shafts; but the richness which they, in combination with the elaborate entablature, might in a happier situation have produced, is almost lost from the house being placed on the shady-side of Pall-Mall. Nearly opposite to it is another club-house copied from Sansovino: the Army and Navy, by Messrs. Parnell and Smith, who have taken for their type the Palazza Cornaro of the great Venetian, or rather Florentine, architect. More originality has been displayed by Messrs. Nelson and Innes in the Junior United Service Club, Regent Street, a spacious and very stately pile, which replaces a smaller and less assuming one by Sir Robert Smirke.

A few private residences have been built at the west-end during the last few years which may help to maintain the prestige due to the abodes of our nobles and wealthy commoners, somewhat endangered by the palatial splendour of the club-houses. Of these the first and grandest is Bridgewater House, Cleveland Row, built by Sir Charles Barry, 1848-50, for the late Earl of Ellesmere. In its general character, and in the gracefulness and finish of its details, it reminds the observer of the designer of the Travellers' and Reform Club-Houses, but it is more ornate than either, while retaining their chaste dignity. Its dimensions are 142 feet by 120. It has a noble state dining-room, 48 feet by 25, and a state drawing-room 68 feet by 28; but the great feature of the interior is a spacious picture gallery, with loggias, 110 feet long, and which, were the lighting somewhat more satisfactory, would be in every way worthy of its magnificent contents. Scarcely less palatial in scale or style is Dorchester House, Park Lane, erected in 1852-53 for Mr. R. S. Holford, by Mr. L. Vulliamy. In style it belongs rather to the English renaissance, as represented by Inigo Jones, than to the Italian adopted by Barry; and in many respects it is hardly so satisfactory, but it is a stately and imposing structure: its dimensions are 135 feet by 105. The mansion of Mr. H. T. Hope, erected in 1848-49 by Professor Donaldson from the designs of M. Dusillon, at a cost of 30,000*l.*, also deserves a word of notice, though in an artistic point of view it cannot be considered a happy effort. Like the mansions just noticed it is fitted up with great splendour, and like them it contains a singularly choice collection of paintings—indeed the finest collection of works by the Dutch and Flemish masters in this country.

Turning to 'The City,' we are at once struck by the great improvement in the ordinary street architecture, which is there still more distinctly manifested than at the west-end, though at the west-end the improvement has not been inconsiderable. In the new streets have sprung up a long succession of warehouses of a size and costliness quite unprecedented in London. Many of them are faced with stone, decorated with carving, and make considerable architectural pretensions; and all are built in a style of construction at once bold and substantial. The most striking feature of these new city warehouses is their great loftiness; five, six, and even seven stories being far from unusual. Of these warehouses the most noticeable are those in New Cannon Street and its vicinity, Wood Street, &c.; but piles of 'offices' of almost or quite equal magnitude have been built, or are building, in every part of the city which lies within the business boundaries, in the narrowest alleys, courts, and lanes, as well as in the main lines of traffic. The most remarkable of these blocks of offices for extent is one which it is impossible for an architect to look at without a certain feeling of regret; for to make room for it one of the most artistic edifices in the city was pulled down. This was the Excise Office in Broad Street, built by James Gandon in 1769, of which it was remarked in the article London ('Penny Cyclopædia,' vol. xiv. p. 114) that "for imposing grandeur of mass, and greatness of manner, combined with simplicity, it surpasses everything else in the metropolis." Unfortunately on the removal of the Excise department no other use was found for it, and it was destroyed to make way for a building, the chief merit of which is that it contains a greater number of separate offices than any other in the kingdom.

Another class of city buildings which has done much to raise the character of London street architecture is that which includes the banking-houses and insurance-offices. To the former several have been added by the joint-stock companies, as the Bank of London and the City Bank, which stand nearly opposite to each other in Threadneedle Street, the Australian Bank by the Royal Exchange, and several others of more or less architectural pretence; and among them must now be placed the well-known South-Sea House, which was converted to the use of another company of as bad eminence as the corporation for which it was originally built—the Royal British Bank. Among private establishments may be named that of Jones, Loyd, and Co., in Lothbury, whose new office, by Mr. Hardwick, is a very meritorious work. We may also in this connection refer to the as yet unfinished office of the National Discount Company in Cornhill, which is a work of unusually florid character, as well as of considerable size—but the ornament is mere stucco, and the whole affair looks rather 'showy' than substantial. The earliest, and among the best of the recent city insurance offices are the Sun (by Mr. Cockerell), in Bartholomew Lane, and the Imperial in Threadneedle Street: the latest are the Royal, in Lombard Street; the Union (a substantial but rather plain building) in Cornhill; the Crown, with some piquant Byzantine features, in Bridge Street; and the Law, in Chancery Lane.

Some of the City Companies have also built new halls, or put new fronts to their old ones. The largest of the older City halls, the Merchant Taylors', in Threadneedle-street (erected by Jarman after the fire of London), has been concealed from view by a screen of offices of no great elegance built by the company. The Weavers' Company have built themselves a new hall in Basinghall Street—a substantial structure, but deficient in character, the lower part being appropriated to offices. A somewhat better building is Dyers' Hall, Dowgate Hill, (by Mr. Corbett); but, like the companies just noticed, the Dyers have combined profit with display, having also appropriated the lower portion of the building to mercantile offices. The Clothworkers in their new hall, in Mincing Lane,—now in progress, from the designs of Mr. S. Angell,—have been less thrifty. Their building is wholly appropriated to the purposes of the company, and it is a very costly as well as substantial edifice. The façade, which is of Portland stone, is Italian, of a somewhat florid character, and, like the interior, it is much enriched with carving. The chief feature of the interior is of course the great hall, which when finished will be a very splendid apartment. It is 80 feet long, 40 feet wide, and 40 feet high; the vaulted roof being supported on Corinthian columns of polished red granite with columns of Caen stone. The windows are to be of stained glass. The court drawing-room, of somewhat smaller dimensions, is of corresponding richness; and there are two or three other stately apartments, and a grand staircase lighted by a dome.

In shop architecture the City has also of late taken the lead. A very recent example—a silversmith's shop in Cornhill, opposite the Royal Exchange, of which Mr. J. Barnett was the architect—is perhaps the most costly as well as the most pretentious specimen of shop architecture in London. As an illustration of the tendencies of London shop architecture we may spend a few lines upon it. The building, though not more than 40 feet wide, rises to a height of about 100 feet. The shop is 26 feet high, and the whole of the front above it (of Bath stone) is carried on a wrought-iron tubular girder, which is borne (or seemingly so) by red granite pilasters having Corinthian capitals of Bath stone. The upper part, of four stories, has attached Corinthian pillars of polished granite; a balcony at the fourth story; and crowning the summit a very bold cornice. The style is Venetian, and a great deal of ornamentation is everywhere introduced. In the spandrils of the windows of the second story are emblematic figures. The space between the arch of the shop-windows and the cornice above is of statuary marble, carved in a bold and florid style by Trentanova. On the whole, the façade has a rich and striking character, with an allowable excess of ornament, the chief defect being the appearance of weakness, arising from the want of sufficient apparent support in the ground story for the enormous mass above. The disagreeable aspect which a building so narrow, as compared with its height, would almost necessarily have, is removed by the house on each side being built of a uniform height, though somewhat lower than the central building, and in a similar though much plainer style, thus evidently forming with it part of one design—the sides supporting but being plainly subsidiary to the central compartment. The interior of the building is even more ornate than the exterior. The ground floor is open to the room above, around which runs a broad gallery supported by coupled Doric columns, over which are coupled composite columns with shafts of coloured marble. The ceiling, like the gallery, has deep and richly ornamented coffers, the beams being supported by coupled caryatidic figures. From the centre hangs a very large chandelier. Everywhere is a profusion of coloured marbles, carvings, looking-glasses, and decorations, with the glittering stock rather dazzling than satisfying the eye. Such a building as this, with all its faults, shows of how much consequence shop architecture is becoming. We believe that in London it is opening a fertile field for the abilities of architects of artistic tastes, constructional knowledge, and original fancy. By Mr. Ruskin and his followers shop architecture is denounced in unmeasured terms. But shops form of necessity the great feature in the streets of a city such as London, and shopkeepers in such a city must endeavour to render their places of business as attractive as possible. If houses are to be built expressly for shops, there can be no good reason why architects should not construct them of as ornamental and beautiful a character as is consistent with the purpose for which they are designed. In the great majority of recent shops everything else has been made to yield to the desire for as large a surface of plate-glass as possible; and hence what was indicated as the most palpable fault in the shop front just noticed—the want of sufficient apparent support in the ground story for the floors above—is the almost universal defect in the showier class of such buildings: and it is a fault fatal to all architectural effect. In its excess it may be seen in a shop on the south side of Fleet Street, where the whole upper part of the house rests on a heavy carved cornice, and this, with all that it carries, on two immense sheets of—plate-glass. Yet, if possible, the absurdity has been rendered even more palpable in St. Paul's Churchyard, where an extremely long shop front, formed by throwing two or three houses together, is made in appearance to bear the whole superincumbent mass of brick-work upon a few slender glass pillars, and even the wider attached pilasters at the end are covered with looking-glass. Of course in all these cases the upper parts of the building are really supported on wrought-iron girders, and for bearing these sufficient provision is made by strengthening the side walls, and by adding piers, &c., where necessary. Now, instead of trying, as some architects advise, to deceive the eye by giving to the shop front an arched form, and thus inducing the appearance of sufficient support for the upper stories—a method which the shopkeeper will not in many instances allow, and when he does, will probably shortly destroy the effect of by some gaudy decorative additions—why not accept the necessities of the case, and endeavour honestly to surmount them? Railway and other recent engineering works have too much accustomed the eye to the girder for its vast strength to be for a moment questioned where it is seen to be adequately upheld. If the strength of the supports be satisfactory, there will be no doubt—none of the latent doubt even which unconsciously produces the feeling of distrust in the uninstructed observer—of the sufficiency of the girder, and consequently none as to the stability of the building. What seems to be wanted, then, is to frankly admit and not to endeavour to conceal the girder form, and to give to the supports the greatest possible emphasis. Then trabiated, equally with circular or pointed arched, architecture will be found to satisfy the eye in the primary essential of security, while it alone can be found adequate for the varied requirements of the London tradesmen of this present century, as it alone can, within due limits as to altitude, securely bridge over wide spaces. It has therefore the great recommendations of structural truth, and of affording ample scope to the architect's inventive skill. Where a very wide window surface is not required, a different method of treatment is applicable; and the stationer's shop at the corner of Chancery Lane is a favourable example of what may be done under such circumstances, and a sufficient illustration of the opportunity which shop architecture affords for architectural taste and ingenuity; and also, we may remark in passing, a satisfactory illustration of the service which may be rendered by composition as an adjunct to well-executed brickwork in London street architecture, when it is used as composition and not as a deceptive imitation of stone.

Before quitting the City we may just mention that two of the best known of its buildings have been considerably altered: the Bank of England both externally and in the interior, under the direction of Mr. Cockerell, who, as regards the outside, has, without changing any of the better parts of Soane's design, by giving elevation in certain portions of the façades certainly improved its general character; and Newgate prison, of which the whole interior has been rebuilt on a very superior plan, while the exterior—a classic example of prison architecture in general estimation—has with excellent taste been preserved untouched. A building usually associated with Newgate in the architectural mind, as being by the same architect, Dance, very similar in design as well as purpose, and its near neighbour, Giltspur-street Comptoir, has however been less fortunate, having been pulled down when the new city prison at Holloway was completed. The site is still unoccupied, as is also that of the Fleet prison, pulled down in 1844. The new City Prison at Holloway is an extraordinary looking castellated pile, of great size and enormous cost, but said to be a very convenient and healthy place inside. Two or three other prison-palaces have been constructed within the last few years for the care of metropolitan rascaldom: the chief being the Model prison, Pentonville, and an enormous structure on Wandsworth Common.

Of semi-public and corporate buildings outside the city walls a few must be noticed. Lincoln's Inn Buildings, of which the first stone was laid by Vice-Chancellor (now Lord Justice) Knight Bruce, April 20, 1843, and which were inaugurated by her Majesty, October 30, 1846, form one of the most striking and picturesque of the recent buildings of the metropolis. They consist of a dining hall, a library, and a benchers' dining and council rooms, united by a handsome vestibule; the architect was Mr. P. Hardwick, R.A. The buildings are in the later Tudor domestic style; and are constructed of red and black bricks, with stone quoins and dressings—the whole being executed in the best manner. The dining hall is 120 feet long, 45 feet wide, and 64 feet high; has an open roof of oak, with a louvre lantern, a series of five large and handsome windows on each side, two large windows at the dais end, and a noble window of five lights at the opposite or south end. All the windows are enriched with heraldic emblazonings, the pendants of the roof are gilt, and the front of the gallery is adorned with sculpture: on the whole it is undoubtedly the finest room of its kind in London—we are of course not comparing it with Westminster Hall, which is wholly different in character. The library, which stands transversely to the hall, is also a very handsome room,—80 feet (or including the oriels 90 feet) by 40, and 35 feet high—its chief features being an elegant semi-octagonal oriel at each end (like the windows in the hall enriched with stained glass), and an oak roof of good design: as a reading-room it is comfortable and even luxurious in its arrangements. In the Temple, New Buildings, somewhat similar in style but less imposing in intention and effect, have been erected by Mr. Sydney Smirke, R.A. With these we may place, as conformable in style though not in object, University Hall, at the back of University College, by Professor Donaldson. The Abbey Buildings, Dean's Yard, Westminster, require special mention as a very admirable though not servile adaptation of Gothic forms to modern purposes: they are by Mr. Gilbert Scott, whose recent advocacy of a free adaptation of Gothic "as the basis of future development" in English architecture has attracted such very general attention.

The buildings called into existence by philanthropy in the metropolis and its immediate vicinity are so numerous, that—although some of them are, from their size and merits, architecturally of importance—we must be content to enumerate only a few which recur to the memory. St. Mary's Hospital, at Paddington, King's College Hospital, in Carey-street, and the Consumption Hospital, at Victoria Park, are chiefly noticeable for their admirable sanitary arrangements. The Brompton Hospital for Consumption (by Francis) is of large size and effective design, and has an elegant chapel by Lamb. The Small Pox Hospital, near Highgate, is admirably situated, and has some good features; and something similar may be affirmed of the Convalescent Hospital at Walton. The numerous metropolitan orphan schools and asylums have been judiciously placed in healthy sites at a little distance from London: such are the Working Orphan school, a large Italian edifice on Haverstock Hill, the Orphan Asylum at Wanstead, the Royal Patriotic Asylum at Wandsworth Common, the Soldiers' Daughters' School and Home at Hampstead, the Idiot Asylum near Reigate, and numerous others, some of them displaying an amount of architectural character hardly to be looked for in such establishments, but, what is better, almost all showing a regard for the health and comfort of the inmates in the highest degree meritorious. The same may be said of some of the old guild schools of London, and some of the parochial schools, which have been removed to healthy, and often picturesque sites, a few miles in the country, where more extensive buildings have been erected, with all the modern sanitary as well as educational appliances: as, for example, the Freemasons' School, Wandsworth Common, the Welsh School, Ashford, Middlesex, the City of London Orphans' at Brixton, the City Industrial Schools, at Penge, the South Metropolitan Industrial Schools, at Sutton, Surrey, the Whitechapel Industrial Schools at Forest Gate, Essex, and many more.

London is indebted for some recent additions to its architecture to railway progress. The new terminus of the London and North Western Railway, by Hardwick, is really a very imposing, as well as very costly structure: its expense was above 150,000*l.* Scarcely so much can perhaps be said of the Great Western terminus, as it is rather remarkable as an engineering than an architectural work, but it has the superior merit of showing adaptation to its purpose in a very unusual degree, and, to our thinking, is consequently the most satisfactory of all the London termini; it was the joint production of Messrs. Brunel and Digby Wyatt. Adjoining it is an hotel built for the railway Company by Mr. Hardwick, which in size, architectural pretension, and costliness, surpasses any yet constructed in London. The style—late French renaissance, with its bold mansard roofs to the centre and turrets, the colossal terminal figures supporting the balcony, &c.,—was a novelty in London, and altogether it excited much notice. The terminus of the Great Northern Railway, at King's Cross, by Mr. L. Cubitt, merely presents, externally, brick terminations to the carriage sheds, with a lofty central tower; but inside the vista formed by the sheds is characteristic and effective. Alongside the station the Company have built an hotel rivalling in size that of the Great Western: like that the style is continental, but rather strange than beautiful. None of the other metropolitan railway termini of recent erection have any architectural character.

Though we have left ourselves no room to describe, we must just refer to the great works completed and in progress in connection with the docks of London. Of those of the old companies, the most extensive are the new works of the London Docks at Shadwell, to make way for which many hundreds of houses have been removed. The object has been to afford greater facilities for the admission and unloading of the immense vessels which the requirements of modern commerce have called into existence, as well as to obtain increased room for general purposes. With this view new basins of great depth have been formed, a new entrance constructed, with gates of enormous size, and various hydraulic and other appliances added of great power, as well as new warehouses and other works. At the Commercial Docks, on the Surrey side of the Thames, extensive alterations and improvements have been carried out. On the Plaistow Marshes, just below Blackwall, have been constructed the Victoria Docks, which afford at present about 90 acres of water area, with entrances admitting larger vessels than any of the older docks, though not, we believe, larger than the new works at the London Docks mentioned above. At Woolwich, a steam dock has been constructed, and vast works of various kinds erected, in connection with the arsenal, foundries, steam factories, &c., of the Government. And, finally, at Brentford a large new dock has been constructed, chiefly with a view to afford increased facilities for water carriage in connection with the Great Western Railway.

A few words on some of the larger works resulting from the progress of sanitary reform will conclude what we have to say respecting the public improvements of London. After a protracted struggle, the city corporation were compelled, in 1852, to remove their fondly cherished Smithfield market; but it is due to them to say, that when compelled to provide a new cattle market in the suburbs instead of in the centre of the city, they performed their task honestly and well. The site chosen was an elevated and very convenient one, the notorious Copenhagen Fields, adjoining both the Great Northern and North London Railways. The market covers an area of about 25 acres, but a large space is reserved for lairage for sheep and cattle, and for extension at a future time if it be found necessary. The provisions for the comfortable accommodation of the cattle have been made in a thoroughly humane spirit, and, in fact, whatever forethought could suggest for avoiding the evils usually attendant on large cattle markets has been done with a bold disregard of expense, which only a corporation wealthy as that of London, content to look to a somewhat remote future for repayment, could have ventured upon. Though it is rather on account of its skilful arrangement and adaptation to its special purpose that the Metropolitan Cattle Market is to be regarded, yet it is not without claims to notice architecturally. Its hotels and banking-houses, and some of the offices are in very good taste, and its lofty central tower forms not only a prominent feature in the landscape for many miles northward, but gives an air of completeness and unity to the whole design. The plan of the Metropolitan Cattle Market, with all the details of its arrangement, is due to the city architect, Mr. Bunning, who also, two or three years before, had rebuilt Billingsgate Market in a very skilful manner, and with a special regard to convenience, cleanliness, and salubrity.

In 1852 an Act was passed rendering it unlawful for any water-company drawing its supply from the Thames, to take such supply after a certain day from any part of the river below Teddington lock. The several companies accordingly at once set about the construction of very extensive works—the Grand Junction, the West Middlesex, the Vauxhall, and the Southwark, at Hampton; the Chelsea and the Lambeth just above Kingston. The works at these places are some of them on a magnificent scale, the entire new works, for example, of the Chelsea Company, rendered necessary by the Act, have cost 450,000*l.* The water is conveyed from Hampton and Kingston, in mains of from 30 inches to three feet in diameter, to the reservoirs of the several companies in the immediate vicinity of London. The mains of three of the companies are passed under the Thames at Richmond by means of the coffer dams; those of another company are carried above the bed of the river, near Putney bridge, on piers formed by Mitchell's screw piles. But even more extensive and costly have been the works of the New River Company, who, in works near the head of their river (including the drainage and diversion of the sewerage of the town of Hertford), in forming capacious new reservoirs, and covering their old ones, &c., have expended considerably over half a million. Very extensive new works, and alterations in existing works, have also been carried out by the East London, the Kent, and the Hampstead companies.

The result of these vast operations has unquestionably been a very great improvement in the quality of the water supplied to the inhabitants of London. The Registrar-General, in his Report on the Health of London for the week ending April 17, 1858, says that the London water "contains less than half the previous amount of impurity. A gallon of water of the Chelsea Company formerly contained from 37 to 66 grains of extraneous matter; the Southwark water contained from 23 to 73 grains; while the analysis now shows that only 21 grains of extraneous matter are to be found in a gallon of the water of either company." In several of the other companies a still smaller quantity of extraneous matter is found (in the West Middlesex only 17·64, in the Grand Junction 17·76 grains): but then the water of these companies was always purer than that of the former. Still it is very questionable whether,—when so great and costly an alteration was rendered compulsory,—the legislature might not well have gone further, and prohibited the use of the Thames at all for the purpose. For before it has reached the place where the supply is now drawn, it has been polluted by the drainage of Windsor, Chertsey, Staines, and other towns, and, as Mr. Ranger, the Superintending Inspector of the General Board of Health, has pointed out in his recent Report on the Sewerage, &c., of Aldershott village, the new sewerage works of the camp at Aldershott have been so constructed as to have "their outfall into the Blackwater river . . . one of the tributaries of the Thames, entering the latter above the point from which a very large portion of the London supply is now taken, and thus a new source of pollution" has been introduced. In fact, it is stated in a Report just laid before the House of Commons by the Royal Commission appointed expressly to inquire into the best mode of distributing the sewage of towns that "the Thames, before it reaches the point where the water supply of London is at present derived, receives the refuse of districts containing upwards of 700,000 persons." Under the circumstances, it would therefore be consolatory to believe, with another set of Commissioners,—the engineers and chemists employed by the Metropolitan Board of Works to report on the Main Drainage of the Metropolis,—that this is of comparatively little consequence, Thames water being, in fact, a disinfectant: "sewage matter," they say, "being poured into a much larger volume of fresh or freshened water, becomes immediately oxygenised, and ceases to exist as a noisome and offensive agent."

Of the rival plans for intercepting the main drainage of the metropolis, as they are yet only plans, we shall not speak; and it is the more advisable not to do so, as although the government referees and the engineers of the Metropolitan Board of Works were directed to proceed upon the basis, that a vast intercepting sewer extending on each side of the Thames was agreed upon, and the point to be settled was the distance below the metropolitan boundaries to which it should be carried, the whole question has been re-opened by the Royal Commission mentioned above, who have just laid before the House of Commons (April, 1858), the outline of an entirely new plan, which is in effect to execute at once the embankment scheme of the Metropolis Improvement Commissioners of 1844. The embankments they propose to be made to contribute to the beauty as well as utility of the river, the relief of the over-crowded streets by means of advanced terraces which are to afford carriage ways between London and Westminster, and the connection of railways on the southern side of the river; while the sewage is to be received into reservoirs in the embankments at the mouths of the existing main sewers, and having been there deodorised and purified, the liquid part is to be permitted to flow into the river, and the precipitated matter to be carried away for agricultural purposes or discharged into the sea. Of the desirability of such an embankment as they describe there will hardly be a second opinion. The sewage part of the scheme is more questionable; but the Commissioners are sanguine as to its practicability, and they assert that the reservoirs and apparatus would be hidden beneath the surface, and that no nuisance whatever is to be apprehended. The entire cost they estimate at 3,250,000*l.*, which is some 500,000*l.* less than the intercepting sewer scheme of the Metropolitan Board, and 2,200,000*l.* less than that of the Government referees is estimated to cost. But this reminds us that among the metropolitan improvements we have not mentioned the embankment of the Thames between Pimlico and Chelsea, a very excellent work, and thoroughly well executed, but which, estimated at 62,000*l.*, has cost 112,000*l.*

Among the greater sanitary improvements in London we must not pass unnoticed the substitution of spacious suburban or more distant cemeteries for the crowded churchyards of the city. Of new cemeteries the most remarkable is the London Necropolis, or Woking Cemetery, formed by a private company, which under powers of an Act of Parliament purchased 2100 acres of forest heath land, extending upwards of four miles along the line of the South-Western Railway, towards Farnborough and Pirbright. Of this land the company has, in the first instance laid out 400 acres, consisting of a slightly undulating heathy tract, singularly quiet and picturesque in character, as a cemetery, and built chapels for the use of members of the establishment and nonconformists, with convenient waiting-rooms for mourners. A neat station is provided for the exclusive use of the cemetery, in London, and special trains carry the funeral direct from it into the cemetery—a short line of railway having been constructed for the purpose. Funerals are thus conducted with economy, privacy, a careful regard to the feelings of mourners, and in all respects with singular propriety. As near an approach to the best mode of interment as in the present state of society is perhaps practicable, appears indeed to have been attained. In connection with no other cemetery, we believe, has there been made such judicious arrangements for the conveyance of funerals from London—a matter of great consequence where the cemetery is at some distance from the city, and one which, like some other sanitary improvements, presses with peculiar severity on the poor. A very extensive and well-planned cemetery has been formed by the City of London at Ilford, Essex; Marylebone and St. Pancras parishes have constructed theirs at Finchley; Lambeth parish has one at Tooting, and others newly formed are to be seen on journeying a few miles on any side of London.

Turning to the Provinces, we can do little more than repeat our former statement, that great as has been the progress in architecture and public improvements generally in the metropolis, the provincial towns have in their proportion made equal, or nearly equal progress. We can only venture in vindication of this statement to refer briefly to a few particular instances. At Liverpool this has been eminently the case. St. George's Hall, designed by Mr. H. L. Elmes, but, in consequence of his death, completed by Mr.

Cockerell, may not only be fairly placed in comparison with any similar building in London, but without hesitation be pronounced in many respects the finest, as it is undoubtedly the richest, recent example of a Romano-Corinthian edifice in the kingdom. The hall itself, 168 feet long, 100 feet wide, and 85 feet high, is spanned by a vaulted roof, and forms one of the noblest public halls we possess. The rooms devoted to the assize courts are not so satisfactory. The exterior has, at the south end, a Corinthian portico of grand proportions, with a pediment filled with sculpture; a semi-circular portico at the north end; and a portico of sixteen columns without a pediment at the side. It is not impervious to criticism, perhaps, but undoubtedly St. George's Hall is one of the great architectural works of the day. Among other new buildings of the town are the Collegiate Institution, a large and handsome Tudor collegiate structure, also by Mr. Elmes; the Sailors' Home, a spacious Gothic building by Mr. Cunningham; the Branch Bank of England, by Mr. Cockerell, &c.; but perhaps the most characteristic of the new buildings of Liverpool are the extensive and costly piles of 'offices,' which are as much superior to similar buildings in London as the Manchester warehouses are to the warehouses in the City. The Docks of Liverpool, with vast ranges of connected warehouses, have been increased in number and extent, at an outlay of several millions sterling, and are now probably unrivalled. The floating stages on the Mersey, for landing from steamers, likewise claim a word of notice: one, at Prince's Pier, finished in 1857, is 1000 feet long by 82 feet wide, and cost about 140,000*l*. Liverpool is one of the towns which has provided itself at a great cost with a supply of pure water from a distant source. Whether as a rival or an adjunct, its neighbour on the Cheshire side of the Mersey, Birkenhead, cannot be left unnamed in speaking of the material progress of Liverpool. The docks and warehouses of Birkenhead, its vast market, &c., are among the most remarkable illustrations of recent commercial progress.

"Manchester," it was said, in the article MANCHESTER ('Penny Cyclopædia,' v. XIV. p. 369), "is not distinguished for architectural beauty." That could scarcely be said with truth now. It is not certainly a beautiful city architecturally even yet, but buildings of a very superior order of excellence are now numerous, and their number is rapidly increasing. Foremost, as forming a sort of central point of the city, is the Exchange; which as lately enlarged affords the most spacious room, we believe, in Europe, for the meeting of commercial men; and both externally and in the inside is a very admirable work of its class. Free Trade Hall (by Mr. Walters), is in its title as well as its purpose, a structure characteristic of Manchester, and moreover a very fine building. Other buildings of a semi-public character are the Theatre, the Branch Bank of England, by Cockerell; the bank of Messrs. Haywood; the Manchester and Salford Free Library; churches, chapels, synagogues, &c. But indisputably the warehouses form the distinctive feature of Manchester in an architectural point of view. They are very numerous, and new ones are springing up on all sides. They are for the most part of great size—one, but we believe it is the largest in Manchester, built for Sir James Watt, the late mayor, by Messrs. Travis, is of the enormous dimensions of 300 feet long, 90 feet deep, and 100 feet high, three of the fronts being wholly of stone. And these warehouses are constructed in the most substantial manner, of stone or of excellent brickwork, with stone quoins and dressings: 'compo' is not in repute in Manchester. The style usually affected by the merchant princes, or their architects, is the Italian palatial, which is in most instances carried out (as for example in those designed by Mr. Walters) with great refinement and finish, the carving and details being often worthy of a London club-house. The best of the London warehouses would certainly compare badly with many of their Manchester prototypes. A good beginning has likewise been made towards the embellishment of the city and suburbs with public monuments and parks. The front of the infirmary has been laid out as a sort of public place, and here statues of her Majesty, of Wellington, Peel, John Dalton, and James Watt, have been erected. New streets have been opened in the city, and old streets have been widened. The drainage has been greatly improved; and an ample supply of water has been brought into the city at a great cost from a considerable distance. And outside the city three new parks have been formed: two of which, Queen's Park, Harpurhey, and Peel Park, Salford, are very attractive resorts.

Birmingham has hardly kept pace with the two great towns of Lancashire; yet it has added some new buildings worthy to rank with its noble town hall; as for example the grammar school, the news hall, the music hall, the midland institute now in progress, and some others. It has also its park; but we cannot add that it has its improved drainage. At Bristol something has been done. The Victoria rooms is a spacious and very noble building for musical festivals and public meetings. The guildhall has a façade which is rather a favourable example of the Tudor period, but the interior is ill-arranged and undignified. An academy of fine arts, and a general hospital are the most recent additions to the architecture of the old city, and both are more than ordinarily ambitious in design.

Turning from our manufacturing and commercial to our university towns, we find no falling off, though the architectural zeal has taken a different direction. At Oxford the handsome range of buildings by Mr. Cockerell, called the Taylor Institute and University Galleries may be taken as marking the close of the passion for classic art in that university. Oxford is now, and has been for some years, the head quarters of mediævalism, and there the 'ecclesiologists' hold unquestioned sway. Perhaps nowhere else can the good and the evil of the Gothic revival be more distinctly seen. For years past the grand old city seems to have been given up to the gothic builder and the gothic restorer. It would be idle to attempt an enumeration of the works which have been accomplished. Almost every college has added a new chapel, or chamber, or sculptured gateway, or made some little addition to its existing architectural treasures, or restored and re-edified its old ones. Many of the new works are of great beauty and richness, as could not indeed fail to be the case, for they arose out of the promptings of a zealous love of Gothic architecture, and their execution—provided for with no niggard hand—was entrusted to architects already famous for their peculiar devotion to this branch of the art. It is, perhaps, not too much to say, that some of the new works are worthy to stand beside the glorious structures which surround them. But we can afford no such liberal praise for the so-called 'restorations.' They may have been well done professionally: they may have been correctly performed according to ecclesiological conceptions: but the buildings which have been restored are not now the same buildings we knew a few years back, venerable in their hoary and unmistakeable antiquity. They have been, too many of them, made to wear the gay drapery of youth upon the seared and bending frame of age. They now consequently exhibit neither the solemn majesty of the one, nor the lightsome beauty of the other. Our ancient Gothic structures,—marvellous in the grandeur of their forms, in the evidences of mental power and artistic fancy, in their quaint carvings and playful tracery, over which sun and shadow love to linger,—structures on which the cultivated and the uninstructed alike gaze with awe and wonder and endless admiration,—ought only to be touched with a reverential hand. Our fathers, bowing before the sovereignty of the Greek and Roman, regarded our glorious mediæval buildings with something like contempt as the productions of a dark age and a Gothic understanding; and they altered, improved, or destroyed them with almost equal indifference. But their contempt was, we cannot but think, less dangerous than our too ardent love. They thought it folly to spend time over the rude structures of the dark ages, when they could study the temples of the brightest days of Greece and Rome, or of those enlightened times when the lore of antiquity was restored to the scholars of modern Europe. We have come to worship mediævalism, and in our foolish fondness have sought to replace the decaying vesture in which the object of our affection was clothed, by one as exactly resembling it as we could contrive to fabricate, forgetting, till too late, that our new and gay drapery is after all but a modern fiction, and that the old weather-worn garment which we have replaced was the only true one—that we have indeed copied, but in copying have destroyed it. 'Restoration' in truth is for the most part a mistake. Ancient buildings regarded as works of art are to be preserved—like ancient statues—with jealous care from the chisel of the modern artist. If anything can be done to arrest their decay, well: but it must be so done as not to remove, if possible, a hair or a finger-nail of the original—assuredly not to substitute for it a new one, though that be the exactest copy of what the chipped and battered fragment we have removed was in its pristine condition. As well might the Theseus or Ilyssus in the British Museum be submitted to the 'restoring' chisel of Westmacott or Baily, or any other living Phidias, as our cathedrals and colleges be subjected to the tender mercies of modern representatives of the ancient builders. We are not, of course, objecting to necessary repairs, or even, where imperative, to rebuilding, but simply to the destructive process of 'restoration' by the removal of portions of the ancient work (usually the carved details and secondary features which are the characteristic signatures as it were of the old artists), and replacing them by new work intended to represent (and therefore to form a deceptious imitation of) the genuine old work.

Cambridge has proceeded somewhat more slowly of late than the sister university with its mediæval reproductions and restorations, but it too has made a real architectural advance. Such works as those which in the first quarter of the present century Wilkin raised amidst the plaudits of enthusiastic gownsmen, would now excite a shout of universal execration. But Cambridge retained longer than Oxford her love of the classic orders; and some of her latest works of that kind are of a very superior character—as the library by Cockerell, and still more the Fitzwilliam Museum, a work of much beauty and stateliness.

But not to dwell longer on particular towns, we may point to the number of the different kinds of public buildings which have been lately erected in every part of the country, as the best evidence of the reality and extent of architectural progress. In ecclesiastical edifices the progress has been something wonderful. During the last twenty years churches and chapels have been built by the thousand, and a very large proportion of our ancient cathedrals and parish churches have been repaired, or as it is termed 'restored.' As in London, so through the country, all the recent churches have been mediæval in character; indeed, as Mr. Scott, in no exaggerated tone of triumph, exclaims in one of his recent contributions to the literature of Gothic architecture—"No revolution was ever, so far as it goes, more complete; for while, forty years ago, no one, in building a new church, would ever have dreamed of making it Gothic, no one now dreams of making it anything else." But although the reproduction of a mediæval church is infinitely preferable to the reproduction of a Greek or Roman temple as a Protestant place of worship, it must be obvious that mere crude reproduction or imitation of ancient examples, without regard to altered forms of worship and modes of thought, has the double disadvantage of curbing the genius of the architect, and of preventing the erection of an edifice designed with a single eye to its use and character. Many of the most recent churches are however—with the qualification we have suggested—of the highest order of merit, and many have been constructed and decorated with an almost profuse liberality of expenditure, but with unimpeachable taste. Among the more costly some have been built at individual outlay, many more by the combined exertions of a few zealous friends, and most by voluntary efforts. Even where the cost seems fairly to belong to a parish or town, as in the case of the new church at Doncaster (rendered necessary by the conflagration of the splendid old church), an appeal to a wider public is sure to meet with a cheerful response, if an announcement can be made that the building is to be a magnificent work of art, or the exigencies of the neighbourhood justify the appeal. We feel safe therefore in saying that the public feeling for church architecture, and the public wish for church extension, are deeply rooted as well as widely spread, and that great as has been the progress of church building and church architecture during the twenty years to which our survey is limited, the coming years will see a yet greater extension of the one, and we earnestly hope a great advance in the other.

As may be supposed from the character of the revival and the faith of one of its earliest, ablest, and most active champions—Welby Pugin—the Roman Catholic body have fully participated in the Gothic movement. Indeed some of the finest and richest of the recent specimens of Gothic have been the Roman Catholic cathedrals and churches at Birmingham, Derby, Nottingham, Cheadle, Preston, and elsewhere—though many of them have been left to be completed at a future day. Yet the recent Roman Catholic churches have not all been Gothic, here and there one being still occasionally built in the Italian or even classical style. Not of course so numerous as the churches of the establishment, but still very numerous have been the dissenting chapels built within the last twenty years, and not a few of them have been of spacious dimensions and of considerable architectural pretension. The old puritan dislike to a 'steeple-house' seems quite to have passed away; indeed, some of the loftiest spires recently built in England have been appended to nonconformist meeting-houses, as in that belonging to the Independents at Halifax, completed in 1857, which rises to an altitude of nearly 250 feet. Among the Independents—who have taken the lead in the chapel building movements—the Gothic style has been adopted in the great majority of instances; so it has, though not to the same extent, among the Wesleyans: the Baptists have come more slowly into the fashion; the Unitarians seem to adhere to the classic; the Quakers as of old repudiate style altogether: but all build where they can find opportunity and means, and all build in a far superior manner to that in which they built thirty or forty years ago.

Among the architectural features of the period of which we are treating, a place alongside the extraordinary church-extension movement, and accompanying revival of Gothic ecclesiastical architecture, must be given to the parallel extension of educational establishments of a superior class, and the revival of the old collegiate style of building. Not to speak of what has been done in college extension and new building at Oxford and Cambridge, at Eton, Harrow, Rugby, &c., we can but mention, as among many, such magnificent structures as the Church Missionary College, St. Augustine's, Canterbury, built by the munificence of Mr. Hope, and which is so admirable a specimen of the abilities of Mr. Butterfield; and the numerous proprietary and other Church of England colleges, like that at Brighton, by Mr. Scott; at Cheltenham, by Mr. Wilson; St. John's, Hurstperpoint, Sussex, by Mr. Carpenter; at Cuddesden, near Oxford, by Mr. Street; the Lansdowne College, at Bath, by Mr. Wilson; the Wellington, at Sandhurst, &c.: theological institutions belonging to the Independent body at Manchester, by Mr. Irwin; New College, St. John's Wood, by Mr. Emmett; and at Spring Hill, near Birmingham, by Mr. James—all spacious and handsome edifices in the Tudor collegiate style: and the institutions—similar in purpose and similar in architectural style—of the Wesleyan Methodists, at Richmond, Surrey, by Mr. Trimen; at Taunton, by Mr. Wilson; and the school at Kingswood, near Bath, by the same architect.

Of new corporate and town buildings the number has been surprisingly large. We might mention new Town Halls, at Leeds (a work of a high order of merit by Mr. Brodrick); at Colchester (Doric, by Blore and Raphael); at Burslem (Italian, by Mr. Robinson); at Cardiff (by Mr. Jones); at Whittlesey (by Mr. Rowe); at Alfreston (by Mr. Wilson); at Eye, Suffolk (by Mr. Lamb); at Chatham, at Halifax, at Leamington, Stockton, Bilston, Chertsey, Louth, and very many other towns: Market-places at Bolton, Wolverhampton, Stockport, Swindon, Worcester, at Leeds (a very fine one, costing 14,000*l.*), at Ashby-de-la-Zouch, at West Hartlepool, and elsewhere: Corn Exchanges,—on some of which a large amount of money has been expended—at Colchester (by Raphael and Brandon); at Wolverhampton (by Mr. G. Robinson); at Southampton, at Peterborough, at Grantham, at Hitchin, at Louth (a handsome Venetian pile, by Mr. Bellamy); at Banbury, at Hemel Hempstead, at St. Albans, at Grimsby (Elizabethan, by Bellamy and Hardy); at Gloucester (a large and ambitious Corinthian edifice, by Medland and Maberly); at Alcester (Italian, by Mr. Holmes), &c.: Assize Courts at Reading (by Mr. Clary); at Taunton, at Swansea, &c.; County Courts, Post-Offices, Music Halls (some of the very recent ones, like that at Bradford, by Messrs. Lockwood) large and somewhat pretentious works; Lyceums, Mechanics Institutes, Free Libraries, Baths, &c.

Beyond the limits of the towns among the largest and most costly, and from their size and character often the most remarkable modern buildings, are the County Lunatic Asylums, but it must suffice to refer to them thus generally. The County and Borough jails are often curiously enough works of an inordinately ambitious architectural character; and Reformatories, of which there are now in England 41 Protestant and 5 Roman Catholic, must likewise be named in this connection.

Of industrial establishments of a more pleasing order—such as Marshall's Flax Mills, at Leeds; the extraordinary manufacturing village of Mr. Titus Salt, Saltaire, near Bradford, and other great manufactories of recent erection—we should be glad to speak, for they, in their architectural character, and in their admirable arrangements, are among the most striking evidences of material improvement in the country. But we must pass them by, as we must also pass by the termini, the bridges and viaducts, and other great works connected with the railways, remarkable and noteworthy as they in every way are among the recent public works of England. So again we must pass by the magnificent new docks, &c., governmental as well as those constructed by private companies, at Plymouth, Portsmouth, Chatham, Sunderland, Great Grimsby, Cardiff, and elsewhere, vast as they are in extent, and costly but most important in character; and the equally magnificent works which have been in progress at Dover, Holyhead, Portland, &c., for affording to our mariners harbours of refuge from the perils which beset them. The defensive works which are erecting on the more vulnerable parts of our coast, and for affording additional protection to our naval ports and arsenals, hardly perhaps belong to an article on Public Improvements. But such an article ought scarcely to conclude without at least a reference to the great naval and military hospitals which have been recently erected or are in progress at Plymouth, Portsmouth, Netley, Chatham, &c.; and although we have heard much of deficient barrack accommodation, even that must be largely increasing, and ought to be rapidly improving when we see by parliamentary returns that in a single year, 1856-7, upwards of a million sterling has been spent in building and repairing barracks (*i. e.* new works and enlargements 808,996*l.*, repairs 222,745*l.*). Of the many mansions which have been erected in the country we must also refrain from speaking, though the list is headed by her Majesty's Marine and Highland palaces at Cowes and Balmoral.

Though at some length, we have yet but very inadequately set forth the progress of public improvement in England during the last twenty years. In Scotland and Ireland architectural progress, taken as a whole, has not been proportionate to that of the sister country; yet when we look at the noble buildings which have been erected in Edinburgh and Glasgow, the unrivalled railway termini and some other recent buildings in Dublin, the warehouses and public works in Belfast, the Irish Queen's Colleges, &c., we cannot but feel that Scotland and Ireland, as well as England, have made a great stride in the path of architectural progress during the past twenty years.

PUBLIC LIBRARIES. [LIBRARIES, PUBLIC, *S.* 2.]

PUFFINUS. [PETRELS.]

PUGIN, AUGUSTUS, an eminent architectural draftsman, was a native of France, but settled in London at an early age. He was engaged as a draftsman and assistant by Nash, with whom he remained many years. He then found employment among publishers in the preparation of architectural drawings for engraving; one of the most important of his earlier works being the buildings in Ackerman's 'Microcosm of London,' 1808-11. He also made the drawings for a 'Series of Views in Islington and Pentonville, with descriptions by E. W. Brayley.' Subsequently he directed his attention more particularly to the architecture of the middle ages; and in 1821 he began the publication of his 'Specimens of Gothic Architecture, selected from various Ancient Edifices in England, consisting of Plans, Elevations, Sections, and parts at large; calculated to exemplify the various styles, and the practical construction of this class of admired Architecture:' it was completed in 1823, and forms 2 vols. folio and 4to, containing 114 plates, with descriptions, chiefly by Mr. E. J. Wilson. In 1824 he commenced, in conjunction with Mr. John Britton, 'Architectural Illustrations of the Buildings of London,' also completed in 2 vols. 4to; and with the same gentleman he published, in folio and quarto 1825-28, 'Specimens of the Architectural Antiquities of Normandy, measured and drawn by A. Pugin, and engraved by John and Henry Le Keux.' This is his best and most important work, and did much to enlarge our knowledge of mediæval architecture; he was assisted in this work by his son, the subject of the succeeding notice. In 1829 Mr. Pugin made the drawings for a work entitled 'Paris and its Environs displayed;' and in 1831 he prepared, with the assistance of his son, 'Gothic Ornaments, selected from various buildings in England and France.' He died December 19th, 1832.

PUGIN, AUGUSTIN WELBY NORTHMORE, son of the preceding, was born in 1811. Instructed by his father in the principles of architecture, he early acquired under him remarkable facility in drawing, and travelled with him as his assistant, collecting materials in Normandy and England for his works on Gothic architecture. [PUGIN, A.] His first distinct employment was as assistant to Messrs. Grieves, in painting the architectural scenery in her Majesty's and Covent Garden theatres. He afterwards made drawings for the furniture in Windsor Castle, and designs for plate in the mediæval style for Messrs. Rundell and Bridge. In 1833 he removed to Ramsgate, and commenced preparing for publication a series of works illustrative of the furniture and ornamental work of the middle ages. In 1835 appeared his 'Designs for Gothic Furniture, in the style of the Fifteenth Century,' and 'Designs for Iron and Brass-Work, in the style of the XVth and XVIth centuries.' These were followed in 1836 by 'Designs for Gold and Silver-smiths' Work,' and 'Ancient Timber Houses,' all of which met with a ready sale, and tended not a little to stimulate the growing taste for Gothic forms. His next work was one that, by its caustic and irritating way of setting forth some home-truths, aroused not a little professional feeling—'Contrasts; or a parallel between the Noble Edifices of the 14th and 15th centuries, and similar buildings of the present decay of Taste;' a second and improved edition of it was published in 1841.

Mr. Pugin had by this time joined the Roman Catholic Church, to the service of which he henceforth devoted his best energies. Having received a handsome bequest from an aunt, Mrs. Welby, he built himself a fanciful residence in the neighbourhood of Salisbury, and removed there, resolved to study and evolve the principles of the ecclesiastical architecture of the middle ages. Having found in the Earl of Shrewsbury a warm patron, Mr. Pugin soon obtained opportunities of exerting his ability; and during the few years that he lived to practise his profession he was called upon to erect a larger number of Roman Catholic churches, chapels, convents, and schools, than has probably fallen to the lot of any Englishman since the Reformation. The following list, we believe, includes his chief works—(we are indebted for it, and many of the other facts contained in this notice, to a memoir of Pugin by his friend Mr. Talbot Bury, which appeared in the 'Builder' shortly after Pugin's death):—The cathedral church at St. Marie at Derby, one of his earlier and more pleasing works; St. Chad's, Birmingham; three churches at Liverpool; St. Wilfred's, Manchester; church and convent at Edge Hill; churches at Oxford, Cambridge, Reading, Kenilworth, Stockton-on-Tees, Newcastle-upon-Tyne, Preston, Keightley, Rugby, Northampton, Stoke-upon-Trent, Brewood, Woolwich, Hammersmith, Fulham, Pontefract, St. Edward's near Ware, Buckingham, and St. Wilfred near Alton; a church, and a convent and chapel, at Nottingham; convents of the Sisters of Mercy at London, Birmingham, and Liverpool; a priory at Downside near Bath; colleges at Radcliffe and Rugby; improvements at Maynooth; and cathedrals, with schools and priests' houses attached, at St. George's (Southwark), Killarney, and Enniscorthy. To these must be added the extensive and costly works executed for his great patron the Earl of Shrewsbury, consisting, besides the alterations made in the mansion, of a church, school-house, and monastery at Alton Towers; and a church at Cheadle, which has the most splendid interior of any of his churches. The very pretty gateway to Magdalen College, Oxford, is one of the few works executed by him for any Protestant body; indeed he is said to have refused to accept any commissions for Protestant places of worship. The list of works given above would in truth seem to have been more than sufficient to exhaust the time and energies of a man who ceased working at the age of forty; yet he was chiefly employed during his last years in designing and superintending the ornamentation of the New Palace of Westminster, which probably owes its somewhat extravagantly mediæval and ecclesiastical character to Pugin's idiosyncracies. But, besides the practice of his profession, he found time to add to its literature a second and revised edition of his 'Contrasts;' a treatise on the 'True Principles of Pointed or Christian Architecture,' 1841; 'An Apology for the Revival of Christian Architecture,' 1843; a 'Glossary of Ecclesiastical Ornament,' 1844; a treatise on 'Floriated Ornaments,' 1849; and 'A Treatise on Chancel Screens,' 1851. We ought also to add that he was connected commercially with the house of Messrs. Hardman of Birmingham, who manufactured ecclesiastical brass-work from his designs; and he is said to have filled up his leisure hours with landscape-painting.

Mr. Pugin had always been fond of the sea—(indeed it is stated in one of the biographical notices of him that he once owned "and for a time commanded a merchant smack trading to Holland," though it is difficult to see when that time could have been)—and having realised by his profession a handsome sum, he purchased an estate at Ramsgate, in order at once to enjoy his favourite element, and carry out unfettered his notions of architectural propriety. Here he expended all his property in erecting for himself a house, a church, schools, &c., the whole being dedicated to St. Augustine. As he advanced in life his religious feelings took more and more entire possession of him. He now (1850) wrote and published 'An Address to the Inhabitants of Ramsgate,' 'An Earnest Appeal for the Revival of the Ancient Plain Song,' 'The Present State of Public Worship among the Roman Catholics,' and other pamphlets of a religious character. At length, overtasked with all this excessive labour and excitement, his intellect began to give way, and in his fortieth year it was deemed necessary to remove him to a lunatic asylum. For a brief space his mental powers were so far restored that it became practicable for him to return to his home at Ramsgate; but his life was ebbing, and he expired there on the 14th of September 1852, three days after his return. He was buried in a vault of his own church of St. Augustine. He had been three times married, and shortly after his death a pension of 100*l.* a year was granted to his widow from the Civil List.

As will have been seen, Mr. Pugin was a man of extraordinary industry and energy, and he possessed a very unusual amount of knowledge and great ability. He attempted too many things, and he worked too much and too fast to produce many great works, even had he been a man of original power; but in truth his was not a creative mind, and he lacked comprehensive thought. His great principle was, that, except as to size, the architect should aim at a faithful reproduction of an ecclesiastical edifice of the mediæval period; or, as he stated it in his 'True Principles of Pointed or Gothic Architecture,' "We may indeed improve in mechanical contrivances to expedite its construction—we may even increase its scale or grandeur; but we can never successfully deviate one tittle from the spirit and principles of Gothic architecture. We must rest content to *follow*, not to *lead*. We may indeed widen the road which our Catholic fathers formed, but we can never depart from their track without a certainty of failure being the result of our presumption." Following such a dogma, it is evident that the highest success must be a respectable imitation. But even on his own principles, few of his works are entirely satisfactory as a whole; in particular parts and in details he is generally very happy, and some of his interiors have a rich and pleasing effect. His writings have had a powerful influence on the taste and practice of professed architects, and still more on the taste of ecclesiastical amateurs, and the influence has not been entirely a happy one. More than any single man perhaps has he been the cause of that perverse fashion which has predominated during the last fifteen or twenty years, of building modern churches in all their parts on the precise model of the churches of the middle ages, although—at least in Protestant churches—the forms of worship and the requirements of the congregations are so changed. In Pugin it was consistent: in his Protestant disciples it is absurd.

PUMA. [Lion.]

PUNISHMENTS. [Offences and Punishments, *S.* 2.]

PUNJAB, or PANJAB. [Hindustan.]

PURPLE COPPER ORE. [Mineralogy, *S.* 1.]

PUSEY, PHILIP, elder brother of the Rev. Edward Bouverie Pusey, D.D., was born in 1799. Having succeeded in 1828 to the Pusey estates in Berkshire (held originally by the tenure of a horn, which has been in possession of the family upwards of 800 years), he became member for the borough of Chippenham in 1830, and in the following year for that of Cashel. In December, 1834, he was elected for Berkshire, for which he had been an unsuccessful candidate two years previously; and he continued to represent that county until the dissolution in 1852. A Conservative in politics, and a decided supporter of the Corn Laws, on finding that agricultural protection, however desirable he might deem it, was practically unattainable after the passing of the Corn Law measures by Sir Robert Peel in 1846, he, instead of continuing with the bulk of the Protectionist party to agitate for a repeal of the free trade measures, urged the agriculturists to make the best of their position, and to adopt without delay every improvement which scientific investigation and practical experiment had shown to be beneficial, in order to enable them to compete advantageously with the foreign producer. Already well known as a practical agriculturist, and as one who had given his attention to, and carefully watched and tested, every scientific improvement which had been introduced from time to time into the system of draining, ploughing, and reaping, his advice was listened to with respect, and his various practical papers in the 'Agricultural Journal' were received as authoritative, and probably to the influence of his high character and sober judgment may be attributed in no small measure the great advance which has been made within the last few years in every department of English agriculture. Mr. Pusey was president of the Royal Agricultural Society of England in 1854, and one of the chief contributors to the Journal of that society, which he also edited for several years. He died July 6, 1855.

PYÆMIA. [Physic, Practice of (*Blood, Diseases of*), *S.* 2.]

PYREN. [Chemistry, *S.* 1.]

PYROSKLERITE. [Mineralogy, *S.* 1.]

PYRRHITE. [Mineralogy, *S.* 1.]

Q

QUAGGA. [Horse.]

QUASSIN. [Chemistry, *S.* 1.]

QUATA. [Ateles.]

QUATREMÈRE DE QUINCY, ANTOINE CHRYSOSTOME, a celebrated French archæologist, was born at Paris, October 28, 1758. Before the outbreak of the first revolution he had made himself known by his researches on ancient art; a memoir on Egyptian architecture was crowned by the Academy in 1785, and in 1786 he commenced his 'Dictionnaire d'Architecture,' which he did not complete till more than forty years later (1828). In 1790 he published 'Considerations sur l'Art du Dessin en France.' But his political opinions having led to his election as a member of the Legislative Assembly in 1790, he at once took his place among the party known as constitutional monarchists. He in consequence became obnoxious to the revolutionists, and during the Reign of Terror was thrown into prison, where he remained thirteen months. On his release he appears to have continued to act with those who were opposed to the new order of things. In the affair of the 13th Vendémiaire (October 5, 1795), he took part against the Convention, and was in consequence tried "par contumace" and condemned to death; but he managed to secrete himself. When power had fallen into new hands he again emerged, and was in 1797 elected to the council of the Five Hundred for the department of the Seine. But true to his royalist principles, he set himself in opposition to the Directory, and in consequence was one of the first on the list of the 19th Fructidor (5th September 1797) of those condemned without trial to deportation to Cayenne; but he was again fortunate enough to make his escape. After Bonaparte had secured his position, M. Quatremère de Quincy was permitted to return to Paris, and even we believe obtained some official appointment; but he appears to have thought it most prudent to quietly prosecute his literary and artistic studies. On the Bourbon restoration his sufferings for monarchy were amply recompensed. He was named in 1815 by Louis XVIII., Intendant-Général des Arts et des Monumens Publics, Censeur Royal, and Membre du Conseil d'Instruction. In the following year he became a Member of the Institute, and was appointed perpetual secretary of the Académie des Beaux Arts. At one time he seemed disposed to renew his political life, procuring himself in 1820 to be elected member for the department of the Seine, but he retired to his literary pursuits at the close of the session of 1822. He survived till near the end of 1849, but he had for some years outlived his faculties.

From the restoration, partly on account of his position as director-general of public monuments and secretary of the Academy, and partly from his great literary activity, M.

Quatremère de Quincy occupied a prominent and influential place among the French writers on the history and theory of art. He outlived however his reputation as an archæologist, for his learning was but shallow as compared with later scholars, especially those of Germany; and as a writer on the principles of art, he was specious rather than profound. Yet his works contain much valuable matter, and his speculations are mostly interesting, however unsatisfactory. The following, in addition to those already named, are his principal works:—'Lettres Addressées à M. Canova sur les Marbres d'Elgin,' 8vo, Rome, 1818; 'De la Nature, du But, et des Moyens de l'Imitation dans les Beaux Arts,' 8vo, 1823—the most original and the most satisfactory of his speculative works; Lives of Raffaelle (1824), of the Most Celebrated Architects (1830), of Canova (1834), and of Michel Angelo (1835); 'Monumens et Ouvrages d'Art Antiques restitués d'après les Descriptions des Ecrivains Grecs et Latins,' 2 tom. 4to, Paris, 1826-29; 'Sur la Statue antique de Venus découverte dans l'Isle de Milo en 1820;' and 'Essai sur l'Ideal,' 1837. He also wrote several pamphlets, discourses, and papers, as well as a great many dissertations in the 'Magasin Encyclopédique' of Millin, and various lives in the 'Biographie Universelle,' besides numerous 'éloges' read by him at the Academy: of these last he published a selection, of little value or interest, in two bulky volumes, entitled 'Recueil de Notices Historiques lués dans les Séances Publiques de l'Académie Royale des Beaux-Arts á l'Institut,' 8vo, Paris, 1824-37. Two of his works have been translated into English—'The Destruction of the Works of Art, and the Use to which they are applied, considered with regard to their Influence on the Genius and Taste of Artists, and the Sentiments of Amateurs,' by Henry Thomson, 12mo, 1821; and the 'Essay on Imitation in the Fine Arts,' by J. C. Kent, 8vo, 1837.

QUEENSTOWN, or COVE OF CORK, County Cork, Ireland, a sea-port town, is situated on the south side of Great Island, in Cork Harbour, in 51° 51′ N. lat., 8° 18′ W. long., distant by road 14 miles E.S.E. from Cork, and 167 miles S.W. by S. from Dublin. The population in 1851 was 11,428. Previous to the French war Cove was a small village consisting of fishermen's cabins; it then rose into importance by becoming an admiral's station. It was the port of embarkation for troops going on foreign service, and a place of rendezvous for merchant vessels about to sail under convoy. It now depends on the number of invalids who resort to it, especially in summer, when it is much frequented as a favourite bathing-place. The name was changed from Cove to Queenstown on the occasion of her Majesty's visit to Cork in 1850. The town, which occupies a steep acclivity overlooking the harbour, consists of several streets rising one above another in lines parallel to the beach. It contains a handsome parish church, erected in 1812; a Roman Catholic chapel, which serves as the cathedral of the diocese of Cloyne and Ross; a Wesleyan Methodist chapel; national schools; a club-room; a literary society; a public library; and reading-rooms. It has also a market-house, a fever hospital, dispensary, and bridewell. The pier, erected in 1805, forms a fine promenade, commanding a view of the magnificent harbour. The harbour of Cove is 3 miles long by 2 miles broad, with an entrance 2 miles long and 1 mile wide. It contains Spike Island, on which are artillery barracks and a depôt for convicts; the small island of Hawlbowlin, with the ordnance depôt, and near it Rocky Island, with two powder-magazines cut out of the rock. Steamers ply daily in summer between Queenstown and Cork. The Royal Yacht Club of Cork holds its annual regatta in the harbour. Petty sessions are held weekly. A market is held on Saturday.

QUERCIN. [Chemistry, *S.* 1.]

QUERCITRIN. [Chemistry, *S.* 1.]

QUINCY, DE. [Quatremère de Quincy, *S.* 2.]

QUINOIDINA. [Chemistry, *S.* 1.]

QUINOÏL. [Chemistry, *S.* 1.]

QUINOLEIN. [Chemistry, *S.* 1.]

QUINQUINA, or QUINA, names given to the species of Plants which are now generally referred to the genus *Cinchona*. In the article Cinchona will be found an account of the species of *Cinchona*, as recognised by botanists previous to the investigations of M. Weddell. This traveller dwelt in the Cinchona districts of the Andes during the years 1845-6-7, and has since published a work on this subject, entitled 'Histoire Naturelle des Quinquines.' In addition to a highly interesting account of the districts, M. Weddell gives a full description of the methods of preparing the Cinchona Barks by the natives, who live in the forests. By dwelling on the spot he was enabled to correct much that was erroneous with regard to the nature and character of the species used in medicine. He also discovered the real plant which yields the yellow-bark, that furnishes the largest quantity of quinine. The following table from M. Weddell's work exhibits the names of Commercial Cinchona Barks, and the species from which they are believed to be obtained:—

I.—Gray Cinchona Barks.

§ 1. Loxa Cinchona Barks. (Crown Bark, Angl.—China-Loxa, Kron China, Germ.)

Loxa Cinchona Bark, gray compact	*Cinchona Condaminea*, H. et B.
Loxa Cinchona Bark, brown compact (Dunkele Ten China, Germ.—China pseudo-Loxa, Bergen)	*C. scrobiculata*, H. et B.
Loxa Cinchona Bark, red chestnut.—Light Calisaya	
Loxa Cinchona Bark, red fibrous of the King of Spain. (Quina Estoposa, Pav. in collect., Lamb. Mus. Brit.)	
Loxa Cinchona Bark, yellow fibrous	*C. macrocalyx*, Pav.

§ 2. Lima or Huanuco Cinchona Barks. (Silver Bark, Gray Bark, Angl.—China-Huanuco, Graue China, Germ.)

Lima Cinchona Bark, gray-brown. (Cascarilla Provinciana, Peruv.)	*C. micrantha*, Ruiz et Pav. or *C. lanceolata*, Ruiz et Pav.
Lima Cinchona Bark, gray ordinary	
Lima Cinchona Bark, white	(?) *C. purpurea*, Ruiz et Pav.
Lima Cinchona Bark, very rugous, resembling the Calisaya Bark.—Cascarilla Negrilla, Peruv. (?Cascarilla Lagartijada, Laubert)	*C. glandulifera*, Ruiz et Pav.
Cinchona Bark, red of Jaen or of Loxa	(?)

II.—Red Cinchona Barks.

(Red Bark, Angl.—Rothe China, Germ.)

Red Cinchona Bark, becoming white in the air	(?)
Red Cinchona Bark of Lima	*C. nitida*, Ruiz et Pav.
Red Cinchona Bark true, non-verrucous (Cascarilla Roja Verdadera Laubert)	
Red Cinchona Bark, officinal	
Red Cinchona Bark true, verrucous	
Orange-Red Cinchona Bark, verrucous	(?)
Pale-red Cinchona Bark, with a white surface	
Brown Carthagena Bark	
Red Carthagena Bark	

III.—Yellow Cinchona Barks.

Yellow Cinchona Bark of the King of Spain (Cascarilla Armarilla del Rey, Laubert)	*C. Calisaya*, Wedd.
Calisaya Cinchona Bark, or Royal Yellow Bark (Königs China, Germ.—Yellow Bark, Angl.—China Regia, Bergen)	
Orange-Yellow Cinchona Bark; Cinnamon Cinchona Bark (Quinquina—Cannelle), Light Calisaya (Cascarilla Claro-Amarilla, Laub.)	*C. micrantha*, Ruiz et Pav.
Pitaya Cinchona Bark (Quinquina de la Colombie ou d'Antioquia, Guib., 'Hist. Nat. des Drog.'——Cascarilla Parecida à la Calisaya, Laubert)	*C. Condaminea*, Humb. et Bonp.
Woody Carthagena Bark (Quinquina de Colombie Ligneux)	
Orange Cinchona Bark of Mutis (Spongy Carthagena Bark; New Spurious Yellow Bark, Pereira)	*C. lancifolia*, Mutis.

§ 3. Huamalies Cinchona Bark. (Rusty Bark, Angl.—China Huamalies, Braune China, Germ.)

Huamalies Cinchona Bark, dull gray	*C. hirsuta*, Ruiz et Pav.

Huamalies Cinchona Bark, thin reddish	(?) *C. purpurea*, Ruiz et Pav.
Huamalies Cinchona Bark, white	(?)
Huamalies Cinchona Bark, ferruginous	*C. micrantha*, Ruiz et Pav.
Yellow Cinchona Bark of Cuenca	*C. ovalifolia*, H. et B.

IV.—White Cinchona Barks.

Ash-coloured Loxa Cinchona Bark (Ash-Bark, Angl.—Blasse Ten-China, Germ. — China Jaen, Berg.)	*C. ovata*, Ruiz et Pav.
Gray Cinchona Bark, pale ditto	
White Loxa Cinchona Bark	
White Fibrous Jaen Cinchona Bark	
Cuzco Cinchona Bark	*C. pubescens*, Vahl., or *C. cordifolia*, Mutis.
Arica Cinchona Bark	
Pale-Yellow Carthagena Cinchona Bark (Hard Carthagena Bark, Angl.—Quina Amarilla, Mutis. —China Flava Dura, Bergen)	
Orange-Yellow Carthagena Cinchona Bark (Quinquina de Maracaïbo. —China Flava Fibrosa Bergen)	
Pitayon Cinchona Bark, or False Pitaya Cinchona Bark	(?)

The following, according to M. Guibourt, are the most active barks :—

1. Calisaya Cinchona Bark.
2. Yellow Orange Bark.
3. Pitaya Bark.
4. Verrucous True Red Bark.
5. Von-Verrucous True Red Cinchona Bark.
6. Red Lima Bark.
7. Gray Lima Bark.
8. Verrucous White Huamalies Bark.

On the subject of distinguishing the various barks of commerce, M. Weddell points out the fallacy of the present method of distinguishing the sorts of bark by the colours red, yellow, and gray, as frequently the same barks at different ages have different colours. Having shown also the impossibility of a chemical classification, he proceeds to make the following remarks :—

" If a classification be absolutely needed, one which should be based on the anatomical structure of the bark would be found to be of far greater utility than either of the preceding, inasmuch as we shall find existing, even in the Cinchonas, a certain relation between the structural and chemical characters.

" The following are the data which my researches on the subject have furnished me with :—

" 1. If a large piece of the *Cinchona Calisaya* met with in commerce be attentively examined, it will be found that the exterior surface is entirely deprived of its peridermis, and presents broad superficial furrows, short, more or less confluent, and divided by projecting ridges, the bases of which are of a fibrous texture, similar to the inner surface of the bark or of the layer which is immediately in contact with the wood. The examination of a transverse section shows that the texture of the bark is homogeneous, and composed of ligneous fibres of almost equal thickness, uniformly distributed in the midst of cellular tissue gorged with resinous matter, tissue which may be said to isolate each fibre, being interposed in thin layers between them. Finally, when these fibres are examined longitudinally, we find that they are short and fusiform, and that their cut extremities are but loosely attached to each other, and are sometimes completely separate, and appear to float in the midst of the cellular tissue which surrounds them.

" 2. If we take a similar piece of the bark of *C. scrobiculata*, we shall find that instead of these furrows of fibrous texture, which so well characterise the *C. calisaya*, the exterior almost presents a smooth surface of a cellular texture, traversed here and there by slight linear indentations, the inner surface being, as in the preceding bark, of a fibrous texture. In the transverse section the fibres are more numerous than in the *C. calisaya*, especially towards the inner surface ; but they lessen in numbers rapidly near the exterior, and the outermost layer is entirely without them. These fibres, if examined in a longitudinal section, will be found to be of nearly double the length of those of the *C. calisaya*, and their extremities are invariably attached one to the other, their ends being by this means more elongated.

" 3. If we study with equal attention the bark of *C. pubescens*, we shall there find a peculiar structure. The external surface somewhat resembles the preceding bark, with the exception of a slight whitish marbling, formed by the continuity of the peridermis, and scissures which may result from desiccation. The internal surface is fibrous, as in the preceding barks ; but a transverse section shows us that it is principally composed of cellular tissue, in which the fibres form but a small number of irregular and concentric series in the interior half of the bark ; and that which draws attention at the first glance is the size of these fibres, each one being three or four times as large as those of either of the former varieties ; the result being that several of them are attached and united together in bundles, which may be fully proved by the examination of a longitudinal section of this bark.

" As may be perceived, we have only spoken of Cinchonas which have been deprived of their peridermis, because it is in this state that they are now usually met with in commerce. If perchance they were again to be used with their natural coating, it would afford additional means whereby to distinguish them, but would not in any way affect those of which we have just treated ; for nothing would be easier than to remove the peridermis and to expose the surface beneath. Be this as it may, the structure of all the Cinchona barks more or less resemble one or other of the three types we have spoken of, and on this plan there might be formed, without much difficulty, a series of groups comprehending all the known Cinchonas. The purpose however in noticing these peculiarities, has been to facilitate the comprehension of a very important fact in the diagnostics of the different kinds of Cinchonas ; that of the vast difference they present in their mode of fracture. However singular it may in the first instance appear to be, it is easy to prove that, to a certain extent, the chemical composition of the bark operated upon may be determined by its mode of fracture ; or, more properly speaking, there exists a relation between the chemical and the anatomical characters of the Cinchonas, this being constantly proved by a particular form of fracture : smooth or corky where it divides the tunic or cellular covering of the bark ; fibrous, stringy, or woody in those cases where it has affected one or other of the three forms of liber before described. Another fact which is now fully proved is, that the bark containing the largest proportion of quinine is that of the *C. calisaya ;* and experience has shown us, that after the *C. calisaya*, the barks possessing it in the greatest quantities are precisely those the structure of which most resembles this bark ; for instance, those in which the dermis is reduced to a single liber by the successive exfoliation of the outer tunics, or at least by their adjunction to the peridermis. On the other hand, experience seems to have shown, to a certain extent, that the Gray Cinchonas (which we have generally found to be the young barks of other species) contain a larger proportion of cinchonine than of quinine ; we also know that many old barks, which have retained the cellular coating they had when young, yield a proportionably larger quantity of cinchonine ; from which circumstance we may conclude that quinine is contained in the liber, or, more correctly speaking, in the cellular tissue interposed between the fibres of the liber, and that the cinchonine is principally found in the tunic or cellular coating. As to the tannin, it is found in larger quantities in this latter part than in the fibrous tunic—a fact which is easily determined with reference to the fresh bark where the exterior layers of the derm are more styptic than the internal layers." (' Pharmaceutical Journal,' vol. ix.)

The following are the specific characters of the *Cinchona calisaya :*—Leaves oblong or lanceolate, obovate, obtuse, attenuated at the base, rarely acute on both sides ; smooth, polished, or pubescent beneath ; scrobiculate in the axils of the veins ; filaments usually shorter than one half the length of the anthers ; capsule ovate, scarcely equal in length to the flowers. Seeds frequently frimbriate, denticulated at the margin. Of this there are two varieties :—

C. C. vera. A tree with obtuse oblong-ovate or oblong-lanceolate leaves.

C. C. Josephiana. A shrub with somewhat acute-oblong-lanceolate or ovate-lanceolate leaves.

Both varieties are natives of Bolivia and Southern Peru. (*Pharmaceutical Journal*, vol. ix.)

QUINTANA, MANUEL JOSÉ, a very eminent Spanish poet and patriot, remarkable for the depth of his feeling in both characters, and remarkable also for the strange vicissitudes of his long career, was descended from an Estremaduran family; but was a native of Madrid, where he was born on the 11th of April, 1772. He studied and took his degrees in canon and civil law at the University of Salamanca, where he became intimate with the poets Cienfuegos and Melendez, who introduced him to the friendship of Jovellanos [JOVELLANOS], at that time the leading representative of liberal ideas in Spain. Quintana was from the first distinguished for his spirit of manliness and independence, and when he commenced his career as an advocate at Madrid, his house, at which a party of literary friends assembled every evening, became the ordinary resort of those who were opposed to the degrading policy of Godoy, the all-powerful favourite of the day; while the house of Moratin, the dramatic poet [MORATIN], the other literary focus, was the resort of those who paid homage to the minister.

From about 1795 Quintana became known as a poet only second to his friend Melendez, and in almost every case the themes he selected were of a large and lofty character, and treated in a corresponding strain. One of the finest odes in the Spanish language is his 'Ode to the Sea.' He had lived to his twenty-sixth year without ever beholding the ocean, and in 1798 he was seized with so irrepressible a longing to fill up the deficiency, that he made a journey from Madrid to Cadiz for that express purpose, wrote this ode, which is worthy of the occasion, and returned. Such an incident would have been noticeable in any country, but it was particularly so in that country and age, for, as Alcalà Galiano remarks, in his excellent history of Spanish literature, travelling, except on unavoidable business, then had no part in the habits of Spanish life. Many of Quintana's other odes are scarcely less admirable than this, and they constitute by far his best title to poetical fame. It may be remarked that the patriotism, which is the animating principle of almost every one of them, is a very intense, but at the same time a narrow feeling. Two of these odes, which will be found translated into English in Kennedy's 'Modern Poets and Poetry of Spain' (London, 1852), are on the introduction of vaccination into America by the Spaniards, and on the battle of Trafalgar. In the first, after celebrating the great discovery of Jenner, Quintana exclaims—

> "The gift of the discovery is the gift
> Of chance ; that let an Englishman enjoy,
> But let Spain show her noble, generous heart," &c.

by conveying it to her colonies, apparently forgetting that England imparted the discovery not only to her own colonies, but also to the nations with which she was at war, in spite of their at first receiving it with insulting suspicion. In the ode on Trafalgar, the battle is represented throughout as between the English and Spaniards, the French not being even honoured with a mention; and the poet appears to think he is paying a very generous compliment to the memory of Nelson by saying, "As an Englishman, I abhorred thee; but as a hero, I admire." These points are worthy of notice as characteristic not only of Quintana but of the majority of his countrymen.

In dramatic poetry Quintana was far less successful than in lyric poetry. As early as in 1791 he had contended for a prize offered by the Spanish Academy for a poem on the 'Rules of the Drama' ('Las Reglas del Drama'), and in this production, which was not printed till long afterwards, he expresses unbounded admiration for Corneille and Molière, makes but lukewarm mention of Lope, Calderon, and Moreto, and none whatever of Shakspere, though, probably in consequence of his friendship with Melendez, he had studied English. In his own tragedies, of which he gave two to the public, the same line of thought is apparent. One of them, 'El Duque de Viseo' ('The Duke of Viseo'), acted in 1801, is acknowledged by the author to be founded on an English drama, which he does not name; and the finest passage in it, the description of the villain's dream, is evidently taken from the well-known dream of Osmond in Monk Lewis's 'Castle Spectre,' but in other respects the resemblance is very slight. The other tragedy, 'Pelayo,' which is somewhat better, is however less a drama than a collection of patriotic declamations, some of them fine when separately taken, but quite undramatic, and reading like passages from the author's odes.

Up to the time of the French invasion in 1808, Quintana's position continued one of great prosperity. As an advocate, in spite of his liberal opinions, he held several important offices, among others, those of fiscal agent of the junta of commerce, secretary of the department for the interpretation of foreign languages, and censor of the theatres. As a literary man his reputation was constantly increasing. He edited a periodical entitled 'Variedades,' which was considered the best of its time in Spain. In 1807 he issued the first volume of a prose work, the 'Vidas de Españoles célebres' ('Lives of celebrated Spaniards'), commencing with the Cid, and going on to Gonzalvo de Cordova, the Great Captain. In the following year he published in three volumes a selection of specimens of the best Castilian poetry from the time of Juan de Mena, 'Poesias Selectas Castellanas,' to which he prefixed a short history of Castilian poetry, superior to anything of the kind that had before appeared, and which was afterwards rendered into English by Wiffen as an introduction to his translation of 'Garcilaso de la Vega.' This was in the year of the French invasion. That great event had a very different effect on the three friends, Cienfuegos, Melendez, and Quintana. Cienfuegos, seized by Murat, and sent a prisoner to the south of France, died of indignation at the treatment of his country and himself; Melendez passed over to the ranks of the enemy; Quintana became of all the literary antagonists of the French by far the most active and the most dangerous. He was the author of most of the manifestos of the insurrectionary Juntas, the fervid eloquence of which startled Europe. He drew up most of the official documents of the first Cortes. His weekly periodical, 'El Semanario Patriotico,' was the leading organ of the patriotic party, and exercised great influence on the march of events, for Quintana was no less uncompromising an advocate of liberal institutions than of the expulsion of the foreign invader. The six years of the war were the most glorious of his long life. They were followed by six years of imprisonment. The return of Ferdinand VII. was to Quintana, as to others who had saved his throne, the signal of ruin. His having been the advocate of the Cortes and of a constitution was regarded as a crime that called for punishment. He was suddenly seized and thrown into the fortress of Pamplona, where he was left imprisoned with no hope or promise of release, debarred from all intercourse with his friends, and not allowed access to pen and ink. In this state of rigorous incarceration he remained till he was released by the outbreak of Riego's insurrection, on the 1st of January, 1820. He was then at once set at liberty, saw himself surrounded with popularity, restored to his old offices and honours, and was named president of the department of public instruction, but he was no longer the man he had been before his imprisonment. His detestation of tyranny was still strong, and his powers of eloquence unimpaired, but he had no faith in the continuance of the new order of things, and with guarded prudence he abstained from making himself conspicuous in the ranks of the liberal party. When the second French invasion overthrew the constitution, he received the reward of his reserve by being allowed to remain on the soil of Spain, while his friends and companions took refuge in England and France. Commanded to leave the capital he retired to Cabeza del Buey, the town in Estremadura to which his ancestors belonged, and there lived in obscurity and absolute poverty for some years. In this retreat he composed a series of 'Letters to Lord Holland,' with whom he had become acquainted at Madrid, which contain an eloquent and touching vindication of the proceedings of the constitutional party in Spain, not unmingled with reproach at the injustice with which they had been treated by England. These letters, the last of which bears date in 1824, were of course carefully concealed at the time they were written, and did not see the light till they appeared in a collected edition of Quintana's works in 1852. At the time of King Ferdinand's marriage to his third wife, Queen Maria Christina, in 1828, he sent an intimation to Quintana that he would be permitted to return to Madrid, if he would write an ode in honour of the nuptials. The poet's proudest boast had hitherto been that he had never written a line in praise of the powers that were, and his friends were at once grieved and astonished to find that he complied. The poem was pronounced to be the best of all that were produced on the event, although Galiano, an excellent judge, considered it the worst Quintana had ever written. The poet returned to Madrid, was no longer regarded as inflexible, and found himself on the road to fortune. Soon after he was named a member of the committee of the Museum of Natural

Sciences, in 1833 he was for a third time appointed secretary of the interpretation of languages, in 1835 he resumed the office of director-general of studies and of public instruction, which he had held under the Cortes, and was elevated to the dignity of a senator and peer of the kingdom. During the regency of Espartero he was entrusted with the superintendence of the education of the present Queen of Spain. The Madrid newspapers of 1855 had to record an instance of public honours conferred on a poet, for a parallel to which the whole history of many nations might be searched without success. Quintana was conducted in public procession through the streets of the capital, he was introduced to the sitting of the Cortes, and a crown of laurel was publicly placed on his head by the Queen of Spain. The coronation of Oehlenschläger [OEHLENSCHLÄGER, *S.* 2] is the only event of our times which bears much resemblance to it, but the coronation of Petrarch and Tasso afforded some precedent for it in the past. Quintana, then very advanced in years, did not long survive this act of public homage to his genius. He died at Madrid on the 11th of March, 1857, at the age of eighty-four, and his funeral, which took place on the 13th, was attended by Olozaga, by the Duc de Rivas, and almost all the literary men of note in the Spanish capital.

In the great collection of the Spanish classics now in course of publication, Rivadeneyra's 'Biblioteca de Autores Españoles,' Quintana was the only author whose works were admitted during his lifetime. One of the volumes, edited by Ferrer del Rio, and published in 1852, comprises what are called the 'Complete Works' of Quintana, but no specimen even is given of the proclamations and manifestos issued in the name of the insurrectionary Juntas which excited the admiration of Southey. Among the poems also we have been unable to find that on the nuptials of Ferdinand and Christina, an event so fortunate in one sense for the poet; but in addition to those fine odes we have already mentioned, there are some 'On the Invention of Printing,' 'The Pantheon of the Escurial,' 'To Spain, after the Insurrection of March' (written in April 1808), 'On the Armament of the Spanish Provinces against the French' (written in July 1808), which will continue to testify how well Quintana deserved the name of the Spanish Tyrtæus. The prose part of the volume is principally composed of the 'Lives of celebrated Spaniards,' of which Ferrel del Rio complains in the preface that a single edition has hardly been sold in Spain, while seven have been exhausted in the United States of America. English translations of these biographies have been issued by Preston and Mrs. Hodson. It is to Quintana's honour that one cause of their scanty popularity in his native country was the freedom with which the atrocities of the Spaniards in the conquest of America are spoken of, and which he refused to modify. "Let us give at least some place to justice in books," he exclaims in the preface to his life of Las Casas, "since unfortunately so little is now usually left to it in the affairs of the world."

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RACZYNSKI, EDUARD, a Polish nobleman of literary tastes and talents, was born at Posen in 1786, the son of Count Philip Raczynski, a Polish general. Count Eduard entered the Polish army, and took some share in Napoleon's campaign of 1807; but on the fall of Napoleon I., when he became a simple Prussian subject, he withdrew from a military career. He travelled in Turkey in 1814, and published an account of his journey in one of the most splendid volumes in the Polish language, 'Dziennik Podro'zy do Turcyi' (folio, Breslau, 1821, illustrated with numerous plates). The rest of his life was chiefly devoted to literary pursuits. His 'Obraz Polakow i Polski' ('Picture of the Poles and Poland in the 18th Century,' 21 vols., Breslau, 1840, &c.), is a valuable collection of memoirs, most of them before unpublished. Another of his most prominent works is his 'Gabinet medalow Polskich,' or 'Cabinet of Polish Medals,' in 4 vols. 4to (Berlin and Posen, 1841-45), with a text in Polish and French. His 'Wspomnienia Wielkopolski' ('Memorials of Great Poland,' 2 vols, with an atlas of plates), is also deserving of mention. The 'Codex Diplomaticus Majoris Poloniæ,' or collection of documents illustrating the history of Poland, which he edited, had been originally compiled by his grandfather, Count Kazimierz Raczynski; but a companion work, the 'Codex Diplomaticus Lithuaniæ,' was his own. Among other benefactions to Posen, he founded a public library in that town, erecting a building for the purpose, presenting to it a collection of 21,000 volumes, and endowing it with a fund for the maintenance of the librarian, who is at present Lukaszewicz, one of the first historians and antiquaries in Poland, to whom the Count gave the appointment. On the 20th of January 1845 Raczynski destroyed himself, by means of an ornamental cannon which was kept in his park. It was currently reported that the motive of the act was, that in looking over some old family papers, he had found that one of his ancestors had received part of the family estates as a bribe from Catharine II. of Russia to betray the cause of his country. The lady of Count Raczynski, who survived him, was the widow of Count Jan Potocki, also a Polish author of eminence, who destroyed himself thirty years before in 1815. His son, Count Roger Raczynski, who succeeded him, generously abolished the feudal dues that were payable to him by 4000 peasants of the twenty-seven villages on the estates of the family.

RADETZKY DE RADETZ, FIELD-MARSHAL, COUNT JOSEPH, was born at the castle of Trebnice, in the Klattauer district, in Bohemia, on the 2nd of November, 1766. He was the son of Count Peter Eusebius Radetzky, and of the Baroness Maria Bechyne. The family name was formerly spelt Hradecky. Having entered the army as cornet, in the 2nd Austrian Cuirassiers, in 1784, he became sub-lieutenant, February 3, 1787. In 1788 he served in the Turkish campaign under Marshal Lacy, and was raised to the rank of first lieutenant for his services at the siege of Belgrade. When the Austrian army entered France in 1793, Radetzky, then a captain, was sent to the new scene of war; and he was present in all the Italian campaigns from 1795 to 1800, serving alternately under Beaulieu, Wurmser, Alvinzi, and Melas, and distinguishing himself greatly at the battles of Arcola, Rivoli, and Marengo. Meanwhile, in 1797, he was promoted to the rank of major, and in 1799 he became adjutant-general to Melas, who soon learned to appreciate his zeal and gallantry, and repeatedly mentioned his name in his despatches. For his gallant behaviour at the battles of Novi (May 15, 1799) and Marengo (June 14, 1800), he was created colonel, and appointed to command the Archduke Albert's cuirassiers, and received the order of Maria Theresa.

From the peace of Luneville, in 1801, to 1805, Colonel Radetzky was not employed in the field; but at the latter period he was made major-general. During the contest at Aspern, May 21-22, 1809, when the place was six times retaken by the Austrians from the French, few officers contributed so much to the victory as Radetzky. On the 1st of June he received the command of the 4th corps, with the rank of lieutenant-field-marshal. At the battle of Wagram, July 6, 1809, he commanded the Austrian cavalry. In April 1810 he was nominated commander of the military order of Maria Theresa. From that period until the end of 1812 his services were employed at home in the war-office.

During the whole campaign of 1813, when the tide of war had turned against Napoleon I., Lieutenant-Field-Marshal Radetzky acted as chief of the staff to Prince Schwartzenberg; and the Austrian commander attributed the victory of Kulm mainly to Radetzky's skill and gallantry. But his crowning feat of arms was at the battle of Leipzig, October 18, 1813, the plan of which he drew up. As is well known this decisive action was a succession of battles which lasted three days. The Emperor of Russia and the King of Prussia were present, and 1600 pieces of artillery thundered over the field. Although he had then been nearly thirty years in the service, Radetzky received his first wound at Leipzig. Throughout the campaign of 1814 within the French territory he was continually in action, and on the 31st of March he entered Paris, riding by the side of the Emperor Alexander. Radetzky was appointed in 1822 Commander-General of the Lombardo-Venetian Kingdom; and in 1830, in his sixty-fourth year, after forty-six years of service, he was created field-marshal.

But it was the Italian insurrection, in 1848, which first gave prominence to the name of Radetzky. As early as the year 1846 manifest signs of a turbulent spirit were visible in Italy. The stringent rule of the Austrian government had long excited a rancorous feeling in the Italians against their foreign masters, and they panted for an opportunity to reject the yoke. The reforms of Pope Pius IX. served only to promote the smouldering irritation. Societies were formed to diffuse the secret spirit of revolt throughout the entire peninsula. In 1847, the movement was all but brought to a crisis, when Austria claimed and enforced the right to place a garrison in Ferrara. Immediately a Civic or National Guard was constituted in every Italian state. Then came the revolution in Paris, in February 1848, followed by similar movements in Vienna and Berlin, which raised the spirit of insurrection to its height.

On the 18th of March 1848, barricades were erected in every street in Milan; the fighting lasted for three days; after which Marshal Radetzky drew his troops out of that city, and retreated to Verona. The Austrian army at that time in Italy amounted to nearly 75,000 men; but it was scattered over an extensive line of operations. Consequently the insurgents were at first triumphant; the tricolor flag appeared upon all the towers of Italy, except those of Verona, Mantua, Legnano, and Peschiera; and Charles Albert, King of Sardinia, having united himself to the league, a most gallant contest was maintained for five months. More than once the veteran marshal had to quit the field; but every time he retired in good order. At other times victory was on his side. At length, on August 4, 1848, Radetzky, after a series of successful attacks on the Italian posts, advanced against Milan, at the head of the Austrian army; the Milanese lost heart, and deaf to the remonstrances of Charles Albert, urging them to defend the city, they held a council of war, and determined to abandon Milan. A deputation was sent to Marshal Radetzky, and the terms obtained were: "that the Piedmontese army was to be withdrawn in two days from the Lombard territory; that the Austrians were to enter Milan on the 6th of August; and that the lives and property of the people were to be respected." The struggle was now virtually at an end. Radetzky's superior strategy, and the disunion of his opponents, rendered it an easy task for him to break up the Sardinian forces, and he was again master of all Lombardy. The Emperor of Austria in return for his services sent him an autograph letter of thanks, accompanied by the first class order of St. George. In March 1849, the rebellion in Hungary incited the Italians to make a new attempt to establish their independence; but it was rendered abortive by the prompt and energetic measures of the marshal. Full of years, and loaded with honours by his sovereign, he several times afterwards applied in vain for leave to resign his command. Nor was it until the opening of 1857 that he obtained this permission, in a courteous letter from the Emperor, after a prolonged service of seventy-three years in the Austrian armies. He died Jan. 5, 1858, at Milan.

Marshal Radetzky married in 1798 the Countess Frances Strassoldo-Gräfenberg, by whom he has left a son and daughter.

RAFFLESIACEÆ, a natural order of stemless leafless Parasitical Plants, consisting of flowers growing immediately from the surface of branches, and immersed among scales. The perianth is superior, with a 5-parted limb, thickened processes or calli either distinct or united into a ring being attached to the throat of the tube. The essential organs are combined in a column which adheres to the tube of the perianth. Anthers 2-celled, either distinct and opening by vertical apertures, or combined together so as to become a multicellular mass opening by a common pore. Ovary 1-celled; placentas parietal. Fruit indehiscent. The species are East Indian and South American plants, parasitic on the species of *Cissus* and on some *Leguminosæ*. There are 16 species. Some of them are said to be styptic. Their perianth has a fungoid appearance.

Rafflesia Arnoldi, a Sumatra parasite, is capable of containing 12 pints of fluid in its cup. The flower is said sometimes to have a weight of 14 lbs.

R. Patma is employed as an astringent and styptic in Java. *R. Horsfieldi*, *R. Cumingi*, and *R. Rochussenii* have similar properties.

The genera are *Rafflesia*, *Sapria*, *Brugmansia*, *Apodanthes*, and *Pilostyles*.

(Balfour, *Classbook of Botany*; Lindley, *Vegetable Kingdom*.)

RAGGED ROBIN. [LYCHNIS, *S.* 1.]

RAGLAN, JAMES HENRY FITZROY, BARON (previously Lord FITZROY SOMERSET), was the younger son of Henry, fifth duke of Beaufort, by Elizabeth, daughter of Admiral the Hon. E. Boscawen, and was born in 1788. He received his early education at Westminster School, but before completing his sixteenth year obtained a commission in the 4th Light Dragoons. In 1807 he attended the late Sir Arthur Paget in his embassy to Constantinople; and was in the same year placed on the staff of the Duke of Wellington. Two years later he became aide-de-camp to the duke, in which capacity Lord Fitzroy Somerset was present in every engagement throughout the Peninsular campaign. He was wounded at Busaco, and he was among the first who mounted the breach at the storming of Badajoz. Having been promoted to the rank of lieutenant-colonel, he attended the Duke of Wellington as aide-de-camp at Waterloo, where he lost his right arm; and in consequence of his military services he was made a K.C.B. and a colonel in the army. In 1814 he had acted for a short time as secretary to the embassy at Paris, and so great was the confidence reposed in him that he remained in that city as minister plenipotentiary *ad interim* from the following January to March. He continued to act as secretary to the embassy at Paris until 1819, when he was appointed by the Duke of Wellington, then master of the ordnance, to be his military secretary. This post he retained until 1827, when he accompanied the duke to the Horse Guards as military secretary. Here he remained until after the duke's death in September 1852. He had accompanied the duke to the congresses of Vienna and Verona in 1822, and to St. Petersburg in 1826, and on another occasion was sent on a special mission to Madrid. He also represented the borough of Truro in the parliaments of 1818 and 1826.

Upon the death of the Duke of Wellington, and the promotion of Viscount Hardinge to the command of the army, Lord Fitzroy Somerset was appointed Master-General of the Ordnance, and raised to the peerage as Baron Raglan, a title derived from Raglan Castle, a ruin in possession of the ducal family of Beaufort. He had been little more than a year at the head of the Ordnance when war broke out between England and Russia, and Lord Raglan was appointed to command the forces sent out to the east, with the rank of full general. He left England in March 1854, and after spending some months at Varna and Constantinople, during which time the army suffered very severely from sickness, he landed on the shores of the Crimea in the September following. In conjunction with Marshal St. Arnaud, who commanded the forces of our French allies, he fought the battle of the Alma on the 20th of that month. It has been stated that he wished to attempt carrying Sebastopol by a *coup-de-main*, but this not being agreed to by his colleagues, it was determined that it should be invested. Unfortunately, the siege proved one of longer duration than either of the generals had calculated. Difficulties in furnishing provisions and clothing for the troops, which appear to have been for a long time but feebly attempted to be overcome, resulted in a large portion of both the English and French troops perishing in the trenches before Sebastopol during the subsequent winter, 1854-55. The failure of more than one assault upon that city, and the consequent loss of his men, for whose sufferings he felt most tenderly, together with the censures of the English press upon his line of conduct, unhappily increased the symptoms of diarrhœa, by which he was attacked in the following June, and he died in camp before Sebastopol on the 28th of that month, leaving behind him the memory of an able and brave soldier and a general of high ability, who commanded at once the confidence and respect of his men. The general orders issued by the commander-in-chief at home, and by Marshal Pelissier, his colleague in the divided command over the allied troops in the Crimea, bore testimony to his great and important services. His body was carried back to England, and interred in the church of Badminton, Gloucestershire. A life pension of 1000*l.* a year was settled on his widow, and 2000*l.* a year on his son, who succeeded him in his title. He married, in 1814, Harriet, daughter of the third earl of Mornington, and niece of the Duke of Wellington, by whom he left two daughters and an only son, Richard Henry Fitzroy, now second Lord Raglan, who was formerly in the civil service at Ceylon, and afterwards held the post of secretary to the King of Hanover. His eldest son, a major in the army, was killed in the first Punjab campaign, while serving on the staff of Lord Gough, in December 1845.

RAIANIA, a genus of Plants so called in honour of the great naturalist John Ray, is known by the staminiferous flowers having a bell-shaped perianth in six deep oblong pointed segments, most spreading in their upper part. Corolla none; stamens with six filaments, bristle-shaped, shorter than the calyx; anthers simple. Pistilliferous flowers, the perianth superior, of one leaf, bell-shaped, in six deep segments, permanent, withering; corolla none; pistil with the germen inferior, compressed, with a prominent border at one side, 3-celled; styles 3, the length of the calyx; stigmas obtuse; capsule membranous, of three cells without valves, crowned by the calyx; two of the cells barren, almost obliterated, without wings; the third fertile, compressed, extended into a very large half-ovate membranous wing; seed solitary, nearly elliptical, compressed.

R. hastata, Halberd-Leaved Raiania, is found in the island of St. Domingo. The root is perennial, sometimes large and ovate, sometimes 4 or 5 inches long and 2 inches thick, round at each end. Its substance resembles that of a radish without any internal fibres; the back thin, ash-coloured, a little rugged and warty, the flesh very white, tasting like a bean. The flowers small, whitish, in simple axillary drooping clusters.

R. cordata, Heart-Leaved Raiania, has ovate leaves somewhat heart-shaped at the base, 7-ribbed. It is a native of the West Indies, from whence it was sent to Kew Gardens in 1786, by Mr. Alexander Anderson. Plumier represents the habit of the root, stem, &c., much like the foregoing; but the leaves are regularly ovate, pointed, more or less heart-shaped at their base, and furnished with seven ribs continued from that part to the point. These ribs are connected by numerous transverse veins.

R. ovata, Ovate-Leaved Raiania, has ovate-pointed 3-ribbed leaves. It is a native of the hills of St. Domingo, and has a shrubby stem, turning thread-shaped, sub-divided with slender smooth leafy branches. The leaves rather distant, stalked, smooth on both sides, pointed, entire, 3-ribbed, being ovate at the base. The flowers diœcious, the males in compound clusters, females in simple ones; all stalked and turned toward one side. Corolla very minute, yellowish-green in the male, reddish in the female blossoms.

R. angustifolia, Narrow-Leaved Raiania, is a native of the west part of St. Domingo, where it climbs upon high trees, flowering in May.

R. quinata, Five-Leaved Umbellate Raiania, has five leaves on a common stalk. It was observed by Thunberg about Nagasaki, and in Japan, flowering in April and May. The stem is twining, round, smooth, ash-coloured, and branched. Leaves several together, axillary, stalked, smooth. Flowers in umbels from the same buds as the leaves, on slender stalks, as long as the footstalks.

R. hexaphylla, Six-Leaved Clustered Raiania. Leaves six, on a common stalk, oblong-acute. Flowers racemose. It is a native of the country of Fakonia, in Japan, among bushes, flowering in April. The stem is round, striated, smooth, climbing. The flowers in axillary racemes, clusters snow-white. It differs from *R. quinata* in having mostly six leaflets on a stalk, which are acute, reticulated, with veins at the back, and larger than in that species. The flowers moreover grow in clusters, not in umbels.

RAIIDÆ, or RAIINÆ, a sub-order, or family of Plagiostomous Cartilaginous Fishes, of which the Common Ray is the type. The body of these fishes is horizontally flattened, and more or less discous; the dorsal fins are mostly placed on the tail; a peculiar cartilage, called naso-pectoral, arises from the nasal part of the skull, and extends towards or meets the anterior part of the crest or pectoral fin; the branchial openings are inferior.

This sub-order is divided into the following families or tribes:—

1. *Cephalopteridæ*, Horned Rays.—They have a muzzle distinguished by two horn-like processes; the mouth before or beneath very broad; teeth very small, in some wanting in upper jaw; tail as long or longer than body, with a back-fin and spine. The genus *Cephaloptera* has large lateral eyes and a transverse mouth, with small teeth like a file.

C. Giorna is the only species known in the European seas. A specimen of this fish was once taken on the southern coast of Ireland. It has been described by M. Risso as frequent on the coast of Nice. It approaches the shore, and is most frequently taken in the month of July. In Italy the small ones are called Vachetta, and the larger ones Vacha. It dies immediately on being taken out of the water. It is eaten by the poorer classes at Nice, but is not tender. They grow to a prodigious size. Risso records a male weighing 800 lbs. and a female weighing 1200 lbs.

2. *Myliobatidæ*, Eagle Rays.—The head is partially disengaged from pectorals; mouth transverse; teeth large, mosaic-like; eyelids wanting; tail long, with a back-fin on root and a serrated sting behind. The genus *Myliobatis* has flat teeth; the central plate much longer than those which are lateral; pectoral fins wing-like; the tail armed with one fin upon the root, behind that a serrated spine.

M. aquila, the Whip Ray, the Eagle Ray, and the Mullen. This fish, though rare, has been found on the British coasts. Dr. Johnston has described a specimen found at Berwick-upon-Tweed. It inhabits the Mediterranean, and has been taken as far south as the Cape.

3. *Trygonidæ*, the Sting Rays.—The head is laterally inclosed by the pectorals; the teeth transversely elliptical; the tail without any fin, or merely a low vertical cuticular hair, and with one or more sharp serrated spines.

The genus *Trygon* has the characters of the family.

T. pastinaca, the Common Trygon, the Sting-Ray, the Fire Flaire, La Pastinaque of the French, is an example of this family. It was well-known to the ancients, who entertained many fictions with regard to the venom of the spines of these fish. It is not unfrequent on the British coasts. The powerful serrated spine on its tail is used as an organ of defence.

4. *Anacanthidæ*, Stingless Rays.

5. *Raiidæ*, the Skates.—The body is rhomboidal; tail depressed, slender, generally with a low terminal fin, and frequently with rows of small spines; skin smooth or with small curved prickles; teeth flat, pavement-like, and pointed in males in spawning time. The genus *Raia* has two small fins near the end of the tail; the eyes and temporal orifices are on the upper surface of the head; the nostrils, mouth, and branchial apertures beneath.

The Skates are very numerous on the British coasts, and some of the species are used as food. The young are deposited in a similar manner to the sharks, in their horny cases of a square form, with four projecting horns, giving them the form of a butcher's tray. These cases are very frequently picked up on the sea-shore, and are sometimes called sea-purses. In Cumberland they are called Skate-Barrows, on account of their form. As the young fish increases in size it at last separates the edges of the horny layers in which it is inclosed, and escapes into the ocean. The following are the British species of this genus:—

R. mucronata, the Long-Nosed Skate, remarkable for its long pointed nose.

R. oxyrhynchus, the Sharp-Nosed Ray, the White Skate, the Burton Skate.

R. intermedia, the Flapper-Skate.—This species was first taken in the Frith of Forth by Dr. Parnell, and first described by him.

R. batis, the Skate, the Blue Skate, the Gray Skate, the Tinker, La Raie Cendrée of the French. This is one of the commonest species on our coast. The preceding species as well as this, the Thornback, and the Homelyn, are all commonly called Skate.

R. marginata, the Bordered Ray. It has been only occasionally taken in Great Britain.

R. microcellata, the Small-Eyed, or Painted Ray. This is a rare species.

R. miraletus, the Homelyn, the Home, the Sand Ray, and Spotted Ray. It is one of the commonest species along the line of our southern coast. With the Thornback it is the most common species found in the London market.

R. spinosa, the Sandy Ray, Raie Râpe of the French. It has been only occasionally taken in the British Islands.

R. fullonica, the Shagreen Ray. This species is known by its rough back. It is only occasionally taken in the British Islands.

R. clavata, the Thornback, the Rough Ray. This Ray is easily distinguished by the spiny plates with which it is covered. Its flesh is regarded as the finest of all the Rays. It is in the best condition for the table about November.

R. radiata, Starry Ray. A rare species.

6. *Torpedinidæ*, the Torpedoes.—The head is very large and surrounded by pectorals, so as to form a circular disc; the tail is short, fleshy, depressed at the base, cylindrical at the extremity; mouth beneath; teeth pointed or flat. These fish are many of them remarkable for their power of giving electric shocks. There are two species of *Torpedo* found on the British coasts.

Torpedo vulgaris, the Old British Torpedo, the Common Cramp-Fish, the Numb-Fish, the Electric Ray, and the Cramp-Ray. This fish is only occasionally found on our coasts.

T. nobiliana, the New British Torpedo. This is identical with the *Torpedo* of the Mediterranean.

7. *Rhinobatidæ*, the Beaked Rays, have the muzzle generally beaked and pointed; the mouth undulated; the teeth rounded or elliptical, in some broader than long, and longer on summit of undulations; body smooth; caudal fin hilobular, or cut obliquely, forming one lobe. These fishes connect the Sharks and Rays. The species inhabit the Mediterranean, the Atlantic, and the coasts of Brazil. They are not found on the coasts of Britain.

8. *Pristidæ*, Saw Fishes.—The snout is produced into a long flat osseous saw-shaped blade, with teeth on the lateral edges; body flattened before, somewhat elongated posteriorly; skin with very small, flat, roundish, or 6-cornered scales; mouth beneath.

(Adams, Baikie, and Barron, *Manual of Natural History;* Yarrell, *History of British Fishes.*)

RAILWAYS. Since 1846, down to which an account was brought in the 'Penny Cyclopædia,' article Railway, vol. xix., and Transit, *S.* 1, no material alteration has been made in the system, and some account of the peculiar construction of some of their works will be found in *S.* 2, under Bridges. There have been no new trunk lines undertaken, unless the North Kent be considered such, but the construction of branches and connecting lines has been pursued unintermittedly; and there is now no important town in the United Kingdom but what is connected with the railway system, if not directly, at least by a short transit by means of omnibuses or other public conveyances. The legislation, therefore, has been principally as to deviations, connecting branches, the raising of capital, the granting or amending of powers for amalgamation, for the purchase or leasing of constructed branches, and a few of the acts passed were for railways in the East Indies and the colonies. In 1846 there were passed 272 railway acts, 184 in 1847, 83 in 1848, 35 in 1849, 36 in 1850. In 1850, in June, there were 6307 miles open in the United Kingdom, of which 891 miles were in Scotland, and 515 miles in Ireland, and the capital which had been authorised by parliament to be raised was 359,065,115*l.*, of which 178,412,625*l.* had been received on shares, and 51,335,154*l.* by way of loan; and 21,904,047*l.* had been paid in the year on shares, and 7,670,064*l.* had been raised by loan. During the year 72,848,422 passengers were conveyed by railway. In 1851 there were 61 railway acts passed, 52 in 1852, 102 in 1853, 82 in 1854, 76 in 1855, 60 in 1856, and 84 in 1857.

On Dec. 31, 1856, there were in the United Kingdom 8710 miles of railway open for public traffic; there were 1080 miles in course of construction; and there were 3321 additional miles authorised, which had not been commenced at that date. On Dec. 31, 1857, there were 9091 miles open. The total amount of capital and loans authorised to be raised up to Dec. 31, 1856, was 377,767,907*l.*, of which 307,594,086*l.* had been paid up, 70,173,821*l.* had yet to be raised, and the total of the debts of the various companies was 77,359,419*l.* In the year 1856 (during which 963 miles had been constructed) there had been conveyed 129,347,592 passengers, of whom 108,368,901 were in England and Wales, 13,097,238 in Scotland, and 7,881,453 in Ireland. During the year, 27 passengers had been killed, and 298 injured. The total number of accidents had been 281 killed, and 394 injured. In the year 1857 the number of accidents had materially increased; they had amounted to 236 killed, and 738 injured. Of these 25 passengers were killed, and 631 injured, from causes beyond their own control; and 23 were killed, and 15 injured, from misconduct or want of caution. The remaining accidents occurred to servants of the companies, trespassers, &c. The receipts from passenger traffic amounted to 10,153,745*l.*, and the receipts for the conveyance of goods, cattle, minerals, parcels, &c., amounted to 13,011,748*l.* Of the goods traffic, 7,685,379*l.* were for the carriage of 23,823,931 tons of merchandise, 3,585,991*l.* were for the carriage of 40,938,675 tons of minerals, 517,786*l.* were for the conveyance of 10,450,175 head of live stock, and 1,222,628*l.* for the carriage of parcels, &c. In England and Wales the total receipts averaged 3120*l.* per mile, in Scotland 2022*l.*, in Ireland 1092*l.* per mile; the average working expenses were in England and Wales 1531*l.*, in Scotland 970*l.*, and in Ireland 427*l.* per mile. The number of persons permanently employed on the various railways on June 30, 1856, in the capacities of secretaries, engineers, store-keepers, station-masters, clerks, engine-drivers, guards, artificers, porters, plate-layers, labourers, &c., was 102,117.

Railways in England are now as extensive, or nearly so, as turnpike roads; but foreign railways have assumed a position of so much importance as to claim the attention of our own country. Great as may be the advantage to the United Kingdom of having eight or nine thousand miles of railway open, it is of yet more importance to society at large that the other countries of the civilised world should be similarly provided; that prejudices of race and of creed should be softened down by intercommunication; and that each country should benefit from the produce of the others by interchange. It is no inconsiderable a fact in the world's history that the Magyar of Hungary, the Slavonian of Western Russia, and the gay Neapolitan of Southern Italy, should now be travelling in the same way, with locomotives displaying the same kind of highly-finished mechanism, as the inhabitants of the more developed and commercial countries of Europe. We have yet to see whether European nations, if at war, would tear up each other's railways; but so long as this is not the case, a railway line must inevitably be a line of civilisation. It is a "great fact" that a man may now 'book through' from London to so many continental cities, in spite of rivers, mountains, passports, custom-houses, and national jealousies. And if, directing our glance across the Atlantic, we watch the progress of American railways, we shall there be struck with the conquests over the barren wilderness made in a few short years.

In Europe Belgium took the lead. King Leopold proposed to the Legislature, in 1833, the adoption of a government system of railways; and a law was passed in 1834 in conformity with the proposal. The plan comprised a trunk line from Ostend to Liège, with lateral branches to Antwerp and Brussels, and a line from Brussels to the French frontier at Quievrain, making a total of about 247 English miles; in 1837 further lines were sanctioned from Ghent to Courtray, Courtray to Tournay, Braine-le-Comte to Namur, and Landen to St. Frond—a further distance of 94 miles; these various lines were opened to Brussels in 1835, to Antwerp in '36, to Ghent in '37, to Ostend in '38, to Courtray in '39, to Trebize in '40, to Mons in '41, to the French frontier in '42, and to the Prussian frontier in '43, by which time 326 out of the 341 miles were opened; and these had cost 4,114,354*l.*, or about 12,600*l.* per mile, exclusive of stations and carrying stock, which raised the cost to 16,500*l.* per mile. The Belgian lines open in 1858 were, from Ostend to Brussels, 89 miles; from Brussels to Tournay, 47 miles; from Brussels to the French frontier at Quievrain, 50 miles; and from Mons to Quevy, 9 miles; from Brussels, by Malines and Liège to Herbesthal, where it joins the Prussian line to Aix-la-Chapelle, 96 miles; from Landen to Maastricht, also joining the line to Aix-la-Chapelle, 36 miles; from Bruge to Poperinghe, joining a line to Calais, 59 miles; from Brussels to Mouscron, connected with the line from Lille to Paris, 72 miles; from Brussels to Antwerp, 26 miles; from Ghent, through Brussels, to Ath, 46 miles; from Ghent to Antwerp, 31 miles; from Brussels, by Namur, to Verviers, joining the Aix-la-Chapelle line, 85 miles; from Brussels to Erquelinnes, the direct Paris line, 56 miles; from Brussels to Namur, by Braine-le-Comte and Charleroi, 68 miles; from Louvain to Charleroi, by Wavre, 41 miles; from Charleroi to Vireux, 39 miles; from Manage to Wavre, 25 miles; from Wavre to Mons, 15 miles; a total of 890 miles. The Great Luxembourg line, of which only parts are completed, is to join the French railways at Metz, and thus connect Belgium with Nancy, Strasbourg, Cologne, and Mannheim. It is at present only open as far as Namur, though the works are nearly completed as far as Arlon. The Great Luxembourg line, when finished, will form an important link in the chain of communication from England to the centre and south-east of Europe.

The portion of this railway system near Liège required very heavy works; but the average character has been easier than that of English railways. One great cause for this has been, that Belgian railways cross common roads on a level much more frequently than those of England and France, by which many bridges and viaducts have been rendered unnecessary. Very few accidents seem to have resulted from this plan, partly because the speed of Belgian railways is lower than that of England.

With the addition of a few miles of branches, the total length of the Government railways is about 350 miles; these, down to 1848, had cost 6,359,611*l.*, including all expenses and an efficient working stock, or about 18,000*l.* per mile. About 850,000*l.* of this sum was for rolling stock. All the other Belgian lines of railway have been planned and carried out (so far as they are yet completed) by joint-stock companies, under certain concessions from the State. Among these are the 'Namur and Liège,' about 66 miles of main line and branches; the lines from Brussels to Luxembourg, and from Charleroi to Louvain, about 140 miles; the 'Sambre and Meuse,' to join those two rivers, 70 miles of main line and branches; the 'Tournay and Joubise,' and the 'Landen and Hasselt,' 46 miles together; the 'West Flanders,' 93 miles, to accommodate the province of that name; and probably one or two others.

A glance at a map of Europe will show that the Belgian main line from Ostend to Liège forms part of the trunk route to central and eastern Europe; and when the great railway-bridge shall have been built by the Prussian Government across the Rhine at Cologne, this route will become still more important. From the circumstance here mentioned, the Belgian railways have had a very important and international character.

The northern neighbours of Belgium, the Dutch, have hitherto been very modest in their railway enterprises. The principal towns of Holland happen to be packed together in a tolerably small space, between the Rhine-mouths and the Zuyder Zee; and a railway connection between them has thus been easily established. From Rotterdam to the Hague; from thence along the coast to Leyden and Haarlem; from Haarlem to Amsterdam; thence to Utrecht and Arnhem; and from Rotterdam to Utrecht, seven busy towns are placed in intimate communication. There are however but two railways that cross the frontier; one from Amsterdam by Rotterdam and Dordrecht, crossing the Maas by steamer from Dordrecht to Moerdyck, and by Breda to Antwerp; and from Amsterdam by Arnhem to Emmerich in the Prussian states, and thence to Cologne.

France allowed herself to be anticipated by Belgium in the adoption of the railway system. While the lines were being rapidly extended from Malines as a centre, France was doing nothing but watching hesitatingly the result of English enterprise. While this hesitation on the part of the Government yet continued, a joint-stock company was quietly formed for constructing a little line of passenger railway from Paris to St. Germain; the necessary powers were obtained in 1835, and the line was finished and opened in 1837. In this last-named year a commission was appointed to suggest a plan for a system of railways; the commission made a report in 1838; but as the Government and the Chamber of Deputies could not agree whether the railways should be national property or joint-stock private property, the plan fell to the ground altogether. Two companies, however, came forward, and offered to construct railways with their own capital—from Paris to Orleans and from Paris to Rouen—on certain favourable concessions being made to them by the Government. These lines were formed, under many financial difficulties, and were at length opened.

It was not until 1842 that the Government system of French railways was matured. The system comprised seven trunk lines—"the first directed upon the Belgian frontier; the second, upon one or more ports of the channel; the third, upon the ocean, by one or more of the western ports; the fourth, upon the Spanish frontier, by Bayonne; the fifth, upon the Spanish frontier, by Perpignan, passing through the centre of France; the sixth, upon the Mediterranean, by Marseille; and the seventh, upon the Rhine, by Nancy and Strasburg." Besides these, there were to be two additional railways from Marseille—one to Toulouse and Bordeaux, and one to Lyon and the Rhine at Mulhausen. These were to be constructed at the expense of the State, of the departments and communes, and of joint-stock companies—all contributing on certain prescribed terms. The law of 1842 has had to undergo many modifications, but the general outline of the Government plan has been adhered to.

In some cases, private enterprise has come to the aid of the Government in another way. Thus, two short lines of railway have been formed from Paris to Versailles; and one or both of these are to form parts of the route to Brest. Another company formed the Boulogne and Amiens line, which works in harmony with the State line from Amiens to Paris. The Rouen railway has been extended by a private company to Havre, and a branch made to Dieppe. The Paris and Orleans railway, made by a private company, has been adopted as the commencing portion of both the state lines to the Spanish frontier.

The peculiarly central position of France relatively to neighbouring countries, renders its system of State railways one of considerable importance. England, of course, has no other connexion with it than through the medium of the ports, of which Dunkirk, Calais, Boulogne, Dieppe, and Havre, have railway communication with Paris. Nantes, near the mouth of the Loire, has a continuous railway route of about 270 miles to Paris. The Bordeaux line has been opened from Paris; but everything beyond Bordeaux, towards the Spanish frontier, is only yet in process of formation. The railway down southward, through the centre of France, has two branches, one of which is completed to Limoges, and is to be carried on to Bordeaux; the other goes by Bourges to Clermont Ferrand, and is to be connected with Lyon and Toulouse. The great Marseille line is open throughout its whole length. The Strasburg line has been opened throughout from Paris to the Rhine—a very important route in respect to the intercommunication between France and South Germany. In the north of France the railways are now rather thickly congregated; for not only is the traffic with England and Belgium important, but there is considerable mineral wealth in the district near the Belgian frontier. France, as a whole, has very few cross lines of railway; nearly all of them radiate from Paris as a centre.

Before noticing the railways of Germany, it may be well to say a few words concerning the thinly inhabited countries further north, such as Denmark, Norway, and Sweden. The trade in those countries being comparatively small, and capital scarce, there has hitherto been neither a strong inducement nor a practical power to construct railways. But English capital has lately begun to flow thither for these purposes. The Danes have made for themselves a short railway of about 17 miles from Copenhagen to Roeskilde, in the busiest part of the kingdom; but all the other railway projects, both in Denmark and in Norway, are connected with English enterprise. The attempt to establish a steamboat route from Lowestoft to Denmark, will be nugatory unless aided by the formation of railways; and many surveys have since been made in Holstein, Schleswig, and Jutland, to determine on the feasibility of such constructions, as also across the islands which separate Copenhagen from the German Ocean. In Holstein itself, which is Danish in ownership but German in feeling, there is a railway open from Antona to Kiel, with branches to Rendsburg and Glückstadt; but no railways have yet been made in the more northern provinces of continental Denmark. A railway of 43 miles in length, from Tönningen to Flensburg, one on the west and the other on the east coast of Schleswig, establishes a route from the German Ocean to the Baltic, and one 56 miles in length has been opened from Copenhagen to Corsör. Other routes will very probably be determined on before any long time has elapsed, for surveys have been made, or are being made, from Flensburg to Rendsburg, and from Copenhagen to Elsinör; and many of the Danish merchants are looking forward hopefully to the time when Copenhagen may possibly be brought within two days' journey of London.

With respect to Sweden, nothing (that we are aware of) has been effected towards the construction of railways in that lake-covered country, except two short lines from Orebro to Arboga, and from Örebro to Nora, the two not much exceeding 40 miles; but a prospectus has been issued relating to a Swedish company, whose operations will be sanctioned and aided by the government. There is to be a railway from Stockholm to Göteborg, 350 miles in length, which will connect the Baltic with the German Ocean or North Sea. Norway, too, has made a beginning. An English company began the works on a line of railway from Christiania to Miösen; the former town is the capital, and near the sea coast; while Miösen is in a lake connected with the extensive inland navigation of the eastern part of Norway. At present this is only completed as far as Eidsvold, a distance of 42 miles.

In the wide-spreading region to which the general name of Germany is applied—extending as it does from the confines of Denmark in the north to those of Turkey in the south; from the Carpathians in the east to the Rhine in the west—the construction of railways must necessarily be very unequally distributed, arising from the great diversities in population and commercial industry. There is, however, collectively a large and important system of railway here developed. Some of the railways have been constructed by the respective governments, and others by private companies. Nearly the whole of those in the Austrian empire, in Bavaria, in Würtemburg, in Hanover, in Brunswick, and in Hesse, have been constructed by the governments; and even those made by companies have in most cases been redeemed or purchased by the state—so unwilling are most of the states to allow the control of locomotion to slip out of their hands. In Prussia, and in a few of the other states, the government has abstained from any direct interference with the construction or working of the railways; it has rather lent a fostering hand to private companies, in cases where the traffic did not appear to be large enough to pay an adequate dividend on the outlay. In order to keep down the expenditure to a reasonable limit, all costly works are avoided unless absolutely necessary; hilly districts are traversed by steep inclines and numerous curves, instead of by costly tunnels, cuttings, viaducts, and embankments; inasmuch as a slower rate of speed than that adopted in England renders such gradients and curves easily manageable.

Taking Germany in its widest sense, as including the Austrian empire as well as the various states north and west of it, there were completed and in operation in 1845 about 1590 miles of railway, in 1847 about 2800 miles, and by the end of 1849 about 4550 miles. At the last-named date there were also 800 miles more in progress of construction, and about 3100 miles either decided on or contemplated, but without having been commenced; making a total, real and projected, of about 8450 miles. Prussia, with the Rhine states, possesses the larger portion, forming a net-work connecting them with France, Belgium, Bavaria, Austria, and Russia, and they show a great superiority of commercial activity over that of the more widely extended empire of Austria with its dependencies. Berlin is now connected by railways with Dresden, Prague, Vienna, Cracow, and Warsaw, but of course much of the line is beyond her own dominions. The lines in Prussia, though numerous, are generally, from the form of her territory, not long in themselves, though forming links on far longer lines; the single exception is the line from Berlin to Danzig and Konigsberg in East Prussia, 400 miles. Austria, on the contrary, has a few which run on her own soil for great distances, such as the railway from Vienna to Trieste, 363 miles; from Vienna to Temesvar, 358 miles; and from Vienna to Dembica, 68 miles beyond Cracow, of 326 miles. Vienna at present is only connected with the general German system by the lines from that city through Dresden, or through Breslau, to Berlin. By the beginning of 1858, there appear to have been about 6200 miles of railway open in the whole of the German states, besides what is in progress.

There are many noticeable features in German railways, as compared with those of England. Passenger carriages of three classes, 1st, 2nd, and 3rd, are generally used as in our own country, but more comfortable for second and third-class passengers. There are also more of the long carriages, on the American system, holding from 70 to 120 persons. The cost of carriages per passenger, according to the number carried and the luxury of accommodation, varies from 4*l.* to 15*l.* In America, attempts have been, in some few cases, made to establish a cheaper class of carriage with less accommodation; but these have been so little patronised, that the companies have reverted to the uniform or non-classified system. In Germany, more than in any other part of Europe or America, passengers travel by the cheapest mode that can be obtained. All the trains comprise all three classes of carriages (except a few special instances connected with the express "through route" from London viâ Dover and Ostend); and of all the passengers, only four in every 100 travel by the 1st class, the 3rd class ratio being so high as 74 in the 100. As the 3rd class fare is only about ¾ per mile, and the 1st class a fraction over 1½*d.*, the average fares paid by the whole of the passengers is within 1*d.* per mile.

In the vast Russian empire, the first attempt to obtain railways was made by offering great advantages to any capitalists who would establish companies for this purpose; they were to have a gratuitous grant of all the land necessary, and all the timber and raw material which they might find on the spot; they were permitted to import iron and working stock free of duty; they were guaranteed by the Emperor a minimum dividend of four per cent. on their capital; and the great land-owners offered the use of their serfs in constructing the works. It is only to a partial extent that these offers have been accepted, owing to the backward state of joint-stock enterprise in Russia. Some of the railways now constructed or under construction are undertaken by companies; while the rest belong to the State.

The most important line of railway in Russia is that from St. Petersburg to Moscow, of 400 miles in length. The next in importance, in so far as it will connect Russia with central Europe, is the St. Petersburg and Warsaw, about 680 miles. A goods railway, worked by horses, about 100 miles in length, has been formed to connect the Don with the Volga. There is a railway from St. Petersburg through a place near it called Tsarskoé-soélo to Louga, about 84 miles. This is a part of the Warsaw line. Tsarskoé-soélo has a royal residence, and between it and St. Petersburg there is a busy traffic, somewhat akin to that of our Greenwich railway, or to the Varseilles railway near Paris. Southern Russia is to have a railway from Odessa to Kief, to be continued possibly, at some future time, to Moscow, and thus completing a railway line of 1600 miles from the Baltic to the Black Sea. There are also lines planned from St. Petersburg to Cronstadt, and St. Petersburg to Baltischport in Esthonia. The railway from Warsaw to Cracow is open, as is that from St. Petersburg to Moscow; but in the other districts mentioned above, the works, so far as commenced at all, are proceeding slowly.

Of the countries lying south of the Alps, and west of the Pyrenees, little can yet be expected in respect to railway enterprise, Italy being cut off by the Alps from France, Switzerland, and Austria, and Switzerland itself being surrounded by the Alps. Nevertheless Switzerland has not been inattentive to the subject. There are now open lines from Basel to Lucerne, from Basel to Waldshutt, from Berne to Aarau, from Herzezenbuchsee to Bienne, from Yverdun by Lausanne to Morges, from Villeneuve to Bex, from Zurich to Baden and Brugg, and from Zurich to Winterthur and Schaffhausen. Its connection with France is formed by a line from Basel to Mulhausen, and with Germany from Zurich to Zug, crossing the lake of Costanz, and thence to Ulm and Augsburg. In Piedmont a railway has been constructed from Turin to Susa, 34 miles; this is to be continued by a tunnel under Mount Cenis, an enormous undertaking, to join the line now open from St. Jean Lanslebourg to Chambery, and thence to Geneva: lines are also open from Turin to Piñerolo, 23 miles; from Turin to Cuneo, 55 miles; from Turin to Genoa, 103 miles; from Turin to Novara, 60 miles, with a branch of 17 miles to Biella; and from Alessandria to Arona on the Lake of Como through Novara, 63 miles, with a branch of 8 miles to Vigevano. By reaching Milan, from whence this line is not far distant, a communication would be opened with Verona, Mantua, and Venice; and the completion of the line to Geneva, which involves expensive engineering difficulties, would open a communication with France by Lyon.

In Italy, distracted as it is by political disputes, and broken up into so many states, the progress of railway enterprise has been much retarded. Down to the beginning of 1850, nothing had been done towards establishing international railways from state to state; but each state, or at least three of them, have now short lines confined to their own territories. In Tuscany, there are lines from Leghorn to Pisa, Florence to Sienna, Pisa to Lucca, and Florence to Prato; and in Naples the lines extend from Naples to Cava, and from Naples to Capua; from Rome a line of 12 miles is open to Frascati, and some other works are in progress. In Austrian Italy a railway communication has been opened from Milan eastward by Treviglio and Brescia to Verona and Venice, 176 miles, with a branch to Mantua. This line also communicates northward by Monza with Camerlata on the Lake of Como. Venice, as is well known, is situated on a series of islands; and these islands are connected with the mainland by a viaduct of great magnitude: it is 12,000 feet long, and has 222 arches, the piers of which rest upon 80,000 larch piles, driven into the bed of the lagune or channel.

Spain and Portugal have always been much isolated from the rest of Europe by the formidable Pyrenean barrier; and, from various causes, they have been slow to adopt the canal and railway systems which have been so valuable to the rest of Europe. The principal line in Spain now open is from Madrid by Aranjuez to Albacete in Murcia, 174 miles, which it is proposed to continue to Zaragoza and Alicante. The other lines are from Barcelona to Arenys del Mar, from Barcelona to Granollers, from Barcelona to Martorell, from Barcelona to Tarrasa, from Tarragona to Reus, from Alar del Rey to Reynosa, approaching Santander on the French frontier; from Cadiz to Xeres (or Jeres) de la Frontera; and from Valencia to Alcudia; all of them short lines, the length of the longest, that from Valencia to Alcudia, being only 39 miles. Portugal has but one railway, under 30 miles in length, from Lisbon to Virtudes.

The Mohammedan, imitating the European in so many things, is now imitating him in railway enterprise. The Pacha of Egypt, eager to do all that can be done for facilitating the overland route to India, is now having a railway constructed from Alexandria towards Cairo, to touch the Nile at a point which will get rid of the slow transit along the canal from Alexandria, and thence to extend to Cairo. The crossing of the desert itself to Suez, whether from Cairo or from some port in the Mediterranean, has been very amply discussed for several years past; schemes for ship-canals and for railways have been brought forward in considerable number; but the difficulties in a region of loose sand are great; and there is not at the present time, so far as we are aware, any strong probability that either a canal or a railway over the Isthmus will be constructed.

In India itself much has been done, and much more is in progress. From Calcutta 120 miles of railway have been opened for traffic, and 1100 are in progress, to connect it with Delhi. But the terminus at Delhi, in consequence of the recent rebellion in India, it is now said, is to be changed, and that the railway is to run by Allahabad to Meerut, which is to be made the capital of north-western India. From Bombay lines are to run to Mirzapoor, where it will join the Calcutta line to Delhi, to Madras, and to Ahmedabad; on the first 49 miles, and on the second 71 miles, have been opened, but 32 miles are common to both; and 1050 are in progress on the two lines; on the third nothing is opened, but the earth-works are completed from Surat to Ahmedabad, 150 miles. From Madras a line is laid out to the western coast of the peninsula, of which 90 miles are open, and 300 are in progress; and from Madras to Bellary, 296 miles are in progress of construction. [Indian Empire, p. 320, *S.* 2.]

In the United States of America, as early as 1843, we find that there had been more than 5000 miles of railway constructed, belonging to 143 companies, an average of only 36 miles as the length of each railway. The railways were constructed, as in England, by joint-stock companies, and not by the State; and although each railway was constructed mainly for local traffic, there had nevertheless arisen eight great trunk lines of communication, by junctions of various lines. American railways have been constructed very much more cheaply than those in England, partly because the legal and legislative expenses are extremely small, partly because the land is bought at a low price, partly because timber is very cheap, partly because no useless expenditure is bestowed upon splendid stations, and partly because the relatively low speed of travelling enables steep inclines and sharp curves to be worked safely. The eight great arteries of communication were,—1st, parallel to the sea-coast, throughout the whole vast distance from New England to Florida; 2nd, east and west from Boston to Lake Erie; 3rd, New York to Lake Erie; 4th, Philadelphia to Lake Erie; 5th, Philadelphia to Pittsburg, over the Alleghany Mountains, and comprising a system of railways and canals; 6th, Baltimore to the Ohio; 7th, Charleston to Cincinnati, uniting the Atlantic with the Ohio; 8th, Georgia to Savannah. It is not that all these routes were actually completed in 1843, but that sufficient had been done to show that such routes would result from the united labours of many companies influenced primarily by local wants alone. By 1849 the length in work had increased to 6500 miles. The Atlantic states, thickly inhabited and commercially active, were naturally those in which railways were formed earliest and in greatest number; but the system gradually extended to the vast agricultural districts of the west; insomuch that by 1849 there were five short railways in the state of Mississippi, ten in Louisiana, and a few in Alabama, Illinois, Michigan, Indiana, and Ohio. Dr. Lardner describes the utter strangeness of the sights and sounds presented by this encroachment of civilisation on the wilds of the west, this conquest of the locomotive over the forest and the prairie. "Travelling in the back woods of Mississippi, through native forests where, till within a few years, human foot never trod, through solitudes the stillness of which was never broken even by the red man, I have been filled with wonder to find myself drawn on a railway by an engine driven by an artisan from Liverpool, and whirled at the rate of twenty miles an hour by the highest refinements of the art of locomotion. It is not easy to describe the impressions produced as we see the frightened deer start from its lair at the snorting of the ponderous machine, and the appearance of the snake-like train which follows it."—'Railway Economy.'

Of the 6500 miles of railway at work in the United States in 1849, more than half were in New York, Pennsylvania, and the New England States. Of these, the most remarkable, perhaps, is that which traverses Pennsylvania from east to west, as part of the route from Philadelphia to Pittsburg. First there are 81 miles of rail from Philadelphia to Columbia on the Susquehanna. Then there are 172 miles of canal from Columbia to Holidaysburg, which bring the traveller to the eastern base of the Alleghany Mountains. Next is the Portage railway of 37 miles, from Holidaysburg on the eastern to Johnstown on the western base of the Alleghanies; this railway has to climb a height of 1398 feet, and then descend 1172 feet; the trains are drawn up to the summit level by stationary engines and ropes; different levels being reached, one by one, by the aid of separate engines and ropes. Lastly, there is another canal from Johnstown to Pittsburg. This fourfold division of the route is not so troublesome as it would be in England; for by an ingenious contrivance, the canal-boats are made available for land transit. The boats, which are of considerable magnitude and length, are divided into segments or sub-boats, by partitions made transversely and at right angles to their length; so that each boat can be separated into three or more smaller boats. When the canal route is traversed, these several pieces are placed each on two railway trucks which support it at its ends; a proper body being provided for the trucks, adapted to the form of the bottom and keel of the boat; each short stumpy boat thus forms a passenger carriage or a goods waggon on the railway; while three or four of them form a spacious boat on the canal.

By about the middle of the year 1851, it was estimated that the railways in the United States were more than 10,000 miles in length, having cost about 67,000,000*l*., or 6700*l*. per mile. In the spring of 1852 the railways open were stated to be 11,500 miles, besides 11,200 in course of construction, making a total of little less than 23,000 miles. An estimate for 1852 gives 13,000 miles as the probable length in the early autumn of that year, and ten miles a day as the average rate of increase in the length open for traffic. In 1854 there were 17,317 miles completed, and 12,526 miles in course of construction. Since that period there has been a lull, and the chief new lines undertaken have been in connection with those of Canada. In January 1857 there were open and in work 24,220 miles of railway in the United States, and a line of 49 miles in length from Aspinwall to Panamá. Including Canada there were in January, 1858, 440 lines, but many of them form portions of a longer line.

The American railways have several advantages which, to our discredit, have not been introduced upon English lines. Whether the abandonment of all 'classes' in railway carriages, the non-distinction into 1st, 2nd, and 3rd class—whether this be an advantage or not, each reader must determine for himself. We shall simply state, therefore, that such is the case in the United States, and that the passengers—though they have not all the cushioned luxuries of first-class passengers in England—have far more comfort than our second and third-class passengers. The following is the type of an American railway carriage. It is two or three times as long as a London omnibus, but much wider and higher; there are doors at each end, and a row of windows along each side. There is a central passage from end to end, wide enough for one person to walk; and on both sides of this passage are rows of seats, transverse to the length of the carriage, and each accommodating two persons. There are from fifteen to twenty of these seats on each side of the avenue, thus affording accommodation for sixty or eighty persons in the carriage. The seats are cushioned; and their backs, consisting of a single padded board about six inches broad, are so supported that the passenger may at his pleasure turn them either way, so as to have either his face or his back to the engine. At night there is a good lamp at each end of the carriage; and in winter there is a small stove in the middle, with a smoke-pipe projecting through the roof. Some of the carriages have a ladies' compartment at one end. If these very large and roomy vehicles were set upon wheels in the same manner as English carriages, it would be impossible to work them over curves of any but very wide radius; the arrangement adopted is, however, one which renders them even more manageable than our shorter carriages. Each end is supported on a small four-wheeled railway truck, on which it rests on a pivot; similar to the expedient by which the fore-wheels of an ordinary road-carriage sustain the perch. On a sharp curve, the front truck may be moving in one direction, and the hind truck in a direction a little inclined to it, while the body of the vehicle forms the chord of the arc or curve. These long-bodied carriages have much less dead weight per passenger than English railway carriages. In American towns, the locomotive depôts are always in the suburbs, but the passenger stations are in the heart of the town, the carriages being drawn from the suburbs to the centre by horses, along the level of the streets. It should be remembered, however, that in many cases they are laid down as single lines.

We may here state that a new tunnelling machine has recently been introduced in the United States, to excavate tunnels through hard rock. So far as descriptions of it have yet reached this country, it appears as if it would be a very valuable engineering aid. The machine works horizontally, and is set in action by a steam-engine. A rapidly revolving tool bores a hole horizontally in the rock, a few inches in diameter. An enormous vertical wheel, equal in diameter to the intended section of the tunnel, has cutters or tools projecting horizontally from its periphery, and these cut a large circular groove in the rock, concentric with the hole first bored. The central hole is then charged with gunpowder, and a blast loosens and shatters the huge mass of rock between the hole and the groove. If, as is alleged, this machine will tunnel ten feet per day, it will greatly expedite railway works, and cheapen them also.

It is a grand achievement to have the means of locomotion brought to places which were so little time ago quite unknown and even non-existent. It is a great thing to have railways touching four out of five of the Canadian lakes, and this, too, at many different points; these are yet almost wholly on the south or United States side of the lakes, for reasons before adverted to. It is a fact fraught with important social results, that the Mississippi is beginning to hear the steam whistle of the locomotive, and that the cotton regions of the south are becoming connected by rail with the manufacturing states of the north. It would be useless to speculate on the probable amount of time which must elapse before the locomotive will reach the base of the Rocky Mountains; sufficient cause for marvel is it that the valley of the great river is brought within the scope of a commercial system which our own Stephensons introduced less than a quarter of a century ago. One of the Mississippi railways alone, from Lake Michigan to the mouth of the Ohio, will, when completed, be 700 miles in length.

In Canada a variety of circumstances prevented so early an adoption or so wide an extension of railways as in the United States; but since 1852 rapid advances have been made. The Grand Trunk Railway, 935 miles long, is now open from Portland in Maine, in the United States, to Windsor on the Detroit river. From Portland it crosses a part of New Hampshire and Vermont to Richmond, where a branch proceeds northward to Quebec, 96 miles; the other line goes on to Montreal, a distance from Portland of 292 miles. It is to cross the St. Lawrence by the Victoria tubular bridge which is in course of construction, for a notice of which see Bridges, *S.* 2, p. 83. It is expected to be opened in the summer of 1860. Thence the line proceeds west-south-west by Hamilton and Kingston to Toronto, at the head of Lake Ontario, 333 miles; and from Toronto to Stratford and Windsor on the Detroit river, where it connects itself with many of the United States railways, 221 miles; but a portion of this was not open though nearly completed. The Great Western Railway runs from the Niagara Falls by Hamilton and London to Windsor on the Detroit, 229 miles; and from Hamilton to Toronto, 38 miles. The St. Lawrence is crossed by a suspension bridge of 822 feet span, and 255 feet above the water, available both as a railway and a common roadway, and connects the Great Western with the Rochester and Lockport line. There are also lines open from Toronto to Collingwood on Georgian Bay, 95 miles; from London to Port Stanley, 24 miles; and from Prescot to Ottawa, 54 miles. These, though independent lines, form junctions with the two main lines. A third line, parallel with the Great Western, but keeping closer to the river St. Lawrence, has been projected, to be called the Great Southern Railway, to run from Niagara Falls to the Detroit river at Amherstburg.

In the colony of Victoria a railway has been for some time open from Melbourne to Geelong, and others have been projected. In Jamaica a railroad was opened from Kingston to Spanish Town in 1845; and upwards of 500 miles of railway have been opened in Cuba. A railway has also been opened from Algiers to Blidah; and a line is in course of construction in Brazil, to run from Pernambuco to San Francisco, both on the eastern coast.

RALEIGH, or RAYLEIGH. [Essex.]

RAMSBURY. [Wiltshire.]

RAMSEY. [Huntingdonshire.]

RANA. [Frogs.]

RANGIFER. [Deer.]

RANICEPS, a genus of Subbrachial Malacopterygious Fishes, belonging to the family *Gadidæ*. It has the following characters:—Head depressed; body compressed; two dorsal fins, the first very small, the second dorsal and the anal fins elongated; ventral fins small, the first two rays lengthened and separated.

R. trifurcatus, the Lesser-Forked Beard, the Tadpole-Fish. Pennant describes two species of *Raniceps*, as belonging to the British Fauna, *R. Jago* and *R. trifurcatus*. Dr. Johnston, of Berwick, was the first to suspect they might be the same fish; and Mr. Yarrell, after comparing Dr. Johnston's specimens with descriptions by Mr. Couch, of Cornwall, comes to the conclusion that the two species mentioned by Pennant are one and the same. It is a rare fish; but Mr. Thompson records a specimen as taken in Ireland, and Dr. Parnell describes it in his 'History of the Fishes of the Frith of Forth.'

RAOUL-ROCHETTE, DÉSIRÉ, an eminent French archæologist, was born at St. Arnaud in the department of Cher, on the 9th of March, 1789. Educated at Bourges, he was called to Paris when little more than twenty-two, to fill the chair of history in the Lyceum; and in 1815 he supplied the place of Guizot as lecturer on Modern History in the University of Paris. In 1815 appeared the work which first gained him a more than local celebrity, 'Histoire Critique de l'établissement des Colonies Grecques,' 4 vols. 8vo. The following year he was made member of the Académie des Inscriptions, and one of the editors of the 'Journal des Savans;' and in 1818 he was appointed keeper of the medals, &c., in the Royal Library. His attention having been directed to modern Swiss history he, during the following years, made several exploratory journeys in Switzerland, of which he published ample particulars under the title of 'Lettres sur la Suisse écrites in 1819-21,' 3 vols. 8vo, Paris, 1823-26, and 'Voyage Pittoresque dans la Vallée de Chamouni et autour du Mont Blanc,' 4to, 1826. His 'Histoire de la Révolution Helvétique de 1797 à 1803,' appeared in 1823. But whilst thus engaged on topography and modern history, he was still diligently prosecuting the study of classical antiquity, to which he thenceforward devoted himself, making various journeys to Greece and Sicily, Italy, Germany, Holland, &c., in order to familiarise himself with particular localities and to examine the treasures collected in museums. In 1822 appeared his 'Antiquités Grecques du Bosphore Cimmérien.' He had already come to be looked upon as the legitimate successor of Quatremère de Quincy, before the delivery of his lectures in 1826 on his appointment as professor of archæology, which considerably added to his celebrity. These lectures were published in 1828, under the title of 'Cours d'Archéologie,' and again in 1836.

From this time M. Raoul-Rochette was one of the most active and most widely known of the French writers on ancient art, communicating numerous papers to the Memoirs of the Académie, as well as to the journals of other learned societies, and frequently appearing before the public in distinct works. In 1828 he published 'Monumens inédits d'Antiquité figurées Grecques, Etrusques, et Romaines,' 2 vols. fol. His 'Peintures Antiques inédites' appeared in 1836. In 1839 he was appointed perpetual secretary to the Académie des Beaux Arts, the post previously held by Quatremère de Quincy; and, like his predecessor, he composed a large number of official éloges and résumés. In 1840 appeared his 'Mémoires de Numismatique et d'Antiquité,' 4to; in the same year 'Lettres Archéologiques sur la Peinture des Grecs;' and in 1846, 'Choix de Peintures de Pompei.' His last work of importance—one which he describes in the introduction as having for its object "to direct the investigations of the mythographists and antiquaries of the present day to the only course which, I believe, will prove fruitful in new discoveries —the relationship between Greece and Asia"—was entitled 'Mémoires d'Archéologie comparée, Asiatique, Grecque, et Etrusque,' but only one part was published (in 1848), and that, though a bulky 4to volume of 404 pages, is wholly occupied with the 'Premier Mémoire sur l'Hercule Assyrien et Phenecien consideré dans ses Rapports avec l'Hercule Grec.' Except some controversial letters directed to M. Carnot, referring to some charges brought against him in respect of his official conduct, he does not appear to have issued subsequently any separate publications. He died on the 6th of July 1854. An English translation of his 'Lectures on Ancient Art,' by H. M. Westropp, was published in 1854.

RASSOVA, a small town in Bulgaria, situated on the right bank of the Lower Danube, at the point where the river makes its great bend to the northward, about 30 miles E.N.E. from Silistria. It is of importance from its position at the western end of the line of earth-works called Trajan's Wall, which extends across the isthmus of the Dobrudscha from near Rassova to Kustenje, on the Black Sea. Rassova is slightly fortified; it was occupied for a short time by the Russians in their invasion of Bulgaria in 1854.

RATHDRUM. [Wicklow.]

RAUCH, CHRISTIAN, an eminent German sculptor, was born at Arolsen in the principality of Waldeck, on the 2nd of January 1777. He early showed an aptness for art, and received instructions in it from the sculptor Professor Ruhl of Cassel. In his twentieth year he went to Berlin, having been presented to an office in the court of the Queen of Prussia; but his spare hours were all devoted to art. He here secured the friendship of Count Sandrecky with whom he set out in 1804 on a tour through a part of France to Genoa, and thence to Rome. There with the advice and aid of William von Humboldt, then Prussian minister in that city, he devoted himself to the study of the antique, while he availed himself of the friendly instruction of the chief living sculptors, Canova and Thorwaldsen. After a due probation he produced several original works, among others, bassi-rilievi of 'Hippolitus and Phædra;' a 'Mars and Venus wounded by Diomedes;' a 'Child praying,' &c. But he began still more to distinguish himself in the line to which he has continued to owe his chief celebrity, that of portraiture; besides abundant private patronage, he received from the King of Prussia commissions to execute a colossal bust of the King of Prussia, and a life size bust of the queen; and from the King of Bavaria, a bust of Rafael Mengs. In 1811 he was recalled to Berlin, to execute a monumental statue of the Queen Louise. His design was approved, and his health having failed, he was permitted to proceed to Carrara to complete the work, which he did in 1813, in a style that secured his reputation. He then went on to Rome, where he remained till 1822, when he returned to Berlin, where he afterwards resided. During his second residence in Rome, Rauch was chiefly engaged on busts and statues; he executed for the King of Prussia, besides a marble statue of the king himself, monumental statues of Generals Bulow and Scharnhorst. By 1824 he had executed with his own hand seventy marble busts, twenty of them being of colossal size. Among the more important of his later works may be mentioned two colossal bronze statues of Field-Marshal Blücher; the first, representing the hero in vehement action, was erected with great solemnity at Breslau, July 9, 1827; the second, designed after Blücher's death, for the King of Prussia, represents the veteran in repose.

Another of his principal works is a seated bronze statue of Maximilian of Bavaria, erected in 1835 in Munich. The 'Victories' for the Walhalla, near Ratisbon, are also from his chisel. A well-known statue of Göthe, modelled from the life, is the most perfect representation of the great poet of modern Germany. Statues in marble or bronze of Schiller, Schleiermacher, and others of his chief contemporaries, and of Luther, Albert Dürer, and other famous Germans of an older time, serve to show the high estimation in which his works are held by his countrymen; while bronze statues of two or three of the old Polish kings, which he executed for Count Raczynski, to be placed in Posen Cathedral, and a bas-relief erected at Dublin in memory of Miss Cooper, show that his ability was appreciated beyond Germany. His chief work, however, is the grand monument of Frederick the Great of Prussia, erected in the finest part of Berlin. This work, in the design of which Rauch was assisted by Professor Schinkel, the architect, and which called into exercise all the resources of the two artists, was commenced in 1830. The general model was completed in 1839; the colossal model of the king was not however ready till 1842, and the statue was cast in 1846. Four more years were required for the execution of the bas-reliefs, and the statues of military commanders, ministers, judges, literary men, &c., and figures of the Virtues and the like, which were to be placed around the base. Meanwhile the granite basement was being constructed, and by the beginning of 1851 the whole was finished. It was inaugurated with the greatest pomp in May 1851. Of this—perhaps the most elaborate monumental work of recent years—a small model may be seen in the Crystal Palace, Sydenham, as well as casts of the colossal equestrian statue of the king which crowns the monument, of the bassi-rilievi which represent the chief transactions of his life, and of some of the detached statues. The work is a sort of compromise between the severity of classic and the freedom of romantic art, and will not in its details stand the test of rigorous criticism; but, casting aside minute criticism, it must be held to be one of the very finest as well as most imposing of recent commemorative works. And we may add that, even without this his master-work, Rauch would unquestionably stand in the highest class of modern portrait and monumental sculptors, though far from ranking among the first in ideal sculpture. Rauch died Dec. 3, 1857.

RAUPACH, ERNST BENJAMIN SALOMON, one of the most prolific of modern German dramatists, was born at the village of Straupitz, near Liegnitz, in Silesia, on May 21, 1784. He received his early education at the gymnasium at Liegnitz, and in 1801 proceeded to Halle to study theology. He afterwards went to Russia, where for ten years he occupied himself diligently as a teacher, and after a residence, in that capacity at St. Petersburg for a year and a half, he was appointed professor of philosophy in the University there, to which in 1818 was added the professorship of German literature. In 1822 he quitted Russia, and having received somewhat later the solicited discharge from his professional duties, he travelled for a time about Germany, visited Italy, and at length returned and settled at Berlin. The result of his journey to Italy appeared in 1823 in 'Hirsewenzel's Briefe aus Italien.' His dramatic productions had already been numerous, ranging from 1810 downwards, though many did not appear in print till long after they had been written. In 1837-38 he published his series of historical plays in illustration of events connected with the Hohenstaufen dynasty of emperors of Germany, which formed eight volumes. His dramatic works were published in a collected form in two divisions, 'Dramatische Werke komischer Gattung' ('Dramatic Works of the Comic Species'), in 3 vols., 1826-34; and 'Dramatische Werke ernster Gattung' ('Dramatic Works of the Serious Species'), in 18 vols., 1830-44. These works display considerable inventive powers, a great command over his materials, a thorough knowledge of stage resources, a sense of fitness, with a happy introduction of interesting situations. In his serious dramas he often reaches to the expression of deep passion, and in his comedies and farces, a rich vein of verbal wit. His poetic style is harmonious and natural, and he has consequently been a favourite with the public. His defects are a want of poetic consistency, a weakness of characterisation, and occasionally a lapse from pure morality, as in his 'Robert der Teufel,' and one or two others. His series of historical plays on the Hohenstaufen, by provoking a comparison with those of Shakspere, appear the most defective in dramatic merit, but they contain some fine passages. He also published two collections of tales, one in 1820, another in 1833; but they possess little merit, and attracted but little attention. In 1842 he was created a privy-councillor, having previously been made a councillor. He died in March, 1852.

RAY. [Raiidæ, *S.* 2.]

RAZOR-BILL. [Auk.]

RECEPTACLE, in Botany, is that part of the flower on which any of the other organs rest. It represents the aternodes of the stem and branches in their changed condition. It assumes a variety of forms, and enters very variously into the forms of flowers and fruits. [CALATHIDIUM; FLOWERS, *S.* 2; FRUIT, *S.* 2.]

RED-BREAST. [ERYTHACA, *S.* 2.]

RED-EYE. [LEUCISCUS.]

RED-SANDSTONE. The term Red-Sandstone is more especially applied to two formations, the Old Red-Sandstone [OLD RED-SANDSTONE, *S.* 2], and the New Red-Sandstone Rocks. The latter are also sometimes called Saliferous, on account of the salt they contain, and they are also called Triassic.

"It is in Cheshire and the southern part of Lancashire, and the northern part of Shropshire, which together form an extensive and rich plain, watered by the Dee, the Mersey, and the Weaver, that the uppermost beds of the New Red-Sandstone are chiefly developed; and by a minute examination of these beds, and those of Warwickshire, the saliferous marls have been identified with the uppermost strata of the foreign Triassic System. Throughout this range the beds are nearly horizontal, the dip rarely exceeding ten or twelve degrees, and being constantly towards the east, or a few degrees north or south of that point. They are, however, affected by some important faults. The whole district abounds with salt-springs, which are more especially plentiful in Cheshire; and in that county also there occur extensive masses of rock-salt in a solid state, their total thickness amounting to not less than sixty feet. These alternate with beds of gypsum; with numerous bands of indurated clay of a blue, red, or brown colour; and with sandstones, frequently marly, and of a red colour.

"The red-marl district, with brine springs, is continued southward into Worcestershire, and northward into the valley of the Iden, and the same part of the formation extends also eastwards, occupying for the most part the plains through which the Humber and its tributaries make their way to the German Ocean. In Somersetshire and Devonshire similar sandstones recur, and lie unconformably, overlapping the inclined edges of the older rocks, or abutting against them, but uniformly composed of the same materials, remarkable throughout for the ochraceous colour pervading them. Between Sidmouth and Seaton, in Devonshire, the red marls contain gypsum in abundance; and near Teignmouth the cliffs, which are of considerable height, consist of alternations of argillaceous beds of sandstone and of conglomerate.

"The beds which are lowest in position of the upper new red-sandstone are chiefly found in the middle of England, and consist of thick masses of whitish soft sandstone. In some places (as in Staffordshire) these are surmounted by conglomerates, composed of rounded pebbles of quartz rock, and other fragments, chiefly of Silurian rocks and old red-sandstone. The total thickness of this part of the formation is considerable, but has not been accurately calculated. It is only to be distinguished from the overlying saliferous marls by small differences of mineral character." (Ansted.)

Viewed on the great scale, the New Red-Sandstone system of rocks is one of the most varied and interesting we are acquainted with. There are peculiarities in its limestones, sandstones, and clays, as well as in its gypseous and salt deposits; the occurrence and nature of its organic contents, and the relation which it bears altogether to earlier and later classes of rocks, are worthy of careful study.

Sulphate of lime is found perhaps as frequently, and under almost as many curious circumstances in the stratified rocks, as carbonate of lime, in mealy aggregations, acicular prisms, broadly foliated crystals (selenite), fibrous masses and beds, and marmoroid or alabastrine rocks. It lies in strata of almost every age, and is not absent from diluvial, alluvial, and recent deposits. The mode of its occurrence is in a considerable degree characteristic of each particular mineral type. While long prismatic crystals appear in cavities of shells and in recent excavations (as in the gallery of Felling Colliery, Newcastle), the solitary broad flaky crystals of selenite abound in blue-clays of the tertiary and secondary series (which receive their colour from protoxide of iron), and the fibrous gypsum marks, spots, and irregular lines in the red-clays (coloured by peroxide) of the Saliferous System, the fibres being (in agreement with a general law of structures) arranged so as to lie at right angles to the broader surfaces which bound the mass. The marmoroid texture is most commonly found in real however irregular beds, as at Montmartre, and in some points near Fairburn in Yorkshire, on the line of the York and North-Midland railway. At these places fibrous, marmoroid, and flaky sulphate of lime may be obtained in association.

From what is known to take place at the present day, and from appearances in the distribution of the gypsum and selenite in masses of clay and cavities of shells, &c., it appears that in a great proportion of cases these crystallised masses owe their origin to the processes of segregation since the deposition of the earthy masses in which they appear. In no other way is it at all conceivable, or even possible, that the irregular masses of gypsum which appear in red-marl at Axmouth, Aust Passage, and the Trent's mouth could be formed. The marls in which they here lie were deposited as fine mud, and if we suppose merely a slow extrication of the liquid, so that its contained salts might remain, the arrangement of these salts in such irregular masses during crystallisation presents no particular difficulty.

Salt shows itself in the Cheshire mines as either granular, broadly laminated, or fibrous; in great beds or minutely mixed with marls, nearly as gypsum is, and probably in regard to its origin, similar suppositions will apply, the solid beds (of limited extent, however, and irregular area) being due to a great evaporation of liquid over the previously deposited marls. That such water, in the case of rock-salt generally, was derived from the sea, is almost certain, from the occurrence of iodine and bromine in the brine springs connected with them. (Daubeny's Memoir in 'Phil. Trans.') But it does not follow that the area in which the salt was found was, at the time of its formation, or for some time previously or subsequently, connected with the sea. Lagoons may have been the theatre of the evaporation supposed, and earthy sediments, such as occur in Cheshire and Poland, may have been drifted in by fresh-waters or the sea, according to circumstances, and it is not difficult to imagine a repetition of the processes, such as might produce the two great beds of rock-salt in Cheshire. It is not known that organic remains of any kind accompany the salt of Cheshire, but this is almost true of the whole range of the red-marls, in which these deposits lie.

We find, then, associated together, abundance of red-oxide of iron, salt, and gypsum, but few or no organic remains. The prevalence of red-oxide of iron in any of the strata is accompanied by a paucity or total absence of organic remains. In the new red-sandstone these red strata extend through several hundred feet of thickness, and it is found in general terms, that the types of organic life above and below are widely different. Similarly the thick series of old red-sandstone contains few organic fossils, and separates two distinct groups of these productions. Some great physical changes then must be supposed to have occurred previous to and during the saliferous period, and to have influenced both chemical and vital phenomena.

M. Adolphe Brongniart ('Prodrome d'une Histoire des Végétaux Fossiles,' 1829), viewing the series of fossil plants, gives four great periods of ancient vegetation:—The first extending from the earliest strata to the new red-sandstone strata; the second including these strata; the third including the oolites and chalk; the fourth the tertiary strata. Of these the flora of the second period (chiefly terrestrial) is very limited, and may be looked upon as a transition group of plants connecting the earlier and later periods. Similarly the series of marine *Invertebrata* which lie in the new red-sandstone have characters intermediate between the early (palæozoic) and later races of pre-adamitic life.

Although the fossils of this rock are but few, they are highly interesting. It is amongst these rocks that we find the first traces of an air-breathing animal. This creature, which was at first called *Chirotheum*, is now known under the name of *Labyrinthodon*. It belongs to the amphibious tribe of Reptiles. Footmarks of an extinct reptile have also been found in the red-sandstone of America, and described by Dr. Lea.

The equivalents of the British beds of new red-sandstone on the continent of Europe are—the Kauper Marls, or Marres irisées, the Muschelkalk, and the Bunter Sandstein, or Grès Bigarre, of Germany and France.

REDPOLE. [LINNET.]

REDSCHID PASHA, or, MUSTAPHA RESCHID PASHA, was the son of parents in rather affluent circumstances, and was born at Constantinople in 1802. When only fourteen years of age, his brother-in-law, Ali Pasha, attached him to his person, and employed him in the Morea and Broussa during his government of those two provinces. In 1826, when the insurrection broke out in the Morea, Redschid served in the campaign under his patron. After the death of Ali Pasha he transferred his services to Selim Pasha, who made him his private secretary in 1829. He now began his preparation for the higher offices of state by a series of foreign missions. In 1831 he was sent as envoy to Mehemet Ali, viceroy of Egypt; and having taken an active part in negociating the treaty of Kutahia in 1833, he was in the following year raised to the dignity of Pasha. In the course of 1834 he was sent on a mission to the courts of London and Paris. Nearly two years were thus occupied, and the relations he formed with the leading statesmen, diplomatists, and party leaders in England and France, became the basis of the credit and influence he obtained on his return to his native country. The great measure of Parliamentary Reform had recently been carried in England, and the subject was still fresh in men's minds. Redschid Pasha was particularly impressed with this great change, effected as it had been without recourse to violence. When he was recalled to his own court, the following year, to fill an important office in the administration of Pestier Pasha, his mind was occupied with the subject. Almost immediately after his arrival he found himself exposed to imminent danger by the death of the prime minister, who had been overthrown by an intrigue within the palace, and afterwards put to death by the Sultan's orders. But the behaviour of Redschid Pasha was so circumspect as to baffle the designs of his enemies; whilst the credit he had obtained from his diplomatic missions was so high that he was created Grand Vizir in 1837. He did not however hold this position long, being sent into a sort of honourable exile to Paris.

When the report of the death of Mahmud II. reached Paris, he hastened to return to Constantinople, but not before he had raised up a bulwark to defend the throne of the new sultan against the ambition of Mehemet Ali, by concluding the Quadruple Alliance. By Abdu-l-Medjid he was made Foreign Minister, and to the practical knowledge and statesmanship which he had acquired in his European missions, are attributed the systematic reforms which, under the name of the 'tanzimat' have distinguished the reign of the present sultan. Indeed, it is generally believed that from the accession of the young monarch in 1839 until the end of 1857, a period of nearly nineteen years, Redschid Pasha steadily pursued his object of introducing political reforms into Turkey, and that to him is mainly due the many great—however imperfect—social and religious as well as political improvements which have been effected in that country. But it was amidst much hostility and discontent that Redschid Pasha prosecuted his system of reform. During the late war with Russia he was called to direct the government, which through that difficult period he accomplished with signal ability. Though afterwards for a time displaced, he again became the actual head of the Turkish government, and the high respect in which he was held by European statesmen gave him a strong hold on power. In private life he likewise, by example as well as otherwise, sought to modify the objectionable habits of his countrymen: he had but one wife; and he was said to be free from the corrupt practices commonly attributed to the higher officials of Turkey. He died on the 7th of January, 1858.

REED. [Phragmites.]

REFORMATORIES. The establishment of new and the extension of existing Reformatory Schools have been provided for by the statute 20 & 21 Vict. c. 55; the previous statute 17 & 18 Vict. c. 86 having only provided for young criminals being sent to the schools which had theretofore been established by voluntary contributions. [Juvenile Offenders, *S.* 2. Parent and Child, *S.* 2.]

REGULUS. [Cockatrice.]

REGULUS, a genus of Birds belonging to the family *Sylviadæ*. The genus is thus defined by Mr. Yarrell:—Beak slender, straight, the edges dilated at the base, compressed towards the point; nostrils basal, lateral, oval, partly covered by small feathers directed forwards. Wings of moderate length; the first quill-feather very short; the second shorter than the third; the fourth or fifth the longest in the wing. Legs rather slender; feet with three toes before, one behind; the outer toe joined at its base to the middle toe; claws curved and sharp. There are three British species of this genus.

R. cristatus, the Golden-Crested Regulus, Golden-Crested Warbler, or Kinglet.

R. ignicapillus, the Fire-Crested Regulus, Fire-Crested Wren.

R. modestus, the Dalmatian Regulus. This is a very rare species.

There are three other species natives of North America.

REIN-DEER-MOSS. [Cladonia, *S.* 1.]

RELAPSING FEVER. [Physic, Practice of (*Blood, Diseases of*), *S.* 2.]

REMBUS. [Licinus.]

REMORA. [Echeneis, *S.* 2.]

RENDEL, JAMES MEADOWS, a civil engineer of great eminence, was born in 1799, at a village on the borders of Dartmoor, in Devonshire. His grandfather, Mr. Meadows, was a well-known architect, and his father, who was a county surveyor and farmer, was a man of ability, excellent common sense, and determination of character, qualities which descended to the son, whilst to his mother, who was a woman of considerable acquirements, he owed the rudiments of his early education. After being practically instructed in the executive part of his profession, he went to London and obtained an engagement under Mr. Telford [Telford, Thomas] by whom he was employed on the survey and experiments for the proposed Suspension bridge over the Mersey at Runcorn, and subsequently on the survey and construction of roads in the north of Devon, where the difficulties he had to contend with contributed much to create that self-reliance so useful to him in his subsequent career. In 1822, he had occasion to apply, on a professional subject, to the late (John, first) Earl of Morley, who, discovering the latent talents of the young engineer, then scarcely twenty-three years of age, shortly afterwards confided to him, with the approval of Mr. Telford, the construction of a cast-iron bridge across the Lary, an arm of the sea within the harbour of Plymouth, over which his lordship was proprietor of an ancient ferry, for which it was desirable to substitute a bridge, the south bank of the Lary at Saltram being his property. This bridge, consisting of five elliptical arches, was, with the exception of that of Southwark, the largest cast-iron structure of the kind in the kingdom. Mr. Rendel was engaged in its construction from 1824 to 1827. For his account of this work the Telford medal of the Institution of Civil Engineers was awarded to him. About this period he designed and executed the Boucombe bridge, where hydraulic power was for the first time applied to the machinery for working swing bridges. Soon after the completion of the Lary bridge, Mr. Rendel settled in Plymouth, and there exercised his profession with great activity, being engaged in surveying and reporting upon nearly all the harbours in the south-west of England, and executing the works at a great number of places, acquiring that mastery over hydraulic engineering on which his fame will chiefly rest. In 1831 he introduced a new system of crossing rivers by means of floating bridges worked by steam-power; they were applied at Saltash and at Torpoint on the river Tamar, and subsequently at Southampton and Portsmouth; but the rapid progress of the railway system prevented the further development of this useful invention, for which the Telford medal was awarded. Descriptions of the structure of these bridges, as well as of that over the Lary, were published in the 'Transactions of the Institution of Civil Engineers.' Particulars of the construction of the latter were also communicated by Mr. Rendel, in 1829, to the Plymouth Institution, of which he was a member, and published in the following year in the only volume that has hitherto appeared of its 'Transactions.'

The repairs of the Montrose suspension bridge, after its fall, were confided to him, and he there introduced the system of imparting that rigidity to the platform of the roadway which is now admitted to be so essential to the safety of the structure.

In 1838 Mr. Rendel removed to London, where he was soon consulted upon many important works, and was engaged in the chief parliamentary contests of that remarkable period in the history of engineering. About this time he designed the pier at Millbay, where he introduced the system of construction since employed with so much success at the harbours of Holyhead and Portland. Engagements poured in fast upon him, and his career was for the next few years one of unceasing activity, chiefly in the construction of harbours and docks, and the improvement of rivers and estuaries. In the year 1843, the projected construction of docks at Birkenhead, in Cheshire, of such an extent as to create a formidable rival to Liverpool, brought him very prominently before the world; and the protracted contests on this subject will be long remembered in the history of parliamentary committees, for the ability with which he defended his positions; and the evidence given by him and other engineers, as now collected, forms a valuable record of the state of engineering practice. The almost incessant labour, and the mental anxiety inseparable from this undertaking, were more than even his powerful constitution could support, and it is feared that they tended to shorten his life.

The daring project of constructing a dock at Great Grimsby, by projecting the works far out upon the mud-banks of the Humber, was next successfully accomplished; and he commenced the two great works which alone suffice to hand down his name to posterity beside those of Smeaton, Rennie, and Telford,—the harbours of refuge of Holyhead and Portland. Both these works were conceived with the largest views, and have been carried on with great rapidity. In both cases the system was adopted of establishing timber stages over the line of the jetties and depositing the large and small stones together, as they came from the quarries, by dropping them vertically from railway waggons into their positions, thus bringing up the mass simultaneously to above the level of the sea. These two great works are advancing very satisfactorily; and it is worthy of remark, in evidence of the engineer's sagacity in the adoption of this system, although the severe storms which have repeatedly occurred on the exposed coasts where they are situated, have done some injury to portions of the stages, and of the temporary works, at Holyhead—where the piles were not shod with Mitchell's screws, which proved so successful at Portland—not a stone would appear to have been carried away from the jetties; and the success of the system may be said to be complete, in spite of the sinister predictions which prevailed before it was tried. Among the other works upon which Mr. Rendel was engaged, should also be mentioned the constructions on the River Lea, and the improvements of the Nene River. He was also employed by the Exchequer Loan Commissioners to report upon the drainage and other public works in Ireland.

He was less engaged in railways than hydraulic works; but in England he executed the Birkenhead, Lancashire, and Cheshire Junction Line, and he had the direction of the 'East Indian' and the 'Madras' railways in India, the former projected by Mr. (now Sir Rowland) Macdonald Stevenson, as the first of the vast system now in progress, which will doubtless exert a mighty influence on the future destiny of our Indian Empire. The Ceylon line and that of Pernambuco in Brazil were also under his charge.

There was scarcely a harbour or a river of importance in the kingdom with which Mr. Rendel was not connected in some capacity. His advice was also sought by foreign countries; and he was engaged to report upon works for the Brazilian, the Prussian, and the Sardinian governments, and was nominated by the Viceroy of Egypt a member of the International Commission for considering the construction of the proposed canal across the Isthmus of Suez.

In consequence of the danger which threatens the port, and therefore the city and republic, of Hamburg with ruin, from the rapid accumulation of sand in the bed of the Elbe, the Senate, in 1855, invited Mr. Rendel to examine the state of the navigation of that river, and make proposals for averting the danger. A commission of such importance could not have been intrusted to more able hands. He spent some months in studying on the spot the nature of the difficulties to be overcome. Towards the end of the year he sent in a most able report, with a detailed account of his plan for remedying the navigation, and preventing any future recurrence of the deposit of sand and formation of a bar in the river. This report was printed and laid before the Bürgerschaft, or representative body of the citizens, but down to a very recent period the requisite works had not been commenced, or even determined upon, notwithstanding the rapid increase of the evil. Mr. Rendel proposed to construct a longitudinal dam or dyke in the middle of the Elbe, beginning at the island of Finkenwerder, a few miles below Hamburg, and extending down the stream for a distance of nearly forty miles. This would contract the main body of the river into about half its natural limits, and the constant rush of the ebb and flood tides would not only sweep away the present sand-banks and other existing obstacles, but prevent them from ever forming again, deepen the channel, and constantly keep clean the bed of the river. The time he allotted for the execution of this great work was seven years, and his estimate of the expense amounted to 680,000*l.*

In the words of the 'Proceedings of the Royal Society,' from which, with some omissions and corrections, the present article is principally, though not wholly, derived, the subject of it "was a man of great energy, clear perception, and correct judgment; his practical knowledge was well directed, and he knew how to make good use of the scientific acquirements and skill of all whose services he engaged. His evidence before parliamentary committees was lucid and convincing, seldom failing in carrying his point; and his reports on engineering works are distinguished by the clearness and correctness of his views, and the fearless expression of his opinion."

Mr. Rendel was a very early member of the Institution of Civil Engineers, having joined it in 1824. His professional character, administrative ability, and scientific knowledge, conspired to give him a seat in the council as Member and Vice-President for the sixteen years preceding his death; and he was elected president in 1852 and 1853. He had become a Fellow of the Royal Society on the 23rd of February 1843; and, agreeably to the system which has of late prevailed of adding to the representatives of science in the council of that body, those of other scientific establishments, during the years for which he was president of the Institution of Civil Engineers, he was also chosen upon the council of the Royal Society. Mr. Rendel was as amiable and kind in private life as he was energetic and firm in public, and his decease, which occurred on the 21st of November 1856, cast a gloom over the whole of the profession of which he was a brilliant ornament.

REPLEVIN. The proceedings in a replevin have been entirely altered, so far as the granting of replevins is concerned, by the statute 19 & 20 Vict. c. 108. Replevins were previously granted by the sheriff's deputies; they are now effected by the registrars of the county courts. A bond is taken, as formerly, that the replevisor shall bring an action for the trespass, either in the superior courts or in the county courts, the defendant being permitted to remove the cause from the latter, but to lose his cause unless he proves that the title in dispute, or the rent or damage in respect of which the distress was taken exceeded 20*l.* in value. The statute is confined to replevins of distresses taken for rent in arrear or damage fesant; but the restriction is practically needless, for the other species of distresses known to the law have long been almost entirely obsolete.

REPRODUCTION IN PLANTS AND ANIMALS. The term Reproduction has been employed to denote those processes in organic beings by which the individual being is produced, developed, and maintained. It has thus been employed to express processes which are functionally distinct, and have very different ends in the economy of creation. The constant reproduction of the same tissues in the same part, is the means by which the form of the individual being is maintained during its life, and is the result of the ordinary processes of nutrition. This function is carried on throughout the whole animal and vegetable kingdom, until the death of a part or the whole of the being occurs. The power, however, of reproducing the same tissues, varies in different beings, and we find that although it is possessed even to the restoration of a lost limb amongst the lower animals, no such power is possessed by the highest.

The term Reproduction has also been applied to the origination of the germ from which individual plants and animals grow. The process employed in the initiation of life seems to be essentially distinct from those engaged in carrying it on: hence the propriety of distinguishing in terms between that production of cells by which the life of the individual is maintained, and the arrangements by which its existence as an individual is ensured. It has been proposed to restrict the term Generation to the latter process.

Although formerly great difficulties existed in distinguishing between these two processes from the want of sufficient observations, recent researches seem to have supplied all that is necessary. In the ordinary reproduction of the tissues of plants and animals each cell has the power of producing other cells, or a large number of the same kind of cells are developed simultaneously, but in generation it is necessary that two cells should take part. At one time it was supposed that this process did not take place in the generation of the lower animals and plants, but recent investigations have shown that the union of two cells is necessary to so large a number of the forms of lower plants and animals, that it is a fair inference that this is a universal necessity in the generation of organic beings. The two cells thus engaged have been called the germ-cell and the sperm-cell. The germ-cell is that in which the process of growth of the new being commences, whilst the sperm-cell is that which communicates the growing tendency to the other. These cells are of different sizes and forms in the animal and vegetable kingdoms, and are placed in very various positions in relation to other organs, and the means by which they are brought together are very various, but in all cases they perform the same fundamental function.

The discovery of the necessity of the union of these two cells, for the production of a new being, has gone far to settle the question of 'equivocal' or 'spontaneous generation.' Ever since the extended use of the microscope in the investigation of the structure of the organic beings, it has become more and more apparent that there was no basis for the supposition that organic beings came into existence independent of a preceding organism. The only cases in which it is now pretended that such an origin of organic life could take place, are those in which the minuter forms of animal and vegetable life occur in infusions exposed to the atmosphere. But this occurrence admits of easy explanation, when it is remembered how exceedingly minute many of these organisms are, and that they are frequently produced from ova much smaller than themselves. Such organisms are easily taken up into the atmosphere, and can be thus conveyed from one spot to another. That such is the fact is proved by the experiment of passing atmospheric air through red hot tubes or strong sulphuric acid, when it is found that water exposed to such air never affords any indications of the existence of organic beings, whilst the same water exposed to ordinary atmospheric air will, in a few hours, teem with living beings.

Although the subject of the generation of animals and plants has been regarded as a subject of much mystery, the facts it presents are now as well understood as any other branch of physiological inquiry. The greatest mystery is the mystery of all nature, and that is the reason of the assumption of a particular form by what appears to be the same combination of elements. No difference can be discerned in the cells of the flowers of the oak and the apple, but the one always produce oak-trees, whilst the others always produce apple-trees. It is the same with the cells of animals, without the slightest appreciable external difference; the one set of cells will develop the form of one species of animal, and another set, another species. This fact has led some inquirers to the assumption of the existence of a 'vital principle,' of a distinct and independent essence, giving to each species its definite form and character. There is no objection to such an hypothesis, provided it is not made use of to explain phenomena which are clearly under the influence of chemical and physical forces. As so much misunderstanding prevails with regard to the word 'vital principle,' it is better perhaps to discard it, and to speak of the limitation of form to which each species is subject, as under the control of a 'formative force.' This formative force being the ultimate fact in the history of each individual plant and animal, and regulating the chemical and physical processes, the result of which is usually called life, it has been proposed to call this a germ-force, or a germinal capacity; but as it is very clear that it is the same force that is in action to produce the whole life or growth of the plant or animal, there is no necessity for distinguishing its first effects, as observed in the act of generation.

In studying, then, the phenomena of generation, there are three conditions which have to be regarded.

Firstly, the Formative Force, which is peculiar in every species, and identical in all the generative cells produced in that species.

Secondly, the Physical Conditions in which the generative cells are placed. These are more especially heat and light, and the condition of the cell-membrane through which absorption takes place.

Thirdly, the Elements which are supplied for the nourishment of the new being, and which by their Chemical Properties are capable of exercising an influence on the form and development of the plant or animal.

Each of these circumstances is found exercising varying degrees of influence in plants and animals. Thus, amongst the lower forms of both the animal and vegetable kingdom, the formative force appears to exercise less influence than among the higher. This is seen in the very varied forms which the same species of plant and animal assume under different circumstances. In fact, till very recently, many of the forms of *Fungi*, *Algæ*, and Infusorial Animalcules, which had received different generic names, are now found to belong to the same species. These variations are found to be chiefly produced by the influence of the third set of circumstances. The highest animals and plants are however liable to great modifications of the activity of the formative force by the operation of both physical and chemical circumstances. Many insects are not hatched till a certain amount of external temperature takes place. Plants will not produce their leaves without the influence of light. Tadpoles are not developed into frogs and toads when deprived of light and heat. The ordinary bee is converted into a queen-bee by the speciality of its food. The *Brassica oleracea* of the sea-shore is converted into red and white cabbages, cauliflowers, and broccoli, by garden culture. All cultivated plants exhibit more or less modification of their growth under the influence of physical and chemical circumstances. The dog, the pig, the horse, the sheep, and man himself, present varieties which, are manifestly dependent on external circumstances, and not on any change in the character of the formative or species-making force.

That there is no change in the character of this force is seen in the tendency which all the forms of a particular species have to recur to a definite type, or to cease to exist. This is seen especially in the case of cultivated plants and domesticated animals, which are subject to the greatest varieties of form, but which nevertheless retain through all, the evidence of a specific formative force. Thus, closely allied as are the species of apple and pear (the *Pyrus malus* and *Pyrus vulgaris* of botanists), and subject as they are to so great variations that above a thousand forms of apple have been produced in Great Britain alone, there is not the slightest tendency in any of these cases towards confusing the specific character of the apple-tree and the pear-tree. So with our domesticated animals. The horse and ass will even breed together, but the hybrid is not prolific, and there is no tendency on the part of the one species to degrade or develop into the other. All the facts that are known with regard to the nature of the formative force lead to the conclusion that it is specific and not general, and that it is regulated by the same laws throughout all time.

In what is called the alternation of generations [Generations, Alternation of, *S.* 2], it might be supposed that an exception occurred to the ordinary process of generation. It will be seen however that in all the cases in which this phenomenon occurs, it results from modifications of the ordinary processes of reproduction, and the unusual disposition of the sperm-cells and germ-cells.

Having made these general remarks, we shall now proceed to speak more particularly of the process of generation as it occurs in plants and animals, restricting this term to the phenomena which take place as the result of the union of two cells. That reproduction in plants which occurs as the result of the growth of the same tissues from single cells, when it results in the production of a bud, is termed Gemmation or Sprouting. This kind of reproduction also takes place in the animal kingdom, and amongst many of the lower animals the power of reproducing new individuals [*] by a process of budding is seen. To this process of forming new beings as it were, from single cells, Professor Braun of Berlin has applied the term 'Verjungung,' which has been translated by Mr. Henfrey 'rejuvenescence.'

Amongst plants the lowest position must be assigned to the families *Diatomaceæ* and *Desmidieæ*, and it is amongst these that the most clear evidence has been obtained of the union of cells in order to the production of the zoospores from which the new beings are developed. [Desmidieæ, *S.* 2; Diatomaceæ, *S.* 2.] The union of two cells is also seen in a large number of *Confervaceæ*, especially in the groups to which the *Zygnæmata* belong. [Zygnæma.]

Although amongst the *Algæ* the production of spores can be traced in so large a number of cases to the union of two cells, their multiplication more ordinarily takes place by means of zoospores or zoosporoid bodies, which are perfectly homologons with the buds or sprouts of the higher forms of plants.

In the *Fungi* we meet with a variety of reproductive organs. As these have been investigated very recently, we give the following extract from Dr. Sanderson's account of the vegetable ovum in the 'Cyclopædia of Anatomy and Physiology':—

The simplest form of reproductive organs in the *Fungi* are those in which the spores occur on a basis or basidium.

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[*] The right use of the term 'individual' in Natural History is a difficulty. If the term is restricted only to the direct produce of the germ-cell and sperm-cell, then all trees propagated by slips belong to the same individual. In order to confine the term individual to such cases, it has been proposed among animals to give the term zooid or zoonites to the independent structures which result from sprouting, gemmation, or fission.

This form of organ is best seen in Geaster. The next form of reproductive organs in the *Fungi* is in the form of a vesicle or bag, which is called a theca, or ascus. "Of these, the first which we shall mention belong to a group of subterranean plants, of which the Truffle is the best known example. The receptacle of the Truffle consists of a fleshy mass, throughout which numerous sinuous cavities are interspersed. Each cavity is partly lined, partly filled with the thecæ and the cells upon which they are supported. This receptacle, like that of all other *Fungi* with which we are acquainted, originates from a pre-existing mycelium. In its unripe condition it displays on section a number of sinuous empty cavities, which either communicate with each other, or open at one or more points of the external surface. As the Truffle advances towards maturity the cavities are obliterated by the formation of a whitish tissue, so that on section, we observe the whole to consist of two substances—the one translucent, of firm consistence, and of a dark-brown colour; the other white and opaque. The former, which corresponds to the partitions which, in the young state of the Truffle, separated the cavities, is continuous with the external tissue which composes the envelope or peridium, and constitutes the vena interna of Vittadini. The laminæ which it forms consist of filaments running, for the most part, parallel to each other. The white substance which occupies the original cavities of the tuber is formed of closed tubes, which are given off in great numbers from the surfaces of the laminæ. These tubes, which are the terminations of the filaments of which the laminæ are composed, are of two kinds. Some are of equal diameter throughout, and divided at intervals by septa; others much shorter are dilated at their extremities, and contain spores (thecæ). Each theca is an obovate vesicle, and contains two, three, or more spores, never more than eight. Each spore is invested with a beautifully reticulate or sometimes warty epispore, within which may be distinguished a smooth inner membrane, immediately inclosing the oleaginous contents.

"The ascophorous *Fungi* are represented in their simplest form by the *Uredineæ*, a family which has been studied by numerous observers on account of the destructive properties of the plants belonging to it. The mass which is formed by the growth of the reproductive organs of *Uredo* under the epidermis of the leaves of the plants upon which it grows parasitically, may be aptly compared to a pustule, a grumous-looking substance, occupying, as it were, the place of the pus. On more minute examination of the cavity, we find that it is bounded by a kind of irregular wall, or lining of pyriform cells, the smaller ends of which rest upon a reticular cushion of mycelium. These are probably the enlarged extremities of the mycelium filaments, with which many of them can be distinctly traced to be connected. Towards the base of the cavity other cells are developed, resembling those first mentioned in their general form, as well as in their relation to the mycelium. In these however the membrane is produced inferiorly, so as to form a tabular pedicle; while in the club-shaped upper extremity it is lined by a considerable deposit of granular protoplasma, so that here the central cavity is very much smaller than that of the external membrane. It is in this cavity that the spore is formed, at first not exceeding it in size, but afterwards increasing at the expense of the protoplasma, so as almost to fill the theca. In other genera, as in *Phragmidium*, there are pedicled cells of a similar form, and originating in a similar manner, which, however, instead of one spore, develop another in their interior; these spores are arranged in linear series, and are formed in the same manner. The protoplasma however never disappears completely, but remains as a more or less consistent membrane, gluing the ripe spore to the spore-case which encloses it. Some of the *Uredineæ* possess a cyst which reminds us of the perithecium of the *Sphæriaceæ*, to which they are evidently closely related. The cyst is formed (*Œcidium*) of a single layer of roundish cells.

"From the *Uredineæ* we pass by a natural transition to the Discomycetes and Pyrenomycetes. These plants have been investigated with much success by Messrs. Tulasne, who have shown that they possess the closest relationship not only to the Lichens but to the most simple thread *Fungi*. The very remarkable facts which these observers have discovered, render the study of these plants more satisfactory and instructive than that of any other family of the class. The Pyrenomycetes are represented by *Sphæria*, the receptacle of which consists, as is well known, of a spherical cyst, which is open above. Its wall is frequently prolonged upwards into a tabular beak, which projects beyond the surface of the bark or wood in which the whole plant is imbedded. The membrane of the cyst (perithecium) is usually composed of polygonal tabular cells; it is lined by an inner layer, formed of the commencements of the paraphyses and thecæ, and of the filaments with which they are connected. The thecæ are obovate cells, the membrane of which is of extreme delicacy. When fully formed, they contain from three to eight oval spores, the epispores of which are in the early condition delicate and pellucid, but by degrees become brown and opaque. The contents of the spores, as is observed throughout the higher *Fungi*, consist of a fluid loaded with oily granules. The thecæ are arranged with their long axes perpendicular to the inner surface of the perithecium from which they spring, and are intermixed with a greater or less number of slender cylindrical paraphyses. The whole perithecium is usually enveloped in the filamentous stroma or mycelium, from which it takes its origin. The Discomycetes are represented by the *Pezizæ*; between these and the *Sphæriæ* there are differences of external form, which, though they strike the superficial observer as important, are in reality trivial. While the receptacle of the *Sphæria* is a cyst with an apical aperture, that of the *Peziza* is a cup-shaped disc, the concave surface of which looks upwards. This surface is lined with an ascophorous membrane, which resembles in every respect that of a *Sphæria*.

"Along with the *Pezizæ* and *Sphæriæ*, and those allied genera which resemble them in producing their spores inclosed in thecæ, there are other forms also included in the Pyrenomycetes and Discomycetes, which, while they resemble those last named in the general outline and structure of their receptacles, differ from them completely in the mode of origin of the spores. The simultaneous occurrence of some of these forms, along with their ascophorous analogues, or, in other instances, the successive development of both kinds of receptacles in the same position, had been frequently observed, and had given rise in the minds of some mycologists to the suspicion of the existence of a relation more close than was generally admitted. This suspicion did not, however, take a sufficiently distinct form to lead to observation, until the Messrs. Tulasne, in a series of researches scarcely completed, showed that the genera in question, hitherto considered as distinct, were in fact identical, and that receptacles containing thecæ and paraphyses, are produced on the same stroma, or, in other words, on the same individual plant, as those which contain acrogenous spores.

"The earliest researches of Messrs. Tulasne were directed to the Pyrenomycetes. In some species of *Sphæria*, they found not only that the same stroma produces receptacles with acrogenous spores, which are followed by others bearing thecæ, but that, under certain circumstances, it may give rise to spore-bearing organs of a much simpler character; namely, branching filamentous pedicles, bearing at their terminations single spores, and rising directly from the mycelium filaments, with which they are continuous. In this condition the plant cannot be distinguished from a thread fungus, and has been hitherto described as such.

"The later observations of Messrs. Tulasne, which are much more in detail, refer almost entirely to Discomycetes. In a species of *Rhytisma*, a genus of Discomycetes, which inhabits the epidermis of the leaves of plants, the stroma at first presents the appearance of a black spot of various extent on the surface of the leaf. In the substance of this stroma the first receptacles are formed; they are cushion-shaped capsules, furnished with apical apertures, like those of *Sphæria*, and are entirely occupied by a pulpy nucleus, which consists of slender branched filaments, often so long as to project considerably beyond the aperture. These filaments bear at their extremities innumerable minute linear sporules, which are enveloped in an abundant mucilage, and are expelled from the ripe capsules in the form of a long cirrhus. After the capsules, which are developed during the early summer months, have discharged their contents, they are succeeded by the lirelliform discs of the perfect *Rhytisma*. These do not arrive at maturity until the following spring, and bear upon their upper surface thecæ and paraphyses, like those of a *Peziza*. In other genera M. Tulasne found that the ascophorous receptacles are preceded by capsules, which produce, instead of the linear sporules above mentioned, cylindrical spores of a much larger size, each of which is supported at the extremity of a pedicle of its own.

"Thus in the plants under consideration we find that, without counting the sporules which are produced by filaments rising directly from the stroma, there are no less than three varieties of spore-like structures, which can be easily distinguished from each other. All of these may be produced upon the same individual, and one is recorded in which a capsule of a *Peziza* was found, which bore, among the normal thecæ, paraphyses with innumerable slender linear sporules at their extremities. As has been already hinted, the capsules which contain acrogenous spores, have been hitherto considered as belonging to genera distinct from those represented by the ascophorous receptacles with which they were found associated. The genus *Cytispora* is characterised by a structure which corresponds completely with that of the capsules described above in *Rhytisma;* and other genera, as, for example, *Sporocadus*, have a similar relation to the capsules, containing the larger variety of pedunculated cylindrical spores."

We know less of the reproductive organs of the Lichens; they however closely resemble those of the *Fungi*. The following is a summary of the reproductive organs found in these two orders:—1, Sporules which are formed by the constriction and separation of the extremity of a simple cylindrical filament. 2, Spermatia, with their supporting pedicles. 3, Stylopores, with their styles. 4, Thecæ, or asci. 5, Basidia, with their basidia-spores. Although the evidence is as yet imperfect, there is still good reason for supposing that the asci and spermata are truly sperm-cells and germ-cells, whilst the other organs represent the germs or buds.

An account of the reproductive organs of the higher *Cryptogamia* is given under the articles FILICES, *S.* 2, and MUSCI. That the organs there described may be regarded as containing the two elementary cells, which we have called germ-cells and sperm-cells, is now matter of little speculation. Mr. Henfrey in a report made to the British Association in 1851, says, in regard to the question of sexes,—"We have several kinds of evidence:—

"1. The inference to be deduced from the universality of the existence of two kinds of organs in connection with the reproductive process. We have seen that these exist in all the families at some period or other of the life of the representative of the species. In the Mosses and the *Hepaticæ* they occur in the fully developed plant. In the Ferns and *Equisetaceæ* they occur upon cellular structures of frondose character developed from all the spores, which frondose bodies or pro-embryos have an existence of some permanence, especially in the *Equisetaceæ*. In the *Lycopodiaceæ*, the *Isoëtaceæ*, and *Rhizocarpeæ*, the pistillidia occur upon very transitory cellular structures produced from one kind of spore, the larger, while the smaller spores at once develop in their interior cellules containing moving spiral filaments such as occur in the antheridia of the other families.

"2. The inferences to be deduced from the observations on the development of those plants in which the two kinds of organs, occurring in distinct places, can be separated. Strong evidence has been brought forward that the diœcious Mosses, as they are called, do not produce sporangia when the pistillidia are kept apart from the antheridia by natural accident. The majority of observers state that the large spores of the *Rhizocarpeæ* do not germinate if the small spores are all removed from contact with them; a few counter-statements however do exist. Again, the majority of authors, and all the recent ones, state that only the large spores of the *Lycopodiaceæ* and *Isoëtaceæ* produce new plants; while some older writers believed that they had seen the small spores do so.

"3. The direct observation of a process of fertilisation, of which we have only testimony from two authors, Suminski and Mercklin, in reference to the Ferns alone; since the assertions of Schleiden in regard to the *Rhizocarpeæ* have been demonstrated by Nägeli, Hofmeister, and Mettenius to have been based on very imperfect observations."

To the question as to the homologues of the organs in the higher *Cryptogamia*, Professor Henfrey gives the following answer:—

"In the Mosses and *Hepaticæ* the pistillidia occur upon the plant when the vegetative structure is perfect, and the immediate product of the great cell is a sporangium. If a process of fertilisation take place here, we may regard the antheridia and pistillidia as analogues of the anthers and pistils of flowering plants, the sporangia of their fruits; or with Hofmeister we may regard the phenomenon as an instance of an 'alternation of generations,' where the pistillidium would be looked upon as an ovule, producing (in the sporangium) a new individual of totally different character from that developed from the spore (the leafy Moss plant in the usual acceptation of the term).

"In the Ferns and *Equisetaceæ*, we find the spores producing a frondose structure of definite form, upon which are developed antheridia and pistillidia, or 'ovules.' Here then we seem to have one generation complete, and the new development from the pistillidium or 'ovule' appears in a totally new form, producing stem and leaves which have a distinct individual form and existence, and produce the spores after a long period upon temporary parts of the structure, on the leaves; and by no means cease to exist when those are matured. Here we seem to have a real 'alternation of generation;' and Hofmeister compares the whole permanent plant of the Fern, or *Equisetum*, to the sporangium of the Mosses and *Hepaticæ*. In all the other families, the *Lycopodiaceæ*, *Isoëtaceæ*, the *Rhizocarpeæ*, the pro-embryo is a very transitory production, and is developed from a different spore from the spiral filaments. This pro-embryo is clearly analogous to that of the Ferns and *Equisetaceæ;* and if the existence of sexes be a fact, we have here a diœcious condition as contrasted with a monœcious condition in the two last-named families. Hofmeister here again assumes that the pro-embryo developed from the large spore is an intermediate generation between the two perfect forms of the plant.

"It is rather difficult to decide upon the real analogies of these structures with those of the flowering plants. The resemblance of structure is so close between the pistillidia of the Mosses and *Hepaticæ*, and the 'ovules' of the other Vascular Cryptogams, that they must be regarded as analogues, and then the former could not well be conceived to be analogous to the pistils of flowering plants, but rather to ovules; if this be the case, the sporangium must be considered the analogue of the perfect plant in the Fern, &c., and the leafy stem as the analogue of the pro-embryo of the Ferns, &c. The pistillidium of the Mosses can indeed hardly be regarded as analogous to the fruit of a flowering plant, as in that case the spores would be ovules produced long after fertilisation; and on the other hand, if we consider the pistillidia of the Moss as an ovule, which it might be, analogous to that of the *Coniferæ*—in which a large number of embryonal vesicles or rudiments of embryos are produced after fertilisation on the branched extremities of the suspensors—then we seem to lose the analogy between the product of the pistillidium of the Moss and that of the ovule of the Fern, unless we would regard the entire plant of a perfect Fern as analogous to the ovule of a Conifer."

We close this part of our subject with a tabular view (given in the next page), of the analogies in the development of different classes of plants, drawn up by Dr. Sanderson.

The process of generation is much more clearly apprehended in the flowering plants. Here we have two sets of organs whose functions are clearly and definitely the preparation of germ-cells and sperm-cells. The organ in which the germ-cells are prepared is called the Pistil, whilst the Stamen, in that part of its structure called the Anther, elaborates the sperm-cells. In the pistil the germ-cells are called Ovules, or Seed-Buds; whilst in the anther the sperm-cells are called Pollen, or Pollen-Grains. In the growth and development of both these sets of organs great differences are observed, but their function is always the same.

The history of the development of the ovule of *Orchis Morio* may be taken as an example of the germ-cells of the flowering plants. In this plant the ovule springs from a placental surface as a single projecting cell, which by subdivision forms at last a central cell called the nucleus, and this becomes surrounded by a layer of cells. This nucleus, or central cell, becomes the embryo-sac, or germ-cell. The pollen-cells from the anthers having fallen on the stigma, now pass down the passage of the style, and at last, through a little opening in the ovule called the micropyle, come in contact with the outside of the apex of the embryo-sac. Within the embryo-sac are to be observed at this time three small cells called embryonal vesicles. "Soon after the pollen-cell has reached the embryo-sac, one of the embryonal vesicles begins to enlarge, and becomes divided by a cross septum into two cells; and while the upper one grows out in a filamentous form through the micropyle by a continued process of cell-division, the lower cell enlarges and divides repeatedly, so as to form a cellular globule." (Henfrey.)

This is the embryo. The prolonged part subsequently dies away.

The development of the pollen-cell is more uniform in the different families of plants. The part of the stamen called the anther at first appears in the young flower-bud as a little cellular papilla. In process of time this papilla divides into two portions. These are the rudiments of the future loculi, or valves. In each half, a single axile vertical column of cells soon becomes distinguished by their greater size and granular contents. In each of these cells the nucleus disappears, and is replaced by two others; this being followed by a division of the cell-contents, which form the primordial utricle, into a new cell round each nucleus. This process is repeated, and a mass of cells is thus formed which become the parents of the true sperm-cell or pollen-grains The walls of these parent cells now become thickened, their nuclei disappear, but are replaced by four permanent nuclei, which become each invested with a primordial sac. In this manner each of the parent cells is divided into four compartments. A cellulose integument is afterwards formed over each compartment, which now become the pollen-grains. Like the nucleus or embryo-sac of the ovule, these pollen-grains have no further power of independent development or growth, but by contact with each other the embryo of the seed is produced. When the anther is fully developed, the external case which contains the pollen bursts, and pollen-grains are distributed upon the surface of the stigma. No sooner does the pollen-grain arrive upon the stigma than it loses its spherical shape, and becomes elongated, forming the so-called pollen-tube. It is this tube which, passing down the style, becomes applied to the embryo-sac, and is the cause of the development and growth of the embryo. A question has, however, arisen as to whether the pollen-tube acts dynamically upon the embryo-sac, or becomes part and parcel of the new embryo.

TABULAR VIEW OF ANALOGIES IN THE DEVELOPMENT OF DIFFERENT CLASSES OF PLANTS.

ALGÆ, FUNGI, AND LICHENS.	HEPATICÆ AND MOSSES.	FILICES.	RHIZOCARPEÆ.		LYCOPODIACEÆ.		PHANEROGAMIA. GYMNOSPERMIA.		PHANEROGAMIA. ANGIOSPERMIA.	
	SPORE-CELL.	SPORE-CELL.	MACROSPORE.	MICROSPORE.	MACROSPORE.	MICROSPORE.	EMBRYO-SAC.	POLLEN-CELL.	EMBRYO-SAC.	POLLEN-CELL.
Germination results in the formation of a *Conferva*, Mycelium, or Hypothallus.	Germination results in the formation of a filamentous Protonema.	Germination results directly in the formation of the Spore-Cell.	Germination consists of the development within the inner membrane of the spore of the Macrospore.	Germination consists in the bulging out of the inner membrane of the Microspore.	Germination as in Rhizocarpeæ.	The same.		Germination represented by the growing out of the inner membrane, so as to form the pollen-tube.		The same.
Frond, Receptacle, Thallus.	Frondose or Leafy Stem.	Prothallium.	Prothallium.		Prothallium.					
Globule of *Chara*.	Antheridium.	Antheridium.		Absent.		Absent.	Absent.	Absent.	Absent.	Absent.
Antherozoids of *Chara*.	Antherozoids.	Antherozoids.		Antherozoids.		Antherozoids.		Absent.		Absent.
Zoospores, *Spermatia*, &c.									Absent.	
Nucule of *Chara*.	Archegonium.	Archegonium.	Archegonium.		Archegonium.		Corpusculum.			
GERM-CELL of *Chara*.	GERM-CELL.	GERM-CELL.	GERM-CELL.		GERM-CELL.		GERM-CELL.		GERM-CELL.	
	Divides into two transversely.	Mode of division uncertain.	Mode of division uncertain.		Divides into two transversely, and is thus transformed into		Divides into two transversely, and is thus transformed into		Mode of division the same.	
	Inferior of the two cells which result from the above division.	Uncertain.	Uncertain.		Suspensor.		Suspensor.		Suspensor.	
	Fruit-Stem.	*Embryo.*	*Embryo.*		*Embryo.*		*Embryo.*		*Embryo.*	
					Cellular Tissue occupying the cavity of inner membrane of spore.		Albuminous body.		Endosperm.	
	Spore-bearing Fruit-Stem.	*Spore-bearing Plant.*	*Spore-bearing Plant.*		*Spore-bearing Plant.*		*Ovule-bearing Plant.*	*Anther-bearing Plant.*	*Ovule-bearing Plant.*	*Anther-bearing Plant.*
	Sporangium. Primary Parent-Cell divided into four special Parent-Cells, each containing a *Spore*.	Sporangium. The same.	Sporangium. The same.		Sporangium. The same.		Ovule.	Anther. Primary Parent-Cell divides into four special Parent-Cells, each containing a pollen-grain.	Ovule.	Anther. The same.

Schleiden maintains that if the pollen-tubes be followed into the ovule, it will be found that usually one, and rarely more penetrates the intercellular passages of the nucleus and reaches the embryo-sac, which being forced forward, is pressed and indented, and by its folding-in, forms the embryo in the first stage of its development. A bag is thus formed consisting of a double membrane, the indented embryo-sac, and the membrane of the pollen-tube itself. Schleiden infers the identity of the embryo and the pollen-tube from the three following circumstances:—1, The constantly equal diameter of the pollen-tube when it is just within it. 2, The invariable chemical similarity of their contents shown by the reaction produced by the application of water, oil of sweet almonds, iodine, sulphuric acid, and alkalies. The general contents of the grain of pollen are starch, and this either proceeds unchanged downwards through the pollen-tube, or else passes along after being changed by a chemical vital process into a transparent and colourless fluid, which becomes gradually more and more opaque; and is coagulable by the application of alcohol; out of this, by an organising process, the cells are produced which fill the end of the pollen-tube, extending in *Orchis Morio* far beyond the ovule, and thus forming the parenchyma of the embryo. 3, The identity of the embryo and the pollen-tube is further supported by the fact, that in such plants as bear several embryoes, there is always precisely the same number of pollen-tubes present as we find embryoes developed.

These views of Schleiden, with his conclusion that the pollen-tube should be regarded rather as the representative of the female than of the male in the animal kingdom, have been adopted by Wydler of Berne and others.

On the other hand, observations were made by Messrs. Mirbel and Spach, on another class of plants, in which they did not meet with the structure described by Schleiden, and consequently they object to the general application of his conclusions. They examined the development of the ovule of the *Zea Mays* (Common Maize). In this plant there is no true embryo-sac, but they found the commencement of the embryo, which they call the primary utricle, and which Schleiden described as the result of an involution of the sac, existing in the cavity of the nucleus. In this plant also, only one, and not two membranes, as described by Schleiden, existed in the embryo. They also found in other plants the primary utricle existing in the interior of the embryo-sac, and at a period anterior to the act of impregnation. They therefore conclude that the pollen-tube does not become the embryo, and that no involution of the embryo-sac takes place. Their conclusions are probably as much too general as those of Schleiden.

Mr. Griffiths, in a paper published in the 'Linnæan Transactions,' gives the result of a long series of investigations on the development of the ovulum in the genera *Santalum*, *Osyris*, *Loranthus*, and *Viscum*. From his observations on these plants, which differ from those investigated by Schleiden, and Mirbel and Spach, he has arrived at conclusions somewhat different from those of any of these observers, and he carefully refrains from drawing an inference from the facts which he has observed that would apply to the whole vegetable kingdom. "The first process," he says, "in the development of the seed subsequently to the penetration or application of the boyau (the pollen-tube) to the embryo-sac would, in *Santalum*, *Osyris*, *Loranthus*, and *Viscum*, appear to consist of the formation of cellular tissue. This may be applied, I believe, to most if not to all instances. This cellular tissue appears to have two different origins; one, and this is the earliest in development, being perhaps referable to the embryo-sac, while the other appears directly referable to the anterior ends of the pollen-tubes." Thus far he agrees with Schleiden, that the pollen-tube penetrates into the embryonal sac, and that the embryo is derived from its intruded extremity, his observations on *Santalum* and *Loranthus* confirming this fact, whilst *Osyris* is an exception confirmative of the rule. "But none of my observations," says Mr. Griffiths, "have tended to confirm Schleiden's idea of the inflection of the embryo-sac before the pollen-tube; and it appears to me sufficiently obvious, that if such were the case the cylindrical bag (the primary utricle of Mirbel), constituting the embryo in its first stage of development, would consist of three membranes or layers, namely, the first, or outer, of the ordinary and uninflected membrane of the sac; the second, of its inflected portion; the third, that of the pollen-tube itself." He also expresses his conviction that the primordial or primary utricle of Messrs. Mirbel and Spach is the sac of the embryo, which no doubt often and perhaps generally exists before fecundation.

Dr. Giraud has published a paper in the same volume of the 'Linnæan Transactions.' He made a series of observations upon the ovulum of the *Tropæolum majus*. He concludes from his observations on the *Tropæolum majus*, "that in this plant the primary utricle and the future embryo never have any structural connection with the extremity of the pollen-tube at their first origin, or at any subsequent period of their development, as is sufficiently obvious from the fact that the pollen-tube is never brought into contact with the embryo-sac. As the primary utricle makes its appearance before impregnation has occurred, it cannot be possible that the organ has ever formed the extremity of the pollen-tube, as is believed by Schleiden and Wydler. Moreover, as the primary utricle takes its origin wholly within the embryo-sac, and at the earliest period of its formation is not in contact with that membrane, it cannot have been formed by the pollen-tube pressing before it a fold of the embryo-sac in its passage into the cavity of that structure, as Schleiden has maintained."

In the 'Annals of Natural History,' 1852, Professor Henfrey has published a paper on the Reproduction of the higher *Cryptogamia* and *Phanerogamia*, in which he states that he has not been able to observe the penetration of the pollen-tube into the embryo-sac.

We now pass to the consideration of the function of Reproduction amongst Animals. General Reproduction occurs in many of the lower animals in the same manner as plants. There is a common reproduction of destroyed tissues which frequently extends to the production of an entire limb. This is seen amongst the *Radiata*, especially the *Echinodermata*, also amongst the *Articulata*. The highest families of animals in which this kind of reproduction occurs regularly are the Reptiles, in which instances are recorded of legs and tails being renewed. Occasional instances occur in which the limbs of higher animals are reproduced. The case of a Thrush, in which such renewal had taken place in a leg, was brought before the British Association meeting at Hull. A case is also related in which an abnormal finger in a human being having been removed, it was again reproduced almost entire.

Reproduction by division into two, or by gemmation, the Fissiparous and Gemmiparous methods of Reproduction, occur to a very considerable extent among the lower animals. These modes of reproduction do not essentially differ, and both occur in the same families of animals. [HYDRA, *S.* 2; POLYZOA, *S.* 2.] The individuals which are thus produced by fission or by gemmation are called Zooids. This process occurs in unicellular as well as multicellular plants and animals, and the single cells produced by the division of the *Desmidieæ*, the *Diatomaceæ*, and the *Vorticelleæ*, are as much entitled to the term Zooids as the more complicated forms of the *Acalephæ*.

The true generative act is performed in animals in the same manner as plants. In order to the production of the new individual it is necessary that there should be a union of germ cells on the one hand with sperm-cells on the other. We shall not here attempt to describe the various forms of organs in the animal kingdom in which these sperm-cells and germ-cells occur. They are described in considerable detail in this work under the head of the families, and sometimes of the genera and species of the various animals described. We shall however describe generally the nature of these cells. The germ-cells and sperm-cells in animals are usually produced from tissues and organs that are structurally different, but as in plants these organs may be placed on different individuals, or on the same. When the two sets of cells are found on the same individual, or zooid, they are said to be Hermaphrodite; but if these cells are found on different individuals they are said to be Monosexual. The term hermaphrodite is also applied to plants; but when their sperm-cells and germ-cells are placed on different flowers, as happens sometimes in the *Phanerogamia*, they are called Monœcious and Diœcious.

The sperm-cells in the animal kingdom assume a more definite form than those of the vegetable kingdom. In the higher *Cryptogamia*, where they assume the form of self-moving filaments, they most closely resemble those of the animal kingdom. These filaments are formed in the interior of cells, from which they escape by bursting. They usually present an elongated filamentous appearance, with a slight dilatation at one extremity. At one time they were regarded as a kind of animalcule, and called 'spermatic animalcules,' and were supposed to have an interior organisation. This is not the case, and they have no more claim to be regarded as animalcules than moveable blood-discs, or ciliated epithelium-scales. The movements performed by these bodies are in many instances due to the presence of cilia, which are found upon their surface. The movements of such filaments would vary according to the disposition of the cilia. In other cases the movement seems due to molecular activity. The object is very obviously to bring the spermatozoon, as these spermatic filaments have been called, into contact with the germ-cell. These movements soon cease after the filaments have been removed from the matrix in which they have been formed. Some agents rapidly destroy these movements, whilst others renew them after they have apparently ceased. This subject has been recently investigated by Kölliker, and the results which he has arrived at in regard to the movements observed in the spermatic filaments of *Mammalia*, are embraced in the following propositions:—

1. In the spermatic fluid, taken from the epidermis and vas deferens, motile spermatic filaments exist in very great abundance.

2. In water and aqueous solutions of all innocuous indifferent substances and salts, the motion of the filaments ceases, and they form loops.

3. These filaments, thus furnished with loops, are not dead, as has hitherto been generally believed; for, on the

contrary, they revive completely upon the subsequent addition of concentrated solutions of innocuous indifferent substances (sugar, albumen, urea), and of salts.

4. In all animal fluids, when considerably concentrated, or highly saline, which are not too acrid nor too alkaline, nor too viscid, the motions of the spermatic filaments are unimpaired; this is the case, for instance, in blood, lymph, alkaline or neutral urine, alkaline milk, thin mucus, thick bile, the vitreous humour—but not in saliva, acid or strongly ammoniacal urine, acid milk or mucus, the gastric juice, thin bile, and thick mucus. When the proper degree of concentration of the latter fluids is successfully attained, and their reaction is rendered neutral, they are innocuous.

5. In all solutions of indifferent organic substances moderately concentrated, the filaments move with perfect facility—thus in all kinds of syrup, in albumen, urea, glycerin, salicin, amygdalin. More concentrated solutions of these substances cause the motion to cease, but it is restored upon their subsequent dilution with water. Too dilute solutions act in the same way as water (vide 2 and 3).

6. Certain solutions, as they are termed, of indifferent organic substances act like water, however much they may be concentrated, such as solutions of gum arabic, vegetable mucus (gum tragacanth, mucilage of quince-seeds), and of dextrin. Concentrated solutions of other substances, in this case also, restore the motions.

7. Many organic substances cause the motions of the filaments to cease, owing to their chemical action upon them, such as alcohol, creasote, tannin, and ether; others owing to their mechanical effects, as most oils. Narcotics, in certain degrees of concentration, are not injurious.

8. Metallic salts are injurious, even in extremely dilute solutions; such, for instance, as a solution containing 1-10,000th of corrosive sublimate.

9. Most of the alkaline and earthy salts are innocuous in certain degrees of concentration, which in some is greater and in some less; so little hurtful, in fact, are they, that the filaments may be kept alive in them for from one to four hours. Among these may be enumerated solutions of common salt; chloride of potassium; sal ammoniac; nitrate of soda; nitrate of potass, containing 1 part to 100; moreover, solutions containing from 5 to 10 parts in 100 of phosphate of soda; sulphate of soda; sulphate of magnesia; chloride of barium. As regards some of these salts, the fact had been previously noticed by older writers, and more recently by Quatrefages, Newport, and Ankermann. Solutions unduly diluted have the same effect as water, and cause the formation of loops, but the filaments are revived upon the addition of a concentrated solution of the same salts and of indifferent substances (sugar, urea, &c.). Stronger saline solutions than are required, also interfere with the motions; but, in this case likewise, the filaments are capable of revival upon the addition of water. These salts can scarcely be regarded properly as revivifiers, as was asserted not long since by Moleschott and Ricchetti, for filaments which have become quiescent in indifferent substances, as sugar, for instance, are not revivified again by them; and their action is widely different from that of the real excitants—the caustic alkalies. It cannot be denied that their influence is very favourable, and that (but perhaps owing only to their rapid diffusion in the water) they produce motion in a seminal mass more rapidly than other less diffusible substances, such as sugar and albumen; on which account the above-named authors ascribe revivifying properties to them—a fact which, before them, had been made known, as regards common salt, by Quatrefages, and by Newport, for carbonate of soda and potass; which latter salts, moreover, in certain experiments, caused the motion to cease in 10′ or 15′, almost like the caustic alkalies.

10. Acids, even in very small quantity, are injurious; such as hydrochloric acid, in the proportion of 1-7500th.

11. Caustic alkalies (soda, potass and ammonia, not lime and barytes), in all degrees of concentration, from 1-31th to 6-10th are special excitants of the spermatic filaments. Whether the latter have become quiescent spontaneously, as in old sperm-fluid, or have ceased to move in indifferent solutions, the above substances recal the most active movements which are not distinguishable from the vital. But these motions cease after two or three minutes, and from this quiescence the filaments cannot be roused by any means. When mixed with indifferent substances in small proportions (from 1-1000th to 1-500th), as, for instance, in syrup, the caustic alkalies afford a means by which the motions of the spermatic filaments may be maintained for a long time.

12. The sperm-fluid dried in indifferent substances, and in saline solutions, may, in certain cases, have its motion restored by dilution with the same fluid, or with water.

The cells which give origin to the spermatic filaments are found upon the surface of the organs which secrete them. At first they are not to be distinguished from ordinary epithelial cells, but they increase in size, and at last present a corpuscle (seminal corpuscle) in their interior. These corpuscles are filled with granular matter, which is gradually converted into the spermatic filament, which is at first coiled up, and lies in contact with the inner surface of the wall of the corpuscle. The spermatic filaments usually present themselves in clusters, which arises from their tendency when set free from their cells to arrange themselves in this manner.

The size of the spermatic filaments varies. In human beings they are from 1-500th to 1-600th of an inch in length. The head is about 1-5000th to 1-8000th of an inch long, and is about half as wide.

In the females of most animals it is not difficult to find a large cell, which is called an ovum or egg. If this ovum be examined in the *Mammalia*, it will be found to present a vesicle, which is called the germinal vesicle, and this vesicle presents a spot, called the germinal spot. There seems to be little doubt that this vesicle is truly the germ-cell. In the *Mammalia* the ova are found in an organ called the ovary.

"If the structure and formation of the human ovary be examined at any period between early infancy and advanced age, but especially during that period of life in which the power of conception exists, it will be found to contain, on an average, from fifteen to twenty small vesicles or membranous sacs of various sizes; these have been already alluded to as the follicles or vesicles of De Graaf, the anatomist who first accurately described them. At their first formation, the Graafian vesicles are small, and deeply-seated in the substance of the ovary; but as they increase in size, they make their way towards the surface; and when mature they form little prominences on the exterior of the ovary, covered only by the peritoneum. Each follicle is formed with an external membranous envelope composed of fine fibro-cellular tissue, and connected with the surrounding stroma of the ovary by networks of blood-vessels. This envelope or tunic is lined with a layer of nucleated cells, forming a kind of epithelium or internal tunic, and named membrana granulosa. The cavity of the follicle is filled with an albuminous fluid, in which microscopic granules float; and it contains also the ovum or ovule. The ovum is a minute spherical body situated, in immature follicles, near their centre; but in those nearer maturity, in contact with the membrana granulosa, at that part of the follicle which forms a prominence on the surface of the ovary. The cells of the membrana granulosa are at that point more numerous than elsewhere, and are heaped around the ovum, forming a kind of granular zone, the discus proligerus.

"In order to examine an ovum, one of the Graafian vesicles, it matters not whether it be of small size or arrived at maturity, should be pricked, and the contained fluid received upon a piece of glass. The ovum then, being found in the midst of the fluid by means of a simple lens, may be further examined with higher microscopic powers. Owing to its globular form, however, its structure cannot be seen until it is subjected to gentle pressure.

"The human ovum is extremely small, measuring, according to Bischoff, from 1-240th to 1-120th of an inch. Its external investment is a transparent membrane, about 1-2500th of an inch in thickness, which, under the microscope, appears as a bright ring, bounded externally and internally by a dark outline: it is called the zona pellucida, or vitelline membrane, and corresponds with the chorion of the impregnated ovum. It adheres externally to the heap of cells constituting the discus proligerus.

"Within this transparent investment, or zona pellucida, and usually in close contact with it, lies the yelk, or vitellus, which is composed of granules and globules of various sizes, imbedded in a more or less fluid substance. The smaller granules, which are the more numerous, resemble in their appearance, as well as their constant motion, pigment granules. The larger granules, or globules, which have the aspect of fat globules, are in greatest number at the periphery of the yelk. The number of the granules is, according to Bischoff, greatest in the ova of carnivorous animals. In the human ovum their quantity is comparatively small.

"The substance that combines the globules and granules of the yelk is in many animals quite fluid. The yelk then completely fills the cavity of the zona pellucida, and escapes in a liquid form when that membrane is ruptured: but in ova of the human subject, and some animals, the yelk is much more consistent, and sometimes escapes as a solid globular mass when the zona pellucida is torn. It is, according to Bischoff, solely owing to this firm consistence of the yelk that it in many cases preserves its form when a watery fluid passes by imbibition through the zona pellucida, and that an interval is then apparent between the yelk and that membrane. From the appearances resulting from the action of water on the ovum, and from other circumstances, it has been thought that the mass composing the yelk is surrounded by another membrane within the zona pellucida, but the evidence for such a view is not satisfactory.

"In the substance of the yelk is imbedded the germinal vesicle, or vesicula germinativa. This vesicle is of greatest relative size in the smallest ova, and is in them surrounded closely by the yelk, nearly in the centre of which it lies. During the development of the ovum the germinal vesicle increases in size much less rapidly than the yelk, and comes to be placed nearer to its surface. In a mature ovum of the rabbit it is about one-sixtieth of a line in diameter (Bischoff): its size in the human ovum has not yet been ascertained, owing to the difficulty of isolating it. It consists of a fine transparent structureless membrane, containing a clear watery fluid, in which are sometimes a few granules.

"At that part of the periphery of the germinal vesicle which is nearest to the periphery of the yelk is situated the germinal spot, a finely-granulated substance, of a yellowish colour, strongly refracting the rays of light, and measuring, in the *Mammalia* generally, from 1-3600th to 1-2400th of an inch (Wagner)." (Kirkes and Paget, 'Handbook of Physiology.')

The act of fecundation is effected in the same manner in animals as in plants, that is, by the contact of the sperm-cells with the germ-cells. Much discussion has taken place as to how this occurs, but the following account may be regarded as embracing the facts most generally accepted:—As the germinal vesicle becomes fitted for fecundation, it loses its pellucid character, arising from the development of a large number of cells in its interior. It is at this period that the spermatic filaments, coming in contact with it, produce that tendency to growth which results in the formation of the new being. The nature of this contact has been a question. Mr. Newport, however, in a series of very carefully-conducted experiments upon the *Amphibia*, comes to the conclusion that the spermatic filament penetrates the vitelline membrane, and comes directly in contact with the germinal vesicle. There is no special foramen for the admission of the spermatic filaments, but they pierce through this membrane, and may be seen floating about in the yelk. Mr. Newport found that a single spermatozoon did not produce fecundation, but that the penetration of several were required for this purpose.

In the human female the ova are brought from the ovaries along the Fallopian tube into an organ called the uterus. It grows rapidly after reaching the uterus; it at first consists of two sacs, one inclosing the other, and the inner containing a liquid. When it is about half a line in diameter a new element becomes visible in it; a round, opaque, granular disc is seen, with a dark spot in its centre, upon the surface of the internal globule or sac. This spot, which is seen either on or through the inner membrane of the ovum, corresponds with the cicatricula of the egg, and is the first rudiment of the fœtus.

In birds the cicatricula, or germ-spot, lies upon the surface of the yolk: soon after the commencement of incubation it expands and separates into two layers; the outer is called by Pander the serous layer, and subsequently forms the osseous, nervous, muscular, and tegumentary systems of the body; the inner, which is in contact with the yolk, is called the mucous, which (together with a third developed between the two others, and named the vascular layer) appears to give rise, by the changes which it undergoes, to the intestinal, respiratory, vascular, and glandular systems. The mucous layer of the germinal membrane gradually expands over the yolk, till it nearly incloses it in a sac, which towards the body of the chick contracts into an oblong canal, which extends the whole length of the embryo, and becomes the future alimentary tube. The sac containing the yolk, and communicating with the intestines, is called the intestinal vesicle, or yolk-bag, and towards the close of incubation is drawn into the belly of the chick, and its contents are used as nourishment. The lower end of the alimentary canal (the cloaca of birds) shoots out into a sac which is termed the allantoïs, or allantoïd membrane. After a time arteries and veins are seen ramifying upon this sac, which protrudes more and more out of the body of the chick, till at length it forms a double bag, laid immediately under the membrane of the shell. On this sac the blood-vessels are so distributed that their contents are influenced by the atmosphere through the porous egg-shell and its membrane, and thus a true respiratory organ is established.

The original structure of the ovum, and the early development of the embryo, in *Mammalia*, appear to be much the same as in the egg of a bird; though there are some characteristic differences. When a human ovum of any magnitude is examined, the embryo is seen suspended in a loose bag filled with fluid, called the amnios, which is a shut sac: this sac is the outermost product of the serous layer of the germinal membrane; for its formation a membrane is reflected from the sides and extremities of the embryo (the reflection, according to Valpeau, not commencing before the twelfth day), so as to inclose a space behind it. As the walls of the trunk close in front, the circle at which the amnios is attached to the body of the embryo gradually contracts, till at length it is limited to the edge of the umbilical opening; it then invests the umbilical cord, and spreads out from its placental extremity into an ample sac filled with fluid, in which the fœtus floats. The mucous layer of the germinal membrane in *Mammalia* is supposed from analogy to form a sac, as in birds, containing a yolk, or substance subservient to the nourishment of the fœtus in its early stage. Whether this view of its formation and use be correct or not only rests on analogy; but in the early part of gestation a small sac or bladder, which from its being filled with a whitish fluid has been called the vesicula alba, may be found on the placenta, at or near the extremity of the umbilical cord, and exterior to the amnios; from this sac a fine tube may be traced along the cord to the navel, and in some animals it has been seen communicating with the intestinal canal. This tube becomes obliterated so early (Valpeau says in the sixth week of gestation) that its communication with the intestines was long undetected, though the sac was known to the older anatomists. The intestinal vesicle finally differs in *Mammalia* and birds in this circumstance, that in the former it is not drawn into the body of the fœtus, but remains without between the membranes, and gradually wasting becomes obliterated by the third month. The duct of the umbilical vesicle is accompanied along the cord by an artery and vein, which are called the omphalo-mesenteric vessels; the artery communicates with the superior mesenteric, and the vein with the vena portæ. The allantoïs exists in all mammals as well as in birds, though its use in the former, which are furnished with a placenta, is not obvious. In some animals, as in man, it becomes obliterated at a very early period, as soon as the sixth week, but in others, as the *Carnivora*, &c., it attains a large size, and continues during the whole period of fœtal existence. In *Mammalia* it communicates with the fundus of the bladder, and the remains of the duct by which it is connected is denominated the urachus. The channel of communication between the allantoïs and the bladder, or cloaca (in birds), at first is short, so that the sac lies directly against the body of the embryo, but it afterwards becomes elongated, like the corresponding duct of the umbilical vesicle.

In man, after impregnation has taken place, a spongy membrane is formed on the inner surface of the uterus by an exudation of lymph. This membrane, called decidua, lines the whole of the uterus before the descent of the ovum; but when this passes down through the Fallopian tube it gradually pushes the deciduous membrane before it, inverting one portion of it which surrounds the ovum, and is called the decidua reflexa; this grows with the ovum till it fills the cavity of the uterus, and comes in contact with the other portion called the decidua vera, lining the walls of the uterus.

The point at which the decidua is reflected upon the ovum is where the placenta is fixed to the uterus. The ovum has two proper membranes, the amnios, which we have described, internally, and an outer membrane, which is called the chorion; this latter membrane in man, during the first two months of pregnancy, has a shaggy external surface, being covered with vascular villi, which become united with the membrana decidua, which is also thick and vascular. This thickening and vascularity of both these membranes gradually diminishes, and becomes concentrated on one part, usually towards the fundus of the uterus; this thickened part is called the placenta. In ruminating animals the thickening and vascularity of the chorion is confined to a number of circular and spongy elevations varying in number from thirty to one hundred, which are called cotyledons. These vascular processes dip in between corresponding processes attached to the uterus of the mother, which are called maternal cotyledons, the surface of which is supplied with numerous vessels derived from the uterine arteries and veins. The result of this arrangement is that a large vascular surface of the maternal system is applied to an equally extensive one of the fœtus, and though there is no direct communication between the arteries and veins, we must suppose that nourishment is imbibed from the vessels of the mother by those of the fœtus through the fine intervening membranes by which they are separated. In man the relation between the maternal and fœtal systems is not so clearly understood as in the preceding instance. In the human subject the placenta is a spongy vascular mass like a cake, from six to eight inches in diameter, about an inch thick in the middle, and two or three lines at the circumference. It adheres by one surface to the uterus, and by the other is connected with the fœtus by means of the umbilical cord. The uterine surface is lobulated, and is connected with the uterus by blood-vessels. The fœtal surface is covered by the chorion and amnios, and presents the ramifications of the umbilical vessels, which consist of two arteries and a vein. The radicles of these vessels communicate with each other, but no communication has ever been shown to exist between them and the utero-placentine vessels; for if we inject from the umbilical arteries we find that the placenta is rendered turgid, and that vessels are found filled in every part of it, but between their ramifications there will remain an uninjected substance, and the uterine surface will not be injected, for the fœtal vessels do not pass all the way to that surface. In like manner, if we inject from the uterine vessels, the placenta will be rendered turgid, but nothing passes into the fœtal vessels. From this circumstance it is concluded that the placenta consists uniformly of two portions: the one is furnished by the deciduous coat of the uterus, the other by the vessels of the chorion, and these two portions may, during the first three months, be separated from each other by maceration. The structure of the fœtal portion, so far as can be made out, appears to be similar to that of the pulmonary vessels, the artery terminating in the vein. But the maternal portion is somewhat different; there is not a direct communication, but the arteries, as Mr. Hunter thought, seem to terminate in irregular cells, and the veins appear to commence with open mouths from these cells, for by throwing wax in the uterine arteries we fill the cells, and frequently inject the uterine veins also.

It has always been considered doubtful whether the placental cells of Hunter were real or artificial, being, in the latter case, produced by extravasation of the injection; and recent researches have confirmed this doubt, but without throwing any satisfactory light on this very obscure subject. With regard to the use of the placenta we may infer that it is very similar in man to what it is in ruminating and other animals; it most probably serves to produce a change in the blood of the fœtus analogous to that which the blood of the adult undergoes in the lungs; and, from considering that the fœtus itself cannot create materials for its own growth and support, we may further infer that the placenta is the source of nutrition also.

The navel-string, or umbilical cord, which connects the child to the mother, is composed of the umbilical vein and two umbilical arteries twisted together, and surrounded by a gelatinous substance and the reflections of the chorion and amnios; it also contains the urachus, and the remains of the duct of the vesicula alba and omphalo-mesenteric vessels. It is visible in the human embryo in the sixth week as a short and straight cord; at birth the length of it is, on an average, about two feet. The outer tunic of the cord, the amnios, is continuous with the epidermis, or cuticle of the fœtus at the umbilicus; and in the same way the chorion, which is also reflected on the navel-string, is continued into the dermis, or true skin of the fœtus.

The following is Valentin's account of the development of the principal organs of the human embryo.

"The primitive streak or groove is the first indication of the future embryo. It consists of a very small longitudinal groove in the middle of the upper surface of the serous lamina. It soon after enlarges, while its two margins are raised to form the laminæ dorsales. They grow over towards each other, meet in a longitudinal suture, and thus inclose a cavity, the primitive tube. Anteriorly this tube dilates into several vesicles, which lie behind each other, and in which is deposited the cerebral substance. The spinal cord is laid down in its remaining cylindrical portion. The several parts of the brain of the human embryo gradually pass through numerous transitional forms, which correspond with their permanent conditions in various of the lower animals.

"A dense cord, the chorda dorsalis, is early deposited beneath almost the whole length of this primitive tube. At the same time, square spots are observed on either side, symmetrically arranged in pairs. Each two corresponding squares subsequently grow towards each other, to construct the body of a vertebra. In doing this, they include between them a corresponding segment of the chorda dorsalis, and gradually altogether displace it. In *Mammalia* and birds, the remaining portions of this structure subsequently disappear.

"The vertebral arches commence as dense curved pairs of streaks; each of which unites on the one hand with the body of the vertebræ, and on the other with its opposite fellow. The various processes of the vertebræ are only added subsequently.

"The first rudiment of the skull is formed by a membranous capsule, which gradually merges into a special cartilaginous covering, called the primordial skull. Some portions of the latter are ossified immediately afterwards, while others disappear after new pieces of bone have been opposed to them.

"The blastema adjoining the interior surface of the skull produces a series of pairs of processes, which finally give rise to the chief structures of the face and neck. Those which lie between the future mouth and the chest are called the branchial or visceral processes; and the fissures which remain between them, the branchial fissures. Their form and relations to the vascular trunks which supply them somewhat resemble the type met with in the gills or branchial respiratory organs of the fish.

"The margins of the central portion of the serous lamina are gradually involuted, so as to form the walls of the thoracic and abdominal cavities. But as they only subsequently meet in the inferior median line of the embryo (which we are supposing to be horizontal), there remains at first a long fissure, through which are protruded the heart, a large portion of the intestinal canal, and the allantoïs. This aperture afterwards closes in the region of the thorax, and the posterior part of the abdomen; and finally disappears, leaving no relic save the navel. The ribs commence as dense striæ, which first become cartilaginous, and are then ossified. The several pieces of the sternum are developed by a similar process.

"The extremities are at first altogether absent. They subsequently sprout in the form of small stumps. Each of these is first divided into an internal segment which pertains to the trunk, and corresponds to the thigh or upper arm, and a free terminal plate which is developed into the hand or foot. The fore arm and leg are only formed subsequently. The fingers and toes are at first united by a kind of web, so as to resemble fins. This membrane begins to disappear from without inwards.

"The eye at first forms a hollow vesicle, which is connected with the brain by a tubular handle, the future optic nerve. The retina is produced from a deposit which resembles that of the cerebral substance in the vesicles of the brain. The crystalline lens, the vitreous humour, and the iris, are only developed subsequently. A special vascular tunic, the capsulo-papillary sac, surrounds the lens of the early embryo. Its anterior segment then forms the papillary membrane, a vascular coat which is stretched immediately in front of the papillary aperture. By the gradual loss of its blood-vessels, this is converted into a simple transparent membrane, which disappears a few days after birth.

"The labyrinth of the ear also begins as a hollow vesicle, having a handle which is continuous with the brain. The vestibule, the cochlea, and the semicircular canals are then developed, at what is comparatively a very early date. The formation of the auditory ossicles is ultimately connected with the development of the most anterior visceral arches. At this period the long process of the malleus extends on the first maxillary process, or the future lower jaw, as far as to the median line; in the *Mammalia*, however, it afterwards gradually disappears, so as to leave scarcely a trace. The tympanic cavity is chiefly developed from the gap situated at the first visceral arch. The external ear is produced last of all.

"The organs of smell are also first indicated by vesicles, which are connected with the brain. The nose is developed afterwards, during the evolution of the face. The palate, which is subsequently laid down, ends by separating the cavities of the nose and mouth. The tongue grows out of the first maxillary arch. The external integument is only separated into corium and epidermis towards the end of the second month, or the beginning of the third. It afterwards acquires its nails, together with its various glands and hairs. In the advanced embryo, almost all the surface of the body is covered by a very fine down. The copious desquamation and fatty secretion of the skin result in a caseous substance which covers many portions of the fœtal body, and is capable of protecting it like an ointment from the injurious action of the liquor amnii.

"Those primary changes by which many of the embryonal organs commence, are effected without the aid of the vascular system. The heart subsequently begins as a tube, which, anteriorly, is continuous with centrifugal vessels or arteries; posteriorly, with centripetal tubes or veins. It afterwards undergoes a peculiar involution, divides into segments, produces the auricular appendages, and finally, presents two auricles and a single ventricle. The latter gradually acquires a septum, which is at first an incomplete, and finally a perfect one. These embryonal vessels gradually undergo numerous changes, which are due, not only to the formation or metamorphosis of those organs of the body that are rich in vessels, but also to a variety of causes which belong to the vascular system itself.

"The contrast of a systemic and a separative circulation obtains at a very early date. A great part of the surface of the yolk is at first covered by a vascular distribution, the aurea vasculosa, in which the blood of the embryo is changed by a process, the details of which are at present unknown. This vitelline circulation begins soon after the heart of the embryo has commenced to beat. In the *Mammalia* it subsequently disappears, to make way for the placental circulation. The blood then runs through the umbilical arteries into the fœtal placenta, where it undergoes a diffusion with the blood of the maternal placenta, returning to the fœtus through the umbilical vein. The renovation thus produced corresponds, not only to the respiration of the more developed being, but also to the most pressing requirements of its nutrition.

"The connection between the state of development of the heart and that of the great vessels, produces a peculiar movement of the blood which has been designated the fœtal circulation, or the circulation of Sabatier. It is most distinct shortly after the middle of pregnancy. The blood of the right ventricle then passes chiefly into the lower half of the body and the placenta; while that which returns from this organ goes chiefly to the left heart, in order to flow thence to the head and neck, from which it finally returns to gain the right auricle and ventricle. So that there is a partial contrast between the circulations of the upper and lower halves of the body. After birth it is replaced by the systemic and pulmonic circulations.

"The placental circulation ceases soon after birth, being replaced by the pulmonic on the respiration of air. But in the normal course of development the preparations necessary for this change are made some months before the end of pregnancy. Hence, under favourable circumstances, a child which comes into the world seven or eight months after conception may nevertheless continue to live.

"The foramen ovale is due to the fact, that the inferior vena cava originally opens into the left auricle, and not into the right, being only gradually pushed over into the latter. This explains why the greater part of the blood that returns from the umbilical vein and the lower parts of the body passes into the left auricle during the fœtal circulation. The groove which conducts it in this course is the relic of a special adaptation, which dwindles and disappears in proportion as the left auricle is claimed by the advancing development of the pulmonary veins. Immediately after birth, the foramen ovale is at first closed mechanically by the action of the auricle; but it finally becomes organically occluded. The superior and inferior vena cava then belong exclusively to the right auricle.

"The pulmonary artery and aorta of the new-born infant are connected with each other by means of the ductis arteriosus, or duct of Botalli. This structure—which is a necessary result of the development of the embryonal vessels—prevents the two divisions of the fœtal circulation being completely separated from each other, and also hinders the perfect separation of the scarlet and dark-red blood in the new-born infant whose lungs have begun to work. But in the first few weeks after birth, the ductus arteriosus is closed by a process which somewhat resembles that seen in a deligated artery. It is thus converted into a ligamentous band, in which form it remains during the remainder of life.

"After a certain period of embryonal life, the umbilical vein which returns the renovated blood from the fœtal placenta, sends branches to the liver. Besides this, it unites with the portal vein, which also ramifies in this gland. And it has also a certain communication with the inferior vena cava, by means of a vessel—the nervous duct of Arantius—which passes between the two. Hence, part of the purified blood which is returning from the fœtal placenta can avoid the liver, and flow immediately into the auricle.

"The umbilical cord of the infant is usually tied and cut through in some part of its course. The brute mammals gnaw it asunder as soon as their young have breathed. After some time that portion which remains attached to the belly dries up, and falls spontaneously from the navel. Those portions of the umbilical arteries which first run along the bladder, and then ascend on the abdominal walls to the umbilicus, become converted into ligamentous tissue. The duct of Arantius and a large part of the umbilical vein also experience the same fate.

"The development of the intestinal canal commences by the centre of the mucous lamina being raised and folded inwards. In this way it produces an intestinal groove, which is open towards the yolk. This groove is soon afterwards shut off anteriorly and posteriorly, so that there only remains a median gap, the intestinal navel. The circumference of the mucous lamina furnishes a covering for the umbilical vesicle. The portion which intervenes between this and the intestinal navel is drawn out into a cylindrical duct, the pedicle or stalk of the umbilical vesicle." (Valentin, 'Text-Book of Physiology.')

The fœtus has many peculiarities which distinguish it from the child after birth, most of which are peculiar to its mode of life, and are lost immediately after being separated from the mother, or are gradually removed during gestation. The most characteristic difference is that it lives in a medium of water, and not of air, and consequently does not breathe by lungs, but has the blood which is deteriorated by circulating through the system purified in some manner in passing through the placenta. The umbilical vein carries the blood from the placenta to the fœtus: it enters the liver by the longitudinal fissure, and in the transverse fissure communicates with the vena portæ, sending the greater part of the blood to be circulated in the liver. This organ is of great size, and seems to perform some important office in the fœtal economy. It is conjectured by Dr. R. Lee to secrete albuminous matter, which nourishes the fœtus. The rest of the blood is transmitted directly to the vena cava inferior by the ductus venosus, which seems to be a continuation of the umbilical vein in man, though in most animals it is merely a branch arising from the sinus of the vena portæ. The blood conveyed by the vena cava inferior to the right auricle of the heart, does not all pass, as in the adult, into the right ventricle, but a great portion goes immediately into the left auricle through an opening in the septum of the auricles called the foramen ovale, which closes up immediately after birth. The blood that still goes into the right ventricle through the auriculo-ventricular orifice is propelled into the pulmonary artery, but as there is no use for it at present in the lungs, it nearly all passes through a vessel named the ductus arteriosus into the aorta. This duct also becomes obliterated after birth, its functions having ceased when once the child has breathed.

By the aorta the blood is sent from the left side of the heart and ductus arteriosus to the different parts of the body, from which it is returned by the veins, but a great part of it passes out of the body of the fœtus by the umbilical arteries, which are continued from the internal iliacs, and pass out at the navel to go to the placenta. The blood of the fœtus differs in its physical and chemical qualities from that of the adult. There is before birth no distinction between arterial and venous blood: it is of a dark colour in both systems of vessels. The purified blood is brought from the placenta by the umbilical vein, and is mixed before arriving at the heart with that which has been circulating through the fœtus: the mixed blood is then transmitted by the aorta to various parts of the body; some of it only going again to the placenta by the umbilical arteries to be again purified.

The position of the child in the uterus is that which takes up the least room; it lies with the head downwards, the chin being bent on the breast; the knees are doubled up close to the belly, and the arms are folded in the space between the head and legs. This is the most general position, and the child thus forms an oval figure, of which the head forms one end and the breech the other. The long axis of this ellipse measures in the ninth month fully ten inches, and the short one five or six inches. The quantity of fluid which surrounds the child at the full time is, on an average, about two pints.

The ordinary period of utero-gestation in man is forty weeks, though labour often takes place before this period, or is delayed a little beyond it. The embryo having now arrived at a sufficient degree of maturity to exist separately, the fibres of the uterus contract, accompanied by contraction of the abdominal muscles and diaphragm. In consequence of this pressure the membranes gradually dilate the mouth of the womb; they then burst and evacuate the liquor amnii, when the pressure acts upon the child itself, which is gradually forced into the world, and commences a new existence. In man, and other *Mammalia*, the young being for a considerable time depends upon its mother for the whole of its nourishment, and very generally requires a supply of warmth and a degree of protection till it is able to provide for itself.

RESPIRATION is that function in the animal kingdom by means of which the various tissues of the body are exposed to the chemical influence of the gases of the atmosphere, and the products thus formed expelled from the body. The advance of chemical knowledge has demonstrated that this function is one essentially of oxidation, and hence it has been proposed to consider all cases of oxidation in organic bodies as instances of respiration. Such an extension of the use of the term has led to its application to plants as well as animals. It should however be remembered that the older physiologists applied the term Respiration to that function of plants by which they take up carbonic acid and give out oxygen, and which was regarded as an equivalent process to the taking up of oxygen and disengaging carbonic acid in animals. It was subsequently found that plants, during certain processes, gave off carbonic acid and absorbed oxygen gas; and it was hence inferred that plants performed a function essentially the same as that effected in animals by the oxidation of carbon in respiration.

The cases in which plants have been observed to consume oxygen and throw off carbonic acid are as follows:—1. During the growth of the order *Fungi*. 2. During the growth of the leafless parasites. 3. During night by most plants. 4. During the active growth of the *Coniferæ*. 5. During the flowering of most plants. 6. During the germination of plants.

This process has been observed to be attended with the same results in certain of these cases, as in respiration of the higher animals, that is, with the disengagement of heat. When the process of oxidation takes place rapidly, disengagement of heat is the necessary result. That these phenomena take place cannot be doubted, but the propriety of classing them with those of the respiration of animals must be questioned, and on these grounds:—

1. The oxidation that takes place in the vegetable kingdom is not a constant phenomenon, but only occurs occasionally in the life of the plant. It is during the latter stages of the growth of *Fungi* that it is observed, when it may be supposed that these plants are entering upon a stage of decay. The oxidation in the *Coniferæ* arises from their secreting resinous matters, which unite readily with oxygen. Again, in the flowering of plants it is only an occasional and exceptional phenomenon in the life of plants. The carbonic acid given out by plants at night can be quite as readily accounted for on the supposition that a certain quantity of the carbonic acid taken up in the day has been undecomposed, and is given out at night, as on the theory of its being the result of oxidation. So likewise in germination, the carbonic acid given off is not the result of a process of life in the young embryo, but of a process of decomposition going on in the starch of the albumen by which it is surrounded.

2. If the term Respiration is to be applied to the evolution of carbonic acid, and absorption of oxygen gas from the fluids of organic beings wherever found, then it must be used to comprehend the processes of fermentation, putrefaction, and eremecausis, which take place either out of the structure of organic beings, or in their interior. The carbonic acid given off from food in the stomach or intestines ought not most assuredly to be regarded as the result of respiration, yet this would be the case if we accepted a mere chemical definition of respiration.

Respiration then appears to be a purely animal process, by which the fluids of the animal are brought into contact with the oxygen of the air, the final result of which is the discharge of carbonic acid gas. This process is continuous in the animal kingdom; and in the great majority of cases in the higher animals, if it be suspended for a few minutes the animal dies. When an animal dies from being deprived of oxygen gas, it is said to be suffocated.

In the higher animals special organs are provided for the performance of that portion of this function which consists in the taking up of oxygen gas directly from the atmosphere, and allowing the carbonic acid to escape. Hence these arrangements have been called Organs of Respiration. It should however be understood that the chemical changes involved in the disappearance of the oxygen, and the appearance of the carbonic acid, are carried on in the tissues themselves. The lungs, gills, or sacs, are organs where the blood receives the oxygen gas, and gets rid of its carbonic acid; whilst the capillaries of the systematic circulation are the organs by which the blood gets rid of its oxygen, and the tissues their carbonic acid. The process of respiration then is the same in the highest as in the lowest animals, with this exception, that in the lowest animals there are no organs of circulation, and no organs of ventilation, as the lungs and gills may be called, for conveying the oxygen and carbonic acid to and from the tissues.

The absorption of oxygen by the animal cell seems to effect three great objects:—1. The preparation of the materials taken up as food for the purposes of nutrition. 2. The removal of certain constituents which have been employed in nutrition, and destroyed during the performance of the function of the part. 3. The production of heat, arrangements for the accumulation of which are made in the higher animals, which are from this circumstance called warm-blooded.

That the performance of one or other of these functions is essential to the life of animals is seen from the fact that, should the supply of oxygen to the tissues of animals be limited or suspended, they exhibit deficient vitality or die. It is not only one function of the animal body that is affected by this deprivation, but all; so that we find the amount of oxidation performed by this process becomes the exponent of the amount of vital activity displayed by any particular animal, or class of animals. When the functional activity of an animal is great it consumes more oxygen, and gives off more carbonic acid, than when it is small. Thus, in animals which hybernate, the amount of oxygen consumed, and carbonic acid given out, is much less during their period of repose than during their period of activity. Sluggish and slow-moving animals consume less oxygen than those which are active. Thus the *Mollusca* consume less oxygen than the various tribes of active insects. It is also found that animals whose movements are slow will support the absence of oxygen gas for a very much longer time than those whose movements are quick.

Under the head of the various articles devoted to the classes and families of animals some account is given of the general character and structure of what are called the Respiratory Organs. In the lowest forms of animals, the *Infusoria*, the whole surface of the animal is exposed to the fluid in which they live, and which contains the oxygen necessary to produce the respiratory changes. When a number of cells are congregated together, as in the sponges, and cavities or tubes are formed, special provision is made by means of cilia, or molecular movements, for carrying the fluid into these cavities, or tubes, as seen in many of the polygastric animalcules and the sponges. Passing higher in the forms of radiate animals, as in the *Polypifera*, we find the arrangements for introducing water into the interior of the animal becoming more complicated, till in the *Holothuriadæ* we find a special system of vessels for supplying this fluid, which have been called an 'aquiferous,' or 'water vascular system,' and which becomes more fully developed in the *Entozoa*, the lowest tribe of the *Articulata*.

These arrangements amongst the lower animals are preparatory to the two predominant forms of respiratory apparatus which are found in the higher animals. The provision for supplying the system with oxygen is in them made by means of a fluid called blood, and which is carried by a circulating apparatus to all parts of the body. This circulating apparatus brings the blood in contact with the air by one of two arrangements. Either the aërating organ is a projection from the surface of the body, when it is called a Gill; or it is a depression in the surface, when it is called a Sac or Lung. The first of these arrangements is found in all animals which breathe through the agency of water, whilst the second is found in those which breathe air. In the Aquatic *Mollusca*, the *Cirripedia*, the *Annelida*, the *Crustacea*, the aquatic larvæ of insects, the fishes, the tadpole condition of the *Amphibia*, and the perennibranchiate forms of that family, we meet with a vast variety of forms of gills adapting these animals to lead an aquatic existence. On the other hand, we find in the Terrestrial *Mollusca* and the Insects the simplest forms of air-breathing apparatus; whilst in the Reptiles, the Birds, and *Mammalia*, we have varied forms of lungs.

Man breathes by means of lungs. The structure and arrangement of those organs, and the nature of the movements performed by the muscles which contribute to the performance of their peculiar function, are described under the article Lungs. The lungs of man are so constructed that they are alternately expanded and contracted. During each expansion, a certain quantity of air is taken into the lungs, and this act is called Inspiration. This expansion is followed by a corresponding collapse, during which the lungs occupy a smaller space, and a certain quantity of air is expelled—this is called Expiration. The quantity of air changed in the human lungs at each respiratory effort varies. It is however easily measured by blowing into a vessel filled with water or other fluid, when the amount of fluid displaced will be the measure of the quantity of air thrown out from the lungs. Instruments of this kind, with an index attached, under the name of Spirometers, are now frequently employed as a means of diagnosis in diseases of the chest. The difficulty however of securing freedom from disturbing causes renders their results less to be depended on than could be wished. The quantity of air thrown out from the lungs has been variously estimated, but probably from 20 to 25 cubic inches is near the truth. Scharling conducted a series of experiments on the quantity of carbonic acid thrown out of the lungs by persons of different sexes and various ages. The following table gives an idea of the average relations of the excretion of carbonic acid gas during one hour:—

Subject.	Age.	Weight.	Carbonic Acid expired in one hour.	Amount of Carbonic Acid expired in one hour for each 1000 grammes' weight.
	Years.	Kilogrammes.	Grammes.	Grammes.
Man . .	35	65·50	33·530	0·5119
Youth . .	16	57·75	34·280	0·5887
Soldier . .	28	82·00	36·623	0·4466
Girl . . .	17	55·75	25·342	0·4546
Boy . .	9¾	22·00	20·338	0·9245
Girl . . .	10	23·00[*]	19·162	0·8831

The air that is habitually and almost uniformly changed in breathing is by Mr. Hutchinson called Breathing Air. "The quantity over and above this which a man can draw into the lungs in the deepest inspiration he names Complemental Air; its amount is various, as will be presently shown. After ordinary expiration, such as that which expels the breathing air, a certain quantity of air remains in the lungs, which may be expelled by a forcible and deeper expiration: this he terms Reserve Air. But even after the most violent expiratory efforts the lungs are not completely emptied; a certain quantity always remains in them, over which there is no voluntary control, and which may be called Residual Air. Its amount depends in great measure on the absolute size of the chest, and has been variously estimated at from 40 to 260 cubic inches.

"The greatest respiratory capacity of the chest is indicated by the quantity of air which a person can expel from his lungs by a forcible expiration after the deepest inspiration that he can make. Mr. Hutchinson names this the Vital Capacity: it expresses the power which a person has of breathing in the emergencies of active exercise, violence, and disease; and in healthy men it varies according to stature, weight, and age.

"It is found by Mr Hutchinson, from whom nearly all our information on this subject is derived, that at a temperature of 60° Fahr., 225 cubic inches is the average vital capacity of a healthy person 5 feet 7 inches in height. For every inch of height above this standard the capacity is increased on an average by 8 cubic inches; and for every inch below it is diminished to the same amount. This relation of capacity to height is quite independent of the absolute capacity of the cavity of the chest; for the cubic contents of the chest do not always or even generally increase with the stature of the body, and a person of small absolute capacity of chest may have a large capacity of respiration, and vice versâ. The capacity of respiration is determined only by the mobility of the walls of the chest; but why this mobility should increase in a definite ratio with the height of the body is yet unexplained, and must be difficult of solution, seeing that the height of the body is chiefly determined by that of the legs, and not by that of the trunk or the depth of the chest. But the vast number of observations made by Mr. Hutchinson leave no doubt of the fact as stated above.

"The influence of weight on the capacity of respiration is less manifest and considerable than that of height; and it is difficult to arrive at any definite conclusions on this point, because the natural average weight of a healthy man in relation to stature has not yet been determined. As a general statement, however, it may be said that the capacity of respiration is not affected by weights under 161 lbs., or 11½ stones; but that above this point it is diminished at the rate of one cubic inch for every additional pound up to 196 lbs., or 14 stones; so that, for example, when a man of 5 feet 6 inches, and weighing less than 11½ stones, should be able to expire 217 cubic inches, one of the same height, weighing 12½ stones might expire only 203 cubic inches.

"By age the capacity appears to be increased from about the 15th to the 35th year, at the rate of five cubic inches per year; from 35 to 65 it diminishes at the rate of about a cubic inch and a half per year, so that the capacity of respiration of a man 60 years old would be about 30 cubic inches less than that of a man 40 years old of the same height and weight.

"Mr. Hutchinson's observations were made almost exclusively on men, and his conclusions are perhaps true of them alone; for women, according to Bourgery, have only half the capacity of breathing that men of the same age have.

"The number of respirations in a healthy adult person usually ranges from 14 to 18 per minute. According to Mr. Hutchinson, the force with which the inspiratory muscles are capable of acting is greatest in individuals of the height of from 5 feet 7 inches to 5 feet 8 inches, and will elevate a column of three inches of mercury. Above this height the force decreases as the stature increases, so that the average of men of 6 feet can elevate only about 2½ inches of mercury. The force manifested in the strongest expiratory act is, on the average, one-third greater than that exercised in inspiration; but this difference is in great measure due to the power exerted by the elastic reaction of the walls of the chest, and it is also much influenced by the disproportionate strength which the expiratory muscles attain through being called into use for other purposes than that of simple expiration. The force of the inspiratory act is therefore better adapted than that of the expiratory for testing the muscular strength of the body.

"Much of the force exerted in inspiration is employed in overcoming the resistance offered by the elasticity of the walls of the chest and of the lungs. Mr. Hutchinson estimated the amount of this elastic resistance by observing the elevation of a column of mercury raised by the return of air forced, after death, into the lungs, in quantity equal to the known capacity of respiration during life; and he calculated that in a man capable of breathing 200 cubic inches of air, the muscular power expended upon the elasticity of the walls of the chest, in making the deepest inspiration, would be equal to the raising of at least 301 lbs. avoirdupois. In tranquil respiration, supposing the amount of breathing air to be 20 cubic inches, the resistance of the walls of the chest would be equal to lifting more than 200 lbs. The elastic force exerted in ordinary expiration must therefore be much greater than enough to lift this weight; because in it the elastic force of the lungs is also in action—a force which is not included in these estimates, because the lungs were in both cases burst by the air forced into them." (Kirkes and Paget, 'Handbook of Physiology.')

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[*] The kilogramme = 2·206 lbs. very nearly. The gramme = 15·434 grains.

The changes of the air in the lungs effected by the respiratory movements are assisted by the air itself. It is a well-known fact that carbonic acid, although heavier than atmospheric air, is speedily diffused through it, according to the known laws of the diffusion of gases. There is no doubt that this law is in active operation during the respiratory changes, and that it assists the oxygen in passing into the lungs, and the carbonic acid in passing out. If it were not for this interchange the reserve and residual air would probably be injuriously charged with carbonic acid. It is also probable that the difference of temperature within and without the lungs assists in the interchange of the air.

The air which is taken into the lungs during respiration is the air of the atmosphere, which in round numbers consists of 21 of oxygen, and 79 of nitrogen in every 100 parts. A small proportion of carbonic acid exists in it, about 4 parts in 10,000. It also contains a varying quantity of watery vapour. The changes which occur in this air during respiration are: 1. It contains a larger quantity of carbonic acid gas. 2. Its oxygen is diminished. 3. Its watery vapour is increased.

An easy proof of the existence of carbonic acid in the air expired from the lungs, is afforded by blowing through a tube into lime water, when the carbonic acid will unite with the lime, and carbonate of lime will be precipitated. The quantity of this gas which is calculated by Valentin and Brunner, as thrown out from the lungs in 24 hours, is 1345·3 cubic inches, or about 636 grains an hour. This would make about 173 grains of carbon in an hour, or 8 ounces in the 24 hours. Andral and Gavarret calculated the quantity at 9 ounces, and Mr. Coathupe at 5 ounces. Liebig gives 13 ounces as the quantity of carbon thrown off from both the skin and lungs.

The quantity of carbon however which is thrown out from the lungs varies under different circumstances. As is seen in the preceding table, sex and age make a considerable difference in the quantity of carbon expired.

Diet exercises a considerable influence on the quantity of carbon thrown out from the lungs. The following table exhibits the quantity of oxygen required by certain articles of diet to convert them into carbonic acid and water. It should always be recollected in relation to this subject, that although carbon is spoken of so frequently, not only is carbon oxidated, but also hydrogen. Wherever hydrogen is present in the tissues, it sustains apparently the same relation to oxygen as carbon. Hence, in the calculation of the influence of diet on respiration it should never be left out:—

Substance.	Carbon.	Hydrogen.	Oxygen.	The quantity of Oxygen required for the formation of Carbonic Acid and Water in addition to the amount already present.
100 parts of Fat . .	78·13	11·74	10·13	292·14
" Starch . .	44·45	6·17	49·38	118·52
" Sugar (C^{12}, H^{12}, O^{12})	40·00	6·66	53·34	106·67
" Malic Acid (C^{4}, H^{2}, O^{4})	41·38	3·45	55·17	82·78
" Albuminates .	47·48	4·98	13·14	153·31
" Collagen . .	42·52	4·47	13·59	135·56
" Muscular substance " Muscular Fibrin and Collagen (Schmidt) .	46·10	4·72	13·66	147·04

From this table it may be gathered that vegetable diet consumes more oxygen in the production of carbonic acid and water than animal diet. This is also found to hold good in the case of carnivorous and herbivorous animals—the latter taking up a larger quantity of oxygen than the former.

It has been found that the carbon and hydrogen of nitrogenous foods become oxidised, and are given out during respiration, but they do not supply sufficient for the wants of the system, and when animals are fed on nitrogenised foods, the fat is oxidised and converted into carbonic acid and water.

It appears to be now an established fact, that the imbibition of spirituous drinks of all kinds is attended by a diminished excretion of carbonic acid. This was indicated by Prout, and has since been confirmed by Vierordt and others. This shows the importance of such drinks in cases where the oxidating processes are proceeding too rapidly, and of their injurious tendency where these processes need to be stimulated. Dr. Prout observed that strong tea exercises the same influence on the system.

Sleep produces a very considerable diminution of the excretion of carbonic acid. Scharling found that the ratio of carbonic acid exhaled during sleep in one hour in the night, to that eliminated in one hour in the day after dinner, was as 31·39 to 40·74. A much greater difference is found between animals during their waking and hybernating states.

Bodily exercise increases the exhalation of carbonic acid, whilst rest diminishes it. Seguin, Prout, Vierordt, and Hoffman, have all proved this by experiment.

With regard to the quantity of oxygen consumed during respiration, it was at one time supposed to be exactly equal to the quantity found in the carbonic acid expired. This however is not this case, for accurate experiments show that, after all allowance made for oxygen present in the tissues, there is constantly a small quantity more taken into the lungs than is thrown out. The destination of this oxygen is undoubtedly to be found in the carbonic acid gas thrown out from the lungs, in the formation of the substances found in the bile and urine, and in the formation of phosphoric and sulphuric acids. The quantity of oxygen consumed is nevertheless measured by the carbonic acid thrown off from the lungs, so that, where there is an increase of excretion of carbonic acid, there is an increase of absorption of oxygen. It is an interesting fact that small animals consume a relatively much greater proportion of oxygen gas than larger ones. It also a fact of practical importance, that the quantity of carbonic acid gas exhaled is not increased by increasing the quantity of oxygen in the atmosphere. As a proof of the necessity of the changes involved in the absorption of oxygen gas, it has been found that the eggs of birds, and undoubtedly this applies to the eggs of all animals, absorb oxygen and give out carbonic acid. The following table gives the result of some experiments of Valenciennes on this subject:—

In 1000 grammes' weight of Eggs.	From the 9th to the 12th day of Incubation.	From the 16th to the 19th day of Incubation.
	Grammes.	Grammes
The loss of weight amounted to	26·26	41·72
The absorbed oxygen . .	5·74	10·70
The exhaled carbonic acid .	4·33	11·92
The exhaled water . . .	2·88	3·66
The ratio of absorbed O to the O in C O^{2} . . .	100 : 54·9	100 : 31·0

The nitrogen of the atmosphere appears to act as a diluent, and to temper the activity of the oxygen gas. Although when animals are placed in atmospheres of pure oxygen, or hydrogen, a certain quantity of nitrogen is thrown out from their lungs, it still requires proof that this has been taken up from the atmosphere. It is not improbable that a certain quantity of nitrogen may be thrown off by the decomposition of the nitrogenous tissues in the blood, or excretions.

With regard to the watery vapour which passes off from the lungs, it may be stated as a general rule that it is sufficient to saturate the expired air. Its absolute amount is therefore influenced by the following circumstances: 1, By the volume of air expired; 2, By the quantity of watery vapour contained in the air previous to its inspiration; 3, By the temperature of the expired air; 4, By the length of time which each volume of inspired air is allowed to remain in the lungs.

We have thus considered the principal physical and chemical phenomena presented during the respiration of animals. It should however be recollected that these phenomena are dependent for their existence on the influence of the nervous system. All the respiratory movements effected by the muscular tissues, as far as they are independent of the consciousness of the individual, are under the absolute governance of that part of the brain which is called the medulla oblongata. It is this portion of the nervous system which acts as the centre of all the impressions which convey the necessity of breathing, and which initiates all the motions which result in respiratory action.

(Kirkes and Paget, *Handbook of Physiology;* Lehmann, *Physiological Chemistry*, translated for the Cavendish Society by Dr. Day; Valentin, *Text-Book of Physiology*, translated by Dr. Brinton.)

REST-HARROW. [ONONIS, *S.* 1.]

RETINALITE, a Mineral, having a resinous appearance, found with and allied to Serpentine. It is found at Granville in Upper Canada. (Dana.)

RETINITE, a Mineral Resin. It occurs in roundish masses. Its colour is light yellowish brown, green, or red; lustre earthy or slightly resinous in the fracture. It is subtransparent to opaque. Often flexible and elastic when first dug up, but loses these qualities on exposure. Its hardness is 1-2·5, and its specific gravity 1·135. It takes fire, and burns with a bright flame and fragrant odour. It is soluble in alcohol. It is found in the Bovey coal of Devonshire, and also in the brown coal of Wolchow in Moravia, and near Halle. (Dana, *Mineralogy.*)

REUSSITE. [MINERALOGY, *S.* 1.]

REVENUE AND TAXATION.—On the accession of Queen Victoria, in 1837, the total public revenue of the United Kingdom for that year was £50,592,646, arising from the following sources:—

	£
Customs	22,063,118
Excise	14,518,142
Stamps, including hackney-coach and hawkers' and pedlars' licences	7,039,538
Taxes under the management of the Commissioners of Stamps and Taxes . . .	3,890,146
Post office	2,339,738
Tax on pensions and salaries	6,791
Crown lands	419,780
Small branches of hereditary revenue . .	5,067
Surplus fees of regulated public offices . .	32,846
Poundage fees, pells fees, &c., in Ireland .	1,477
Money received from East India Campany, on account of retired pay, pensions, &c., of her Majesty's forces serving in India . .	60,000
From the trustees of the king of the Belgians, out of the annuity granted to Prince Leopold	33,500
Imprest moneys repaid by public accountants, and other moneys paid to the public . .	128,105
Money received from the Bank on account of unclaimed dividends	54,398
	50,592,646

The expenditure for the same year was £51,319,112, under the following heads:—

	£
Charges of collection and other payments before reaching the Exchequer	4,188,159
Interest and management of National Debt .	24,357,137
Terminable annuities	4,195,745
Interest on Exchequer Bills	936,688
Civil List	444,068
Annuities on pensions charged on Consolidated Fund	578,966
Salaries and allowances	194,042
Diplomatic salaries and pensions . . .	188,140
Courts of justice	674,452
Miscellaneous charges on Consolidated Fund .	331,788
Army	6,521,716
Navy	4,750,658
Ordnance	1,444,524
Miscellaneous charges on annual grants of Parliament	2,513,029
	51,319,112

Showing an excess of expenditure over income of £726,466. The amount of the public funded debt, on Jan. 5, 1838, was £764,704,057.

The following table gives the gross results from 1838 to 1856:—

Years.	Revenue.	Expenditure.	Surplus.	Deficiency
£	£	£	£	£
1838	52,124,471	52,566,289	...	441,818
1839	52,058,349	53,440,287	...	1,381,938
1840	47,567,565	49,161,536	...	1,593,971
1841	48,084,359	50,185,729	...	2,101,370
1842	46,965,630	50,945,169	...	3,979,539
1843	52,582,817	51,139,513	1,443,304	
1844	54,003,753	50,647,648	3,356,105	
1845	53,060,354	49,242,713	3,817,641	
1846	53,790,138	50,943,830	2,846,308	
1847	51,546,264	54,502,948	...	2,956,684
1848	53,388,717	54,185,136	...	796,419
1849	52,951,749	50,853,623	2,098,126	
1850	52,810,680	50,231,874	2,578,806	
1851	52,233,006	49,506,610	2,726,396	
1852	53,210,071	50,792,512	2,417,559	
1853	54,430,344	51,174,839	3,255,505	
1854	56,737,133	59,946,192	...	3,209,059
1855	63,364,605	84,505,788	...	21,141,183
1856	72,218,988	82,223,400	...	10,104,412

In 1857 the revenue amounted to £70,390,343, from the following sources:—

	£
Customs	22,464,354
Excise	17,472,000
Stamps	7,269,224
Taxes (land and assessed)	3,104,020
Property tax	15,137,996
Post Office	2,992,000
Crown lands	273,654
Produce of sale of old stores, &c.	1,122,004
Money received from East India Company .	60,000
Imprest and other moneys	407,957
Unclaimed dividends received	87,134
	70,390,343

The expenditure was—

	£
Interest and management of permanent debt .	23,626,907
Unclaimed dividends paid	88,531
Terminable annuities	3,979,136
Interest on Exchequer Bonds and Bills .	988,810
Civil List	401,479
Annuities and pensions	337,828
Salaries and allowances	157,557
Diplomatic salaries and pensions . . .	155,560
Courts of justice	578,421
Miscellaneous charges on Consolidated Fund .	177,817
Compensation for abolition of Sound Dues .	1,125,206
Army	13 616,557
Navy	10,390,000
Persian expedition	900,000
Expenses of war in China	590,693
Miscellaneous civil services	6,905,456
Salaries, &c., of revenue departments . .	4,334,288
Redemption of Exchequer Bonds . . .	2,000,000
	70,354,246

The salaries of the Revenue Department form now a separate charge, and are no longer deducted as charges of collection before transmission to the Exchequer, and are consequently subject to parliamentary supervision.

The National Debt, funded and unfunded, at the end of 1857, was £805,282,699, of which 21,555,416*l.* had been created in 1856. In addition to the sums shown as excess of income over expenditure in the preceding years, the greater part of which had been applied to the reduction of the Debt, an Act was passed in 1853 by which the South Sea Stock, certain Bank Annuities, and Three per Cent. Annuities, were incorporated with the National Debt upon terms which added something to the nominal amount of capital, but produced a large reduction in that of the interest paid.

In 1842 the Property Tax, as proposed by Sir Robert Peel, was imposed to remedy the annual defalcation in the revenue. It was assessed at 7*d.* in the pound on all incomes of 150*l.* a year and upwards. Its effects were visible in 1843, and enabled him to make extensive reductions in the customs and excise duties, to the great benefit of the commerce of the country, as well as the comfort of the inhabitants.

The excise duties necessarily interfere with the processes of manufacture—are unavoidably inquisitorial—and are a check upon improvement. In 1797, not fewer than 2 articles were subject to duties of excise. The list includes salt, wine, beer, cider, and perry, hides and skins, printed goods, candles, bricks and tiles, starch, soap, stone bottles, sweets and mead, auctions and glass. There were separate

Boards of Excise for England, Scotland, and Ireland, the functions of which were discharged by 21 commissioners. In 1858 there is only one Board for the whole of the United Kingdom, the number of commissioners has been reduced to seven, and the number of articles in which officers of the board interfere during the process of growth or manufacture has been reduced to four; namely, hops, malt, paper, and spirits. The amount of vexatious meddling which has thus been got rid of can only be estimated by those who have had experience of the working of the excise system in its worst days, when the most conscientious respect for the law rendered it difficult at all times to avoid infringement of the regulations of the Board, and when a manufacturer was often at the mercy of the exciseman, and might easily be ruined by a venial offence committed under a misapprehension of very complicated rules which he was compelled to observe in carrying on his business.

In the department of the customs the practical reforms effected are equally gratifying. At one time the laws relating to customs were contained in not fewer than 1500 Acts of Parliament. In 1853 they were consolidated in a plain, simple, and intelligible form under one statute. At the same time the whole of the customs duties of the United Kingdom were consolidated into a single Act in which every article is arranged alphabetically. The Consolidated Act of Customs Regulations and the Consolidated Tariff Act are all that the merchant will now require for his guidance in place of hundreds of labyrinthine Acts which these two simple codes have superseded.

In 1810 five years were required to effect a digest of the customs laws into 1375 pages; and in 1826 the work of consolidation was compressed into eleven separate Acts, the first of which repealed 443 statutes, many of which were obsolete; and one of the eleven Acts enumerated 1150 different rates of duty chargeable on imported articles; and yet, in 1839, nearly 99 per cent. of the customs duty was contributed by 46 articles. In 1840 there were 1052 articles subject to these duties. In 1845 they were reduced to 590; in 1852 the number was 466, and in 1853 the duty was entirely repealed on no fewer than 105 articles, so that, since 1845 the number of articles on which customs duties are levied has been reduced from 1052 to about 360. In 1856, however, there were 139 articles charged with customs duties, no one of which amounted to 10,000*l.* in the year, and some producing the most insignificant sums; such as almond paste, 2*l.*; barley, pearled, 4*l.*; essence of spruce, 1*l.*; nux vomica and oil of almonds, 3*l.* each. The whole yearly produce of the 139 enumerated articles was 151,596*l.* Yet, however, in the seventeen years, from 1840 to 1857, the amount of customs duties reduced or repealed has amounted to upwards of 10,000,000*l*, while the amount collected has increased from 23,341,813*l.* in 1840, to 23,618,375*l.* in 1856. The exports and imports have enormously increased, and the amount of shipping tonnage has doubled [TRADE AND SHIPPING, *S.* 2.]; and yet, owing to the much smaller number of articles on which duty is levied, and to greater simplicity of arrangements, all this immense addition to the trade of the country has occasioned but small increase to the Custom-house staff, as compared with the number in 1840. Let the reader pause and consider for himself the vast benefits conferred on commerce, and on the people of this country, by the changes which have thus been briefly noticed. Trade has been extended and invigorated, and the prosperity of the country has been based on foundations which only war and scarcity can shake: and the influence of the latter calamity has been reduced to its minimum by wise and enlightened legislation.

It will thus be seen how each successive application of sound principles has added to the stability of our financial system; and the public confidence in these principles enabled the Chancellor of the Exchequer, in the session of 1853, to carry still further towards completion the work of commercial and fiscal reform. The remissions of taxation, which Sir Robert Peel commenced in 1842, and which were renewed on a very large scale in 1845 and 1846, completely, or almost completely, recovered themselves within a period, as to some of them, of eleven years, some of them of five or six years, and all in a mean term of seven or eight years. The safe test of experience has carried conviction to practical men, who are otherwise slow in adopting bold experiments. When, in April 1853, Mr. Gladstone, then Chancellor of the Exchequer, proceeded to unfold a great scheme for settling the finances of the country on a permanent basis for a future term of seven years, he was enabled triumphantly to refer to this popular test. He could show that the effect of remissions of duty, in the way of recovery, was twofold: upon the consumer of the particular article, by enabling him to increase his consumption; and next upon the general consumer, by extending and widening the means of consumption on the part of the great body of the people. Mr. Gladstone, therefore, proceeded, in reliance upon former facts, to carry on the work of tariff reform on the following principles, as far as his financial means permitted:—

1. To abolish altogether the duties which are unproductive, except in cases where there may be some special reason to retain them on account of their relation to other articles.

2. To abolish, as far as revenue considerations will permit, duties on articles of manufacture, except such as are in the last stage as finished articles, and are commonly connected with hand-labour, in regard to which it was considered more prudent to proceed in the mode, not of abolition, but of reduction.

3. Whenever it can be done, to substitute rated duties for duties *ad valorem.*

4. To get rid, except in a few instances where it is important on account of revenue, of the 5 per cent. addition to the customs duties made in 1840, which greatly complicates the transaction of business. The articles on which the 5 per cent. additional duty is still retained are seven in number, and the duty in question produced 327,167*l.*, in 1852:—Tobacco, wine, timber of British possessions, pepper, gloves, currants, and figs. The 5 per cent. additional on figs only realized 1253*l.*, and on gloves 1864*l.*

5. To merge the differential duties in favour of British possessions by lowering the foreign article to the level of the colonial; and where this is not expedient, not to raise the duty on the colonial article.

6. To lower the duties that press on foreign articles of food which enter largely into what may be called the luxuries and comforts of the mass of the people.

The result was, that the duty on 231 articles was dealt with on these principles—on 105 the duty was repealed, and on 126 important reductions were made. The immediate loss to the revenue consequent on these alterations was estimated at 1,338,000*l.* The changes are analogous to those effected in 1842 and 1845-46, and the same result was produced—the gradual recovery of revenue by increased consumption.

The soap duty was entirely abolished, on the ground that it was injurious to health and comfort, that the interference of the excise with the process of soap-making prevented improvement, and disabled the manufacturer from competing in markets abroad with the foreign soap-maker, who was free to carry on his business according to the most approved methods, and not under peremptory restrictions; and because the necessity of allowing drawbacks on soap used in certain textile manufactures entailed fraud and occasioned great loss to the revenue. It is evident that "considerations of revenue" alone prevented the duty on paper being similarly dealt with.

There were three different rates of duty in the United Kingdom on home-made spirits, and this antiquated mode of dealing with the article led to smuggling. An approximation was therefore made in 1853 towards their equalisation by adding 1*s.* per gallon to the duty on Scotch spirits, 8*d.* on Irish spirits, reserving to an early period the further advancement of the principle of equalisation. This was accomplished, as far as regards Scotland, in 1855, by advancing the duty on that kingdom to the same as that in England. This measure at once relieved the borders from a blockade of excise officers. At the same time the duty in Ireland was raised so as to bring it to so near an approximation, that smuggling almost ceased to be remunerative; and in April, 1858, Mr. Disraeli, Chancellor of the Exchequer, in his budget proposed an entire equalisation.

Another great object of the Budget of 1853 was to establish a general uniformity of taxation in the three kingdoms under another important head, by rendering Ireland liable to the income-tax; and to accomplish this end, the Chancellor of the Exchequer was willing to make a great sacrifice. He remitted a sum of 4,500,000*l.* due from Ireland to England, constituting an annual charge of 245,000*l.*, three-fourths of which burden would have continued for forty years. He swept away this debt, and commuted the charge in consideration of an addition of 8*d.* per gallon on Irish spirits, and the income-tax for seven years. Ireland had been exempted from this tax in 1842, in consideration of a duty of 1*s.* additional on spirits, and an augmentation of stamp-duties; but the first was abandoned almost as soon as enacted, and the second disappeared in 1850, when a reduction of stamp-duties took place both in this country and Ireland. Exemption necessarily implies a heavier burden on others. Great Britain had borne the income-tax, and Ireland had largely participated in the remission of duties which that tax was designed to supply. When, therefore, further benefits were to be placed within reach by assenting to the income-tax for a period of seven years, it was felt to be just in principle to impose the tax on Ireland, which would otherwise derive advantages at the cost of the people of England and Scotland.

The complex system of the assessed taxes, levied under seventy-two Acts of Parliament, was re-modelled with a view of securing simplicity and uniformity. With this object the progressive plan of assessment has been abolished, also compositions, and, as far as possible, exemptions.

Some important alterations have been made under the head of Stamps. Penny receipt-stamps have been substituted for stamps of varying value, in order to obtain the advantages of uniformity, and to remove the temptation to evasion; and the facilities of trade have been promoted by allowing the penny receipt-stamp to be used in connection with bankers' cheques, so as to add to their security. [STAMP DUTIES, *S.* 2.]

The most important portion of the Budget of 1853 was undoubtedly the new tax on successions, which subjects every description of property to the legacy duty. The income-tax, it was alleged, pressed unequally on intelligence and skill, as compared with property, and the succession-tax was designed to adjust the balance. Real property, whether settled or unsettled, had hitherto been exempt from legacy duty. This feudal claim of exemption permitted an estate in land of 50,000*l.* a year to pass to the heir without his contributing one farthing to the state, while a poor man who received a legacy of 100*l.* paid a tax of 10*l.* The anomaly has now ceased, and a person who succeeds to a landed estate of 10,000*l.* is taxed on the annual value of his property, which, on the principle of calculation adopted, gives a rental of 300*l.* a year.

The income-tax was retained, but was associated with remissions of indirect taxation to an amount exceeding 5,000,000*l.*; and its extinction was finally provided for in 1860, on the ground that it is not well adapted to form a permanent portion of ordinary public income. It is like the reserve of an army, which should only be brought forward to avert great dangers or accomplish important objects. It may reconcile those who dislike the inquisitorial nature of this impost to consider what it has effected under the opposite conditions of war and peace.

During the great war, which lasted, with two brief intervals, from 1793 to 1815, there were three periods, in the first of which there was no income-tax; in the second it was only incompletely adopted; and in the third it was fully brought into operation.

From 1793 to 1798 there was no income-tax. The charge of government, and the charge of debt incurred before 1793, together with the cost of war, amounted on the average of these six years to 36,030,000*l.* a-year. The revenue, with all the additional taxes laid on, amounted to 20,626,000*l.*, leaving an annual deficiency of 15,404,000*l.*

In 1798, the income-tax was imposed by Mr. Pitt, and from 1799 to 1802, the cost of the war and public charges rose to 47,413,000*l.*; but the revenue, aided by the income-tax, rose from 20,626,000*l.* to 33,724,000*l.*, and under an increase of expenditure, amounting to 11,400,000*l.* a year, the excess of expenditure over revenue was less by 2,000,000*l.* a year during these four years than from 1793 to 1798.

From 1806 to 1815, the income-tax was in full force. The expenses of the war and of government, and the charge of debt (9,500,000*l.*) incurred before 1793, amounted to 65,794,000*l.*, but the revenue rose to 63,790,000*l.* The annual deficiency, instead of being 15,404,000*l.* as in the first period, or 13,689,000*l.* as in the second, was only 2,004,000*l.* Omitting the charge of debt incurred before 1793, there was actually raised, during the heaviest period of war expenditure, 7,000,000*l.* a year more than the charge of government and the cost of the war.

If the resolution to submit to an income-tax had been adopted at an earlier period, the national debt need not at this moment have existed. Rightly, therefore, is it regarded as an auxiliary, to be reserved for great occasions.

In reimposing the income-tax for seven years, the intentions of the government were to mark it as a temporary measure, to equalise, as far as possible, its pressure on skill and intelligence as compared with property, to mitigate its operation by every rational means compatible with its integrity, and to associate it with extensive reductions of taxation; and on these terms it was accepted for the sake of the benefit which it brought in its train.

The Government, after giving the most mature consideration to the subject, declined to undertake the reconstruction of the tax, and staked their official existence on the success of their general financial plan. The Chancellor of the Exchequer showed that the incidence of the tax on real property was already heavier than was generally supposed, and he estimated that on land and houses it was 9*d.* and not 7*d.* in the pound, and that evasion or unfair assessment was impossible; while on trades and professions the principle of self-assessment entailed extensive frauds, of which he gave a striking instance. It was necessary to compensate twenty-eight persons for their profits for a single year, and they claimed 148,590*l.*; a jury awarded 26,973*l.*, but their return of profits for assessment to the income-tax was only 9,000*l.*! The case of the professions, which has often been brought forward as one of peculiar hardship, appears when analysed to be of less magnitude than the public have been led to believe. They do not contribute more than one-twenty-second part of the tax; but to mitigate their case as far as possible, persons who insure their lives up to one-sixth of their incomes, may deduct from their income the cost of insurance, but not so as to escape the tax altogether; and this will chiefly benefit the professions to the amount probably of 120,000*l.* a year.

The extension of the income-tax to Ireland has already been noticed. The tax has also been extended at a lower rate of assessment to all persons with incomes between 100*l.* and 150*l.* a year. They were benefited by all the remissions of taxation, which had been purchased at the cost of others by the payment of the income-tax; and when further remissions were to be made, it was only just that this exemption should cease. The Chancellor of the Exchequer adduced cases showing, that persons with incomes between 100*l.* and 150*l.* a year, had been benefited by the reduction of duties on necessaries and luxuries to a greater extent than those whose incomes varied from 150*l.* to 170*l.* a year; the first to the extent of 6 and 7 per cent., and the second only to 5 per cent., or deducting the payment by them of income-tax of 2 per cent. On the occurrence of the war with Russia, the tax was raised to 16*d.* in the pound on incomes of 150*l.* and upwards, and to 11½*d.* on farms rented to that amount; it was reduced to the original 7*d.* in 1857; and to 5*d.* in 1858.

"Considerations of revenue" alone prevent the further application of sound financial principles to other parts of our fiscal system. The duties on paper and wine, and particularly those on fire-insurance, are amongst the first which have claims to be abolished or reduced, and which promise when relieved from taxation to be productive of the greatest advantage to the community. The insurance tax operates against one of the very best principles of society—that of distributing losses which would ruin an individual, over the whole community, in a manner to render it scarcely appreciable by any. An exemption from the tax only shows its impolicy. Farming-stock and implements do not pay insurance duty, but a workman's tools do. The tax, however, yields upwards of a million to the Exchequer, and the Chancellor cannot afford to give it up.

Much has been already accomplished, more than could possibly have been anticipated a few years ago; and we will conclude by quoting the closing sentences of Mr. Gladstone's most able speech on introducing the Budget in April, 1853, as a fair statement of the principles which now regulate our fiscal system: "While we have sought to do justice, by the changes we propose in taxation, to intelligence and skill, as compared with property; while we have sought to do justice to the great labouring community of England, by further extending their relief from indirect taxation, we have not been guided by any desire to put one class against another; we have felt we should best maintain our own honour—that we should best meet the views of Parliament, and best promote the interests of the country—by declining to draw any invidious distinction between class and class, by adopting it to ourselves as a sacred aim, to diffuse and distribute—burden if we must—benefit if we may—with an equal and impartial hand; and we have the consolation of believing that by proposals such as these we contribute as far as in us lies, not only to develop the material resources of the country, but to knit the hearts of the various classes of this great nation yet more closely than heretofore to that throne and to those institutions under which it is their happiness to live."

As intimately connected with the ameliorations of our financial system, we append a list of the taxes repealed or reduced, and of taxes imposed or increased during the following years:—

Taxes Repealed or Reduced.

		£
1840.	Postage	1,240,000
	Other taxes	18,959
	Total	1,258,959
1841.	Rice in the husk	21,832
	Other taxes	5,338
	Total	27,170
1842.	Coffee	201,113
	Timber & wood	608,414
	Export duties	109,778
	Other customs duties	579,639
	Stage coaches	77,779
	Other taxes	19,643
	Total	1,596,366
1843.	Timber & wood	126,453
	Spirits, Ireland	240,000
	Other taxes	45,368
	Total	411,821
1844.	Coffee	86,174
	Currants	95,816
	Wool	97,140
	Marine insurances	101,959
	Glass	45,000
	Other taxes	32,721
	Total	458,810
1845.	Sugar	2,309,857
	Molasses	129,183
	Cotton, raw	682,042
	Coals, export duty	115,438
	Other customs duties	380,786
	Auctions	305,000
	Glass	624,000
	Total	4,546,306
1846.	[*]Butter & cheese	205,437
	Silk manufactures	162,985
	Spirits	482,286
	Tallow	101,966
	Woollen manufactures	27,970
	Seed, Clover	36,077
	Other customs duties	135,069
	Total	1,151,790
1847.	Woods from foreign countries	243,085
	Sugar and molasses	53,152
	Rum	46,974
	Other taxes	1,675
	Total	344,386
1848.	Copper ore	35,745
	Rum, British Possessions	69,3 3
	Sugar and molasses	258,854
	Wood, Foreign	215,028
	Other taxes	6,988
	Total	585,968
1849.	Sugar and molasses	355,257
	Oil and sperm	29,327
	Other taxes	4,214
	Total	388,798
1850.	Sugar and molasses	331,073
	Stamps	520,000
	Bricks	456,000
	Other taxes	3,078
	Total	1,310,151
1851.	Window duty	1,878,800
	Coffee	149,161
	Sugar and molasses	359,804
	Wood & timber, Foreign	292,099
	Total	2,679,864
1852.	Sugar and molasses	95,928
1853.	Tea	968,877
	Butter & cheese	106,535
	Sugar and molasses	78,793
	Raisins	65,659
	Other articles	279,610
	Total customs	1,499,474
	Excise, Soap, &c.	1,171,000
	Stamps	277,000
	Taxes, Assessed	300,000
	Total	3,247,474
1854.	Customs:—	
	Tea	980,568
	Platting of chip, and other articles	2,539
	Stamps—bills of exchange	11,000
	Taxes, Assessed	290,000
	Total	1,284,107
1855.	Customs:—	
	Window glass and other articles	2,960
	Stamps:—	
	Newspapers[†]	250,000
	Stage Carriages	60,000
	Total	312,960
1856.	Customs:—	
	Spruce Beer	1,428
	Plums	1,886
	Other articles	161
	Excise:—	
	Malt—War-Tax	2,200,000
		2,203,475
1857.	Customs:—	
	Window glass	2,053
	Caoutchouc manufacture	6,004
	Carry forward	8,057
1847.	Brought forward	8,057
	Coffee	145,816
	Sugar and molasses	418,988
	Tea	1,054,637
	Other articles	1,084
	Property and income tax	9,125,000
	Total	10,753,582
1858.	Income tax reduced to *5d.*	2,000,000

Taxes Imposed or Increased.

		£
1840.	Customs 5 per cent.	1,060,226
	Excise 5 per cent.	438,000
	Ditto, spirits	344,000
	Assessed taxes 10 per cent.	311,477
	Postage, abolition of franking	118,567
	Other taxes	1,970
	Total	2,274,240
1841.	None.	
1842.	Income and property tax	5,100,000
	Export duty on coals	141,930
	Spirits, Ireland	240,000
	Stamps, Ireland	121,745
	Other taxes	26,314
	Total	5,629,989
1843.	None.	
1844.	None.	
1845.	Auctioneers' and appraisers' licences	53,720
1846.	Meal and flour	2,000
1847.	None.	
1848.		84
1849.	None.	
1850.	None.	
1851.	Inhabited house duty	600,000
1852.	None.	
1853.	Customs	16,383
	Carry forward	16,383
1853.	Brought forward	16,383
	Excise (spirits)	590,000
	Stamps (succession tax)	2,000,000
	Property tax	750,000
	Total	3,356,383
1854.	Customs:—	
	Spirits	16,694
	Sugar and molasses	420,298
	Other articles	3,651
		440,643
	Excise, malt	2,450,000
	,, spirits	450,000
	Income and property tax	6,614,000
	Total	9,954,643
1855.	Customs:—	
	Sugar and molasses	1,267,566
	Tea	774,413
	Coffee	155,629
	Spirits, colonial	25,546
	Other articles	2,753
	Excise spirits	1,000,000
	Income tax	2,000,000
	Total	5,225,907
1856.	None.	
1857.	Rice dust, for feeding cattle	92
1858.	Irish spirits	500,000
,,	Stamps on cheques	300,000
	Total	800,000

REVIVOR. [SCIRE FACIAS, *S.* 2.]

RHAYADER. [RADNORSHIRE.]

RHENITE. [MINERALOGY, *S.* 1.]

RHINOPOMA. [CHEIROPTERA.]

RHIZANTHEÆ, *Rhizanths*, *Rhizogens*, a small class of Plants, comprising the orders *Balanophoraceæ*, *Cytinaceæ*, and *Rafflesiaceæ*. They are parasitical plants, destitute of true leaves, in place of which they are furnished with cellular scales. Their stem is either an amorphous, fungous mass, or a ramified mycelium, and is very imperfectly supplied with spiral vessels, which are sometimes wholly deficient. They are of a brown, yellow, or purple colour, never green. They produce flowers which have genuine stamens and carpels, and are surrounded by a whorl of petaloid bodies. They possess ovules, but their seed is not known.

These plants have been regarded by Lindley, Endlicher, and other botanists, as sufficiently distinct to warrant their being placed in a class by themselves. Their flowers, stamens, and ovules, indicate their relation to the phanerogamic plants, whilst their mycelial stem, parasitic habits, and cellular structure ally them with the *Fungi* and other low forms of vegetation. Mr. Brown however is of opinion that the Rhizanths are but less developed forms of Exogenous Plants. He regards them as having affinities with *Aristolochiaceæ*, and other orders of Exogens. More recently Mr. Griffiths has adopted the views of Brown, and advanced a number of arguments in favour of their being degraded forms of higher plants, and not a permanently low form of vegetation. He thinks the relations of Rhizanths various. Thus he places *Mystropetalon* near *Proteaceæ* and *Santalaceæ; Sarcophyte* and *Balanophora* he places near *Urticaceæ*. Finally, he places *Thismia* between *Taccaceæ* and *Burmanniaceæ*.

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[*] In 1846 the prohibitory duty on foreign sugar was also reduced, but as the expected result was an increase of revenue, it is not specified.

[†] Portion of Stamp Duty lost by the repeal of the Act which made the stamp compulsory, allowing the sum of 50,000*l.* a year for the addition to the Post-Office revenue for unstamped newspapers sent with postage stamps.

The following are the orders of *Rhizantheæ* as recognised by Lindley:—

Ovules solitary, pendulous; fruit one-seeded	*Balanophoraceæ.*
Ovules 00, parietal; fruit many-seeded; calyx 3-4-6-parted; anthers opening by slits	*Cytinaceæ.*
Ovules 00, parietal; fruit many-seeded; calyx 5-parted; anthers opening by pores	*Rafflesiaceæ.*

RHIZOBOLACEÆ, *Rhizobols*, a natural order of Plants, consisting of trees of very large size. The leaves are opposite, digitate, coriaceous, with a pointed stalk and no stipules; flowers large, regular, arranged in racemes, with their stalks pointed at the base and below the apex; the sepals are 5 or 6, more or less combined, imbricated in æstivation; petals 5 to 8, equal-sided, but unequal thickish, arising along with the stamens from a hypogynous disc; fruit of several combined indehiscent one-seeded nuts; seed reniform, exalbuminous, with a cord dilated into a spongy excrescence; radicle very large. The species are found in South America. They are large timber-trees, some of which yield edible fruit. It is from trees of this order that are produced the Souari (or Suwarrow) Nuts of the shops, the kernel of which is one of the most delicious fruits of the nut kind that is known. An oil is extracted from them not inferior to that of the olive. The timber of the tree is used for ship-building. (Lindley, *Vegetable Kingdom*.)

RHIZOCARPEÆ. [Marsileaceæ, *S.* 2.]

RHIZOPHOREÆ. [Rhizophora.]

RHODALITE, a Mineral which appears to consist of small rectangular prisms with square bases. Hardness about 2. Colour between rose-red and flesh-red. Specific gravity 2. Before the blow-pipe per se not altered. With carbonate of soda fuses into a greenish-blue transparent bead in the exterior flame, becoming yellow in the interior flame: with borax gives a transparent colourless bead; with phosphate of soda does not fuse. It is found in Ireland, occurring probably in an amygdaloidal rock. An analysis by Mr. Richardson gives—

Silica	55·9
Alumina	8·3
Peroxide of Iron, and trace of Oxide of Manganese	11·4
Lime	1·1
Magnesia	0·6
Water	22·0
	——99·3

RHODEORETINE. [Chemistry, *S.* 2.]

RHODIOLA. [Sedum.]

RHODIZITE, a Mineral resembling *Boracite* [Boron] in its crystals, but it tinges the blow-pipe flame deep red. It occurs with the Red Tourmaline of Siberia. (Dana.)

RHODYMENIACEÆ, an order of *Algæ*, consisting of purplish or blood-red Sea-Weeds, with an expanded or filiform inarticulate frond, composed of polygonal cells, occasionally traversed by a fibrous axis; superficial cells minute, irregularly parted, or rarely disposed in filamentous series; fructification double; conceptacles external or half-immersed, globose or hemispherical, imperforate, containing beneath a thick pericarp a mass of spores affixed to a central placenta. The root is disc-like or branched, sometimes much matted; frond variable in habit and colour, either leafy or filiform, and much branched, never articulate: in some an intense scarlet, in some crimson, in others brown-red or purple, usually growing somewhat darker in dyeing. The species are widely dispersed; all our genera having representatives in very distant countries, with very various climates.

Rhodymenia is an ill-defined genus, and will probably be divided into several distinct genera. Many of the species, especially of the section *Calophyllis*, are among the most splendidly coloured of crimson and carmine *Algæ*. Others, as *R. Hombroniana*, are clothed in royal purple; while others, like the sober dulse of our coasts, *R. palmata*, have often as much of brown as of purple in their attire.

Many of the *Rhodymeniaceæ* are valuable in an economic sense.

R. palmata, the Dulse of our coasts, is collected largely in Scotland and Ireland, and forms an important article of diet. Many of the *Gracilariæ* are largely used in the East as ingredients in soups and jellies, and also as substitutes for glue. One of them *G. spinosa*, is the Agar Agar of the Chinese, and is largely collected both for culinary purposes and as a component part of some of the strongest Chinese glues. It has recently been imported into England, and is occasionally used instead of carrageen moss in making jellies and blancmanges.

(Harvey, *British Algæ*.)

RHYDDLAN, or RHUDDLAN. [Flintshire.]

RHYNCHITES. [Weevil.]

RICCIACEÆ, a natural order of moss-like Plants or Herbs, inhabiting mud or water, swimming or floating, usually annual; their leaves and stems blended into a frond of a cellular structure, creeping, green or purple underneath, with a distinct epidermis, and a cavity of air-passages beneath it in some species.

These plants form a plain transition from *Thallogens* to *Acrogens*. Their spores are collected in large numbers within organs resembling the pistils of Phænogamous Plants. They have a distinct axis of growth, and an epidermis is distinctly formed with stomates for breathing with. The genus *Duriæa* is regarded as forming the nearest transition to Liverworts. It fructifies under water, which is very seldom the case with the other Crystal-Worts.

Of the species hitherto known two-thirds have been observed in Europe, and the remainder in various parts of the world. Several species in North America, the Cape of Good Hope, and Brazil, appear to be very similar to those of Europe. There are 8 genera and 29 species.

RINGWOOD, Hampshire, a market-town, and the seat of a Poor-Law Union, in the parish of Ringwood, is situated on the left bank of the river Avon, in 50° 50′ N. lat., 1° 47′ W. long., distant 27 miles S.W. from Winchester, 92 miles S.W. by W. from London by road, and 104 miles by the London and South-Western railway. The population of Ringwood parish in 1851 was 3928. The living is a vicarage in the archdeaconry and diocese of Winchester. Ringwood Poor-Law Union contains five parishes and townships, with an area of 16,425 acres, and a population in 1851 of 5465. The town is lighted with gas. The manufacture of thread and woollen gloves employs some of the inhabitants. The chancel and transepts of the parish church appear to have been erected about 1230; the nave and the tower are more recent. There are chapels for Wesleyan Methodists, Independents, and Unitarians, and National schools. There is an excellent corn-market, held every Wednesday. Fairs for horses and cattle are held on July 10th and December 11th.

RINTOUL, ROBERT STEPHEN, one of the most eminent of the writers of the newspaper press in London, was a native of Scotland, and was born in 1787. Of the history of his boyhood little is known. He was probably born in Leith or in Dundee, and he availed himself of the advantages afforded by the grammar-schools of Scotland to acquire a well-grounded education. His first known entry into public life was as editor of the 'Dundee Advertiser,' a weekly newspaper, somewhere about or a little before 1813. In this paper he at once evinced those remarkable powers of condensation and arrangement by which his after labours were distinguished. The paper advocated liberal, or rather the Whig, principles of the day, at that time by no means generally received in Scotland, though somewhat more favoured in Dundee, a large commercial and manufacturing town; and the talent he displayed not only ensured the popularity and success of the newspaper, but procured him the support and friendship of many of the leaders of the Whig party in Scotland. As editor he was the assailant of the corruptions of the close corporation of the town; the advocate for the improvement of the burgh schools; for the extension of harbour accommodation; and the exposer of fiscal mismanagement. About 1825 his connection with the 'Dundee Advertiser' ceased, and he endeavoured to establish a paper at Leith; it did not succeed; and on the recommendation of Mr. Douglas Kinnaird and Mr. Joseph Hume he was appointed editor of the 'Atlas' weekly newspaper in London. In this position he did not remain long; assisted by his friends he commenced 'The Spectator,' of which he was to have absolute control, and of which the first number was issued on July 5, 1828. He had now an opportunity of realising his notion of what a newspaper should be; and no man ever worked harder, more conscientiously, or more independently to effect his object. We have already noticed his faculty of arrangement, which he thoroughly carried out in 'The Spectator.' Besides writing on a multiplicity of subjects himself, he secured the assistance of a number of well qualified and distinguished men as contributors; but in most cases he suggested the subject, and in all he critically examined every one of their productions before they appeared in print. He was a supporter, through the paper, of all the great measures of social and political progress, from the time of its establishment, and probably few newspapers have had so much influence in forming opinions, particularly among the more highly educated class, as 'The Spectator.' The caution with which opinions were expressed; the avoidance of all exaggeration or depreciation of facts; the recognition of objections or defects in matters where an approval was given of the whole; though sometimes seeming to give an air of coldness to his judgments, and occasionally even of indecision, aided the influence by exciting thought. For thirty years he continued this laborious and useful life up to within a month of his death, which occurred on April 22, 1858.

RIOJA, LA, one of the provinces of the Argentine Confederation, comprehends the country between the Gran Salina and the Andes, and extends from north to south from 28° to 31° S. lat. It is bounded S. by the provinces of San Juan and San Louis, E. by Cordova, N.E. and N. by Catamarca, and W. by the republic of Chili. The area is about 5850 square miles. The population is variously estimated at from 18,000 to 25,000.

The country is described generally under PLATA, LA, STATES OF. It consists of a narrow strip of cultivable land along the eastern base of the Sierra de Velasco, the two valleys of Famatina and Guandacol, and a pastoral tract extending round the southern extremity of the Sierra de Velasco. Only the northern districts of the country east of the Sierra Famatina are fit for agriculture. The province is by its position almost cut off from intercourse with the more civilised parts of the Confederation. The roads leading to La Rioja are mere circuitous paths, hardly passable by mules, and the country is altogether in the most backward condition. The province is divided into four departments—Arauco, Famatina, Guandacol, and the Llaños. *Arauco* lies east of the Sierra de Velasco, and produces wheat, maize, and cotton; but its principal wealth is its vineyards. From 7000 to 10,000 barrels, of 16 gallons each, of a strong sweet wine, and 100 barrels of brandy, are annually made, nearly the whole of which is exported to Cordova and the neighbouring provinces. The capital, La Rioja, is also that of the whole province. *Famatina* lies to the west of Arauco, between the Sierra de Velasco and the Sierra Famatina. It contains rich orchards in its northern districts, and makes and exports about 6000 barrels of wine annually. This department takes its name from the Sierra Famatina, celebrated for its mineral wealth. The silver-mines of Famatina are very rich, but the remoteness and inclemency of their situation—they being above the line of vegetation, and only accessible by difficult mountain-paths—have hitherto prevented them from being worked except on a small scale. The capital, Chilecito, is a place of no importance. Goitre prevails to a fearful extent in the valley of Famatina. *Guandacol* lies between the Sierra Famatina and the Andes, and produces very rich crops of wheat. It is thinly inhabited, and chiefly by aborigines, who hunt the vicuña in the adjacent monntains. The wool of the vicuña is the only article of export. Guandacol, the capital, and Vinchina are the only towns. The Llaños consist chiefly of a desert plain, containing a great number of grassy oases, on which there are numerous cattle-farms. About 20,000 head of cattle are annually reared. Like the other provinces of the Argentine Confederation, La Rioja is a federal state, owning a qualified dependence upon the central government. The state government is nominally vested in a governor and municipal junta of five members.

La Rioja, the capital of the state, is situated at the foot of the Sierra de Velasco, in 29° 12′ N. lat., 59° 50′ W. long. It contains some substantial houses, a few public buildings, the only school in the province, and about 3000 inhabitants.

RIPLEY. [YORKSHIRE.]

ROCAMBOLE. [ALLIUM.]

ROCCELLIC ACID. [CHEMISTRY, *S.* 1.]

ROCHEA (named after La Roche, a French Botanist), a genus of Plants belonging to the natural order *Crassulaceæ*. It has a 5-lobed calyx; petals 5, united into a gamopetalous hypocrateriform corolla, with a short tube, equal in length to the spreading limb or shorter than it; stamens 5, alternating with the petals, a little exserted; glands and carpels 5. The species are fleshy simple succulent shrubs. The leaves opposite, connate at the base, thick, and white. The flowers are disposed in terminal corymbs, without any bracts. A large number of the species are cultivated in our gardens and greenhouses.

ROGERS, SAMUEL, was born on the 30th of July 1763, at Newington Green, a suburb of London. His father, who was a Dissenter, and much respected by the Dissenters of London, was a banker by profession; and the poet, after a careful private education, was placed, when yet a lad, in the banking-house to learn the business prior to his becoming a partner. Among the reminiscences of this time was that of Wilkes calling at the banking-house to solicit his father's vote, and, as his father was out, shaking hands with him as his father's representative. From a very early period, the future poet exhibited a taste for letters, and he used to date his first determination towards poetry from the effect produced upon him by reading Beattie's 'Minstrel' when a mere boy. His admiration of literature and literary men led him, while still a clerk in his father's bank, to meditate a call on Dr. Johnson for the purpose of introducing himself; and once, with a young friend, he went to Johnson's house in Bolt Court bent on accomplishing the object, but his courage failed him when he had his hand on the knocker. It was in 1786—two years after Johnson's death—that Rogers, then in his twenty-third year, published his first volume of poetry, under the title of 'An Ode to Superstition, and some other Poems.' The date is important. "The commencement of a new era in British Poetry," says a critic, "dates almost exactly from this year. For a year or two before 1786, there had been manifestations of a new poetic spirit, differing from that of the poetry of the 18th century as a whole, and more particularly from that of Darwin, Hayley, and the Della Cruscans, who represented the poetry of the 18th century in its latest and dying stage. Crabbe, for example, had published his 'Library' in 1781; and Cowper had made his first distinct appearance as a poet in 1782, when he was already in his fifty-second year. Crabbe's 'Village' was published in 1783, and Cowper first made an effective impression by the publication of his second volume, including his 'Task,' in 1785. Thus Rogers was heard of as a poet almost at the same time as Crabbe and Cowper. But more exactly contemporary with Rogers than either Crabbe or Cowper, was Robert Burns, the first edition of whose poems appeared in that very year, 1786, which saw Rogers's *début* as an author." In short, Rogers's first appearance as a poet coincides with the opening of that era in our literature in which we still are, and of which Rogers himself is one of the minor stars.

Shortly after his first publication, Rogers travelled in France, where he saw Condorcet and many other men afterwards celebrated in the French Revolution. He also visited Scotland, where he saw Adam Smith, Dr. Robertson, and other celebrities. In 1792 he published his 'Pleasures of Memory,' by which, and by a subsequent volume containing 'An Epistle to a Friend and other Poems,' published in 1798, he "established his place among the men of letters who adorned Great Britain in the closing decade of the last century." During the next fourteen years he gave nothing new to the world, either to increase or to mar his reputation. It was during this long interval of silence that he retired from his hereditary business as a banker (though with an income still derived from the bank, and with the nominal character of partner continued to him) to enjoy, by means of his ample wealth, a leisure absolutely at the command of his private tastes. "The house of Rogers in St. James's-place," it is said, "became a little paradise of the beautiful, where, amid pictures and other objects of art, collected with care and arranged with skill, the happy owner nestled in fastidious ease, and kept up among his contemporaries a character in which something of the Horace was blended with something of the Mæcenas." As he had known Fox, and Horne Tooke, and Dr. Price, and Dr. Priestley, and Lord Nelson, and others of the eminent men of the former generation, so now he gathered round his table the political and social, and literary and dramatic celebrities who had succeeded them—Wordsworth, Scott, Byron, Coleridge, Mackintosh, Southey, Wellington, Chantrey, &c., &c. His own political sentiments were those of moderate Whiggism, but this did not prevent men of all parties from being his guests.

In 1812, Rogers, when his muse seemed dead, added to a republication of his earlier poems, the fragment entitled 'Columbus.' He was then in his fiftieth year. In 1814 his 'Jacqueline' was published in conjunction with Byron's 'Lara,' this being the period of the height of the intimacy between the two so dissimilar poets. "Composed with the same laborious slowness, and polished line by line to the same degree of smoothness," says the writer of a sketch of his life, "his 'Human Life' appeared in 1819. Finally, as the last and much the longest of his productions, came his 'Italy,' the first part of which was published in 1822, in the poet's sixtieth year, and the complete edition of which, illustrated, under the author's care, at an expense of 10,000*l.* by Stothard, Prout, and Turner, did not appear till 1836. With the preparation of this exquisite book his literary career may be said to have closed. He still wrote an occasional copy of verses at the rate of a couplet a week; and some of these trifles, including one written as late as his ninety-first year, are preserved in his collected works. But on the whole it was in his character as a superannuated poet, living on the reputation of his past performances, drawing the artists and wits, and men of rank of a more modern age around him, and entertaining them with his caustic talk, and his reminiscences of the notable persons and events of former days, that he figured in a select portion of London society during the last twenty years of his existence." The longevity of the poet was, indeed, one of the sources of the public interest felt for him in his later life. Always fond of open air exercise and of going to public exhibitions, he might be seen strolling about in the parks, or in a stall or box at the opera, to within a few years of his death. An accident in the streets at last disabled him from walking out; but the extraordinary tenacity of his constitution enabled him to recover from it, when a younger man might have died. It was not till the 18th of December 1855, when he was in his ninety-third year, and had already for many years been the literary patriarch of his country, that he departed this life. Wordsworth and many others who had been born after him, and had attained old age under his view, had predeceased him, and left him alone among a generation of juniors.

Rogers will be remembered partly for his poetry, and partly from the peculiar connection in which he stood, in virtue both of his longevity and his social position and habits, with the miscellaneous phenomena, and especially with the art and literature of his time. His poetry is of the highly finished and tasteful rather than the powerful kind. "We have in his works," says a critic, "a classic and graceful beauty; no slovenly or obscure lines; fine cabinet pictures of soft and mellow lustre, and occasionally trains of thought and association that awaken or recall tender and heroic feelings." His relations to his time were less those of active influence than those of shrewd observation and interesting reminiscence. They are best exhibited in the volume of his 'Table Talk,' published since his death, by his friend Mr. Dyce.

ROMEINE. [Mineralogy, *S.* 1.]

ROSE-WOOD. [Triptolomea, *S.* 2.]

ROSITE. [Mineralogy, *S.* 1.]

ROSS, REAR-ADMIRAL SIR JOHN, Knight, was born June 24, 1777, at Balsarroch, Wigtownshire, Scotland. He was the fourth son of the Rev. Andrew Ross, of Balsarroch, minister of the parish of Inch. He entered the navy as a first-class volunteer November 11, 1786, on board the Pearl, 32 guns, and served in the Mediterranean till 1789. From November 7, 1790 till 1791, he served on board the Impregnable, 98 guns, in the English Channel. After being some years in the merchant-service he became, in September 1799, a midshipman on board the Weazel, sloop-of-war, which in that year formed part of the expedition to the coast of Holland. After having served on board several other king's ships, he received his commission as lieutenant, March 13, 1805. While attached to the Surinam, 18 guns, in 1806, he was severely wounded in four places in cutting out a Spanish vessel under the batteries of Bilbao, for which, in 1808, he was granted a pension of 98*l.* a year, increased in 1815 to 150*l.* He attained the rank of commander February 1, 1812, and was appointed to the Briseis, sloop-of-war, and afterwards to other vessels, till the termination of the war in 1815, during which period he performed several valuable services. He married his first wife in 1816.

In December 1817, while in command of the Driver, sloop-of-war, in Loch Ryan, on the coast of Scotland, he received a letter from Sir George Hope, one of the Lords of the Admiralty, informing him that two ships were to be sent out, to "ascertain the existence or non-existence of a north-west passage;" and inquiring whether he was disposed to undertake the command of the expedition. Having expressed his willingness to do so, he was directed to repair to London, where he arrived on the 30th of December. On the 15th of January 1818, he received his commission as commander of the Isabella, 385 tons, Lieutenant W. E. Parry being appointed to the command of the Alexander, 252 tons. The two ships departed from the Thames, April 25, 1818. They sailed up the eastern side of Davis's Strait and Baffin's Bay, and returned by the western side. They entered Lancaster Sound, and after proceeding some distance up it, Ross and the officer of the watch thought that they saw "land round the bottom of the Bay, forming a chain of mountains connected with those which extended along the north and south sides." The Alexander being a slow-sailing vessel, was a considerable distance behind the Isabella. Parry however and his officers could see no mountains, and were greatly surprised and disappointed when the Isabella turned her head eastwards, and gave the signal for the Alexander to follow the example. Ross named the supposed high land the Croker Mountains, and has laid them down in his chart as a continuous chain closing up the bottom of the supposed bay. This was a mistake, as Parry believed at the time, and as he proved the following year when he sailed through Lancaster Sound into Barrow's Strait. [Parry, Sir William Edward, *S.* 2.] The ships arrived in the Thames on the 14th of November, 1818. On the 7th of December, the same year, Ross was advanced to the rank of post-captain. In 1819 he published 'A Voyage of Discovery, made under the Orders of the Admiralty, in his Majesty's ship Isabella and Alexander, for the purpose of exploring Baffin's Bay, and enquiring into the Probability of a North-West Passage,' 2 vols. 8vo.

After the unsuccessful attempt of Captain Parry to reach the north pole, in 1827, Captain Ross submitted to the Lords of the Admiralty and to the Lord High Admiral the plan of another voyage of discovery to the Arctic seas. The government however did not undertake it; but after some delay a steam-ship was equipped at the expense of Mr. Felix Booth (afterwards Sir Felix Booth), then sheriff of London. The ship was named the Victory, and was fitted with an engine, invented and patented by Messrs. Braithwaite and Ericsson, which proved to be so bad as to be almost useless. Commander James Clark Ross, nephew of Captain Ross, was chosen as second in command. They had an attendant vessel of 16 tons burden, granted to them by the Admiralty, named the Krusenstern. The Victory, with its attendant, left the Thames May 24, 1829, and using partly her sails, and partly her "execrable machinery," as Ross calls it, entered Davis's Straits, July 5. Captain Ross expected to find a north-west passage through Prince Regent Inlet, which Parry had discovered, and in which one of his ships, the Fury, had been wrecked. The Victory and the Krusenstern entered the Inlet on the 12th of August, and on the following day discovered the wreck of the Fury. They afterwards took such of her stores as they required, passed farther down the Inlet, and on the 8th of October were frozen up in Felix Harbour, on the west side of the Gulf of Boothia. They were not released from the ice till the 17th of September 1830, and were able to advance but a very short distance before they were again frozen up on the 31st of October. On the 29th of August 1831, the Victory was again released from the ice, but on the 25th of September was forced by the pressure into another harbour. In April 1832 the sailors commenced carrying northwards two boats, with sledges and provisions, and on the 29th of May the vessels were finally abandoned. Captain Ross, in his journal, observes, "In the evening I took my own adieu of the Victory. It was the first vessel that I had ever been obliged to abandon, after having served in thirty-six, during a period of forty-two years." Some of the crew had died, and the rest were much weakened, but they struggled on till the 15th of August 1833, when the ice broke, and they were enabled to set sail in the boats. On the 26th of August, when near the entrance of Lancaster Sound, they came in sight of the Isabella, which was out on a whaling voyage. The mate in command of a boat that was sent to them, on Captain Ross asking him the name of the vessel, said it was the Isabella of Hull, once commanded by Captain Ross, "on which I stated that I was the identical man in question, and my people were the crew of the Victory." Unshaven as they all were, dirty, dressed in tattered skins, and wasted almost to the bones, the man doubted the statement, and said that Captain Ross had been dead two years. He was easily convinced of his error, and they were received on board the Isabella, with the yards and rigging manned, and with three hearty cheers. The Isabella arrived at Hull on the 18th of September, 1833, and on the 19th Captain Ross reached London by steamer.

While the ships were frozen up in the Gulf of Boothia, many journeys and surveys were made by Commander Ross, and some by Captain Ross himself, chiefly of the coasts and country which they named Boothia Felix. During one of these journeys Commander Ross discovered, June 1, 1831, a spot which he considered to be the north magnetic pole, 70° 5′ 17″ N. lat., 96° 46′ 45″ W. long., where the dipping needle indicated a dip of 89° 59′, or within one minute of the vertical.

On the 24th of December 1834, Captain Ross received the honour of knighthood, together with the companionship of the Bath. Many other honours and several rewards were conferred upon him. In 1835 he published a 'Narrative of a Second Voyage in Search of a North-West Passage, and of a Residence in the Arctic Regions during the years 1829, 1830, 1831, 1832, 1833, by Sir John Ross, C.B., &c., Captain in the Royal Navy, including the Reports of Commander (now Captain) James Clarke Ross, R.N., F.R.S., F.L.S., &c., and the Discovery of the Northern Magnetic Pole,' 4to, with Maps and Plates. In the same year was published an 'Appendix to the Narrative,' &c., also in 4to, chiefly consisting of accounts of the Esquimaux, and of the zoology, the meteorology, and similar matters. On the 8th of March, 1839, Sir John Ross was appointed consul at Stockholm, where he remained till February 1845. In 1850 he went out in search of Sir John Franklin, in a small vessel of 90 tons, named the Felix, and remained one winter in the ice. The government lent him no assistance, and early in 1855 he wrote a pamphlet, in which he complained of his own treatment, and blamed Sir John Richardson and others. The pamphlet is entitled 'A Narrative of the Circumstances and Causes which led to the Failure of the Searching Expeditions sent by government and others for the Rescue of Sir John Franklin,' 8vo.

Sir John Ross's first wife having died in 1822, he married a second, October 21, 1834. By his first wife he had issue one son, who is a magistrate at Cawnpoor in Hindustan. Sir John Ross is the author of 'Letters to Sea-Officers,' 'Memoirs and Correspondence of Admiral Lord de Saumarez,' a 'Treatise on Navigation by Steam,' and other smaller works. He attained the rank of Rear-Admiral July 8, 1851, and died in London. August 30, 1856.

ROSSIA, a genus of Cephalopodous *Mollusca*, named by Professor Owen in honour of Sir John Ross, who found one of the first specimens in the Arctic Seas. It belongs to the family *Teuthidæ*, and has a rounded or oval body, furnished on each side with a suborbicular fin; a large head, with eyes covered by an epidermic expansion, and pierced by a very small hole; arms ten, two tentacular and retractile, eight corneous, flexible, small, and sub-spatulate. There are five species, of which two are British, *R. macrosoma* and *R. Oweni*. These have been both taken in Ireland, and the latter also near Bonchurch, in the Isle of Wight.

ROTIFERA, Wheel-Animalcules, a class of animals placed by Ehrenberg among the *Infusoria*, under the name of *Rotatoria*. They have acquired these names on account of the apparent rotation of the disc-like organs which surround their mouths and which are covered by cilia. These creatures are very minute, and although some of the larger forms may be detected by the naked eye, their organisation can only be seen by the aid of the microscope. We are indebted to Leeuwenhoek for the discovery of their existence, and the first account of their structure and habits. In the 'Philosophical Transactions' for 1702, he gave an account of the discovery of what is now called *Rotifer vulgaris*, one of the most common forms of these animals. He afterwards described another form, *Melicerta ringens*.

Subsequent observers added to the discoveries of Leeuwenhoek, so that in 1824 Bory St. Vincent described 80 species. In 1838 Ehrenberg published his great work on the *Infusoria*, and there describes 189 species of *Rotifera* in 55 genera. Although classed by Ehrenberg with the *Polygastrica*, their organisation is much higher and more complicated, and the only claim they appear to have to be classed together is the fact of their minute size. [INFUSORIA.]

The *Rotifera* are very widely diffused on the surface of the earth. They inhabit both fresh-waters and the ocean, and are found in the cold, temperate, and tropical parts of the earth. Although capable of swimming freely, they are generally found near or attached to the leaves of plants. They are found constantly present in ponds and streams in which *Ceratophyllum*, *Callitriche*, *Valisneria*, and other fresh-water plants abound.

A curious point in their history, which first attracted the attention of Leeuwenhoek, is their power of retaining their vitality after having been more or less perfectly desiccated. This property is undoubtedly possessed by the ova of the lower animals, especially those which are called 'winter eggs;' but it does not appear to be very generally possessed by animals of an organisation as high as the *Rotifera*. Professor Owen states that he has observed the revivification of one of these wheel-animalcules after having been kept four years in dry sand.

The *Rotifera* have usually an elongated form, although some of them are nearly as broad as they are long. In most instances they are covered with a lorica or double envelope, the outer layer of which is often of a horny consistence. Some of them build for themselves a little case, or tube, in which they live, but this must not be confounded with their proper envelope. When the lorica is soft the animal has considerable power of elongating and contracting its body, as seen in *Rotifera vulgaris*. Many of the species are furnished with an elongated tail, which is often supplied with pincer-like organs, to enable them to remain stationary whilst feeding. Those which form tubes are usually fixed.

The rotatory organs, or wheels, are fleshy retractile lobes, covered with vibratile cilia, and are capable of being contracted or expanded. These organs are moved by means of a muscular system. Muscular bands are observed attached to the tegumentary system, and also to that part of the digestive system connected with the rotatory organs. The fibres of these muscles have been observed to present the striæ which are characteristic of voluntary muscles.

The digestive system consists of a mouth, jaws, frequently a dilatation which may be regarded as a stomach, and an intestinal tube which has an anal orifice. The jaws generally consist of two semicircular pieces, to which are attached one or more teeth, which act upon a central plate. The number of teeth varies, and also the form and character of the jaws in different species.

The *Rotifera* have no true circulating or respiratory organs, although Ehrenberg has described certain parts of their structure as such. In most of the species minute vessels can be seen, which terminate in blind sacs or cæca. In these cæcal branches a vibratile body exists, which keeps up a peculiar flickering movement, and it is to these bodies that Ehrenberg has given the name of 'gills.' This system of vessels is regarded by Mr. Huxley and other observers as a true aquiferous or water-vascular system. Connected with the respiratory apparatus, according to Ehrenberg, is an organ projecting from the under surface of the mouth, which he has called the 'calcar,' 'siphon,' or 'respiratory tube.' Ehrenberg describes it as a tube, and supposes currents to pass from it. It is connected with the nervous ganglion. Dujardin and Huxley have not observed either currents or an orifice in this organ.

All observers agree that the *Rotifera* possess a nervous system, which presents itself in the form of a pair of cephalic ganglia, from which proceed nervous filaments. The extent of the development of the nervous system is a subject for further inquiry. The red spots which Ehrenberg calls eyes are subject to considerable variations in appearance. Mr. Huxley says he observed them in young *Lacinulariæ*, but not in adult individuals.

The existence of sexes in a species of *Notommata* has been clearly made out by Mr. Brightwell of Norwich. The male however is much smaller and less developed than the female. All observers agree that the parts to which Ehrenberg has assigned the functions of male organs are not so. Certain caudate bodies have been described by Kölliker as *Spermatozoa*, but their nature is doubted by other observers. Mr. Huxley describes in *Lacinularia* certain "vacuolar thickenings," which he suggests have been previously mistaken for male organs, ganglia, &c. Ovarial organs are easily made out in most of the species. The ova are of two kinds. Mr. Huxley says in *Lacinularia* they consist, first, of bodies which resemble true ova in their origin and subsequent development, and which possess only a single vitellary membrane; second, of bodies half as large again as the foregoing, which resemble the ephippium of *Daphnia:* like it they have altogether three investments, and which do not resemble true ova either in their origin or subsequent development; which therefore probably do not require fecundation, and are thence to be considered as a mode of asexual reproduction. Professor Williamson has described very fully the development of the true ova in *Melicerta ringens*, from which it appears the young after they are hatched do not pass through any of those larval changes which are characteristic of animals both higher and lower in organisation. All the changes which take place occur in the ovum.

The position of the *Rotifera* in relation to the other forms of animal life has been the subject of much discussion. Dr. Grant was one of the earliest writers to take them out of the *Radiata*, and place them amongst *Articulata*. The relation of such forms as *Stephanoceros* to the Ciliobrachiate Polyps is very evident. In his 'Memoir on Lacinularia,' Mr. Huxley gives his reasons for regarding these creatures as permanent larva-forms of *Echinodermata*. After referring to the various forms of *Rotifera*, and their homologous organs, he thus concludes:—

"We may say, therefore, that the *Rotifera* are organised upon the plan of an Annelid larva, which loses its original symmetry by the unequal development of various regions, and especially by that of the principal ciliated circlet or trochal band; and it is curious to remark that, so far as the class of the *Rotifera* can be considered to be made out (approximately), the diœcious forms belong to the latter of the two modifications of the type which have been described, while the monœcious forms belong to the former.

"It is this circumstance which seems to me to throw so clear a light upon the position of the *Rotifera* in the animal series. In a Report in which I have endeavoured to harmonise the researches of Professor Müller upon the Echinoderms, 'Annals of Natural History,' 1851, I have shown that the same proposition holds good of the latter in their larval state, and hence I do not hesitate to draw the conclusion (which at first sounds somewhat startling) that the *Rotifera* are the permanent forms of Echinoderm larvæ, and hold the same relation to the Echinoderms that the Hydriform *Polypi* hold to the *Medusæ*, or that *Appendicularia* holds to the Ascidians.

"The larva of a *Sipunculus* might be taken for one of the *Rotifera;* that of *Ophiura* is essentially similar to *Stephanoceros;* that of Asterias resembles *Lacinularia* or *Melicerta*. The pre-trochal processes of the Asterid larvæ *Brachiolaria* are equivalent to those of *Brachionus*.

"Again, the larvæ of some Asterid forms and of *Comatula* are as much articulated as any *Rotifera*.

"It must, I think, have struck all who have studied the Echinoderms, that while their higher forms, such as *Echiurus* and *Sipunculus*, tend clearly towards the diœcious *Annelida*, the lower extremity of the series seemed to lead nowhither.

"Now, if the view I have propounded be correct, the *Rotifera* furnish this wanting link, and connect the Echinoderms with the *Nemertidæ* and Nematoid worms.

"At the same time it helps to justify that breaking up of the class *Radiata* of Cuvier, which I have ventured to propose elsewhere, by showing that the *Rotifera* are not 'radiate' animals, but present a modification of the Annulose type—belong, in fact, to what I have called the *Annuloida*, and form the lowest step of the Echinoderm division of that sub-kingdom."

Dr. Leydig, in a paper in the 'Zeitschrift für Wissenschaftliche Zoologie,' vol. vi., on the other hand, regards the relations of *Rotifera* as much more with the *Crustacea* than with the Worms. The points of resemblance to which he draws attention are:—

1. Their external figure and hard tegument, which more nearly resembles the carapace of the *Crustacea* than the rings of the *Articulata*.

2. Their muscular structure, which resembles that of many *Crustacea*.

3. Their nervous system resembles that of many *Entomostraca*, as *Daphnia*.

4. The alimentary canal resembles that of *Daphnia*.

5. The resemblance in the character of their ova, the *Entomostraca* having two kinds of ova, as the *Rotifera*.

6. The development of *Rotifera* and Entomostracous *Crustacea* correspond.

Leydig concludes a very able paper by proposing to call the *Rotifera* Ciliated Crustaceans.

With regard to the arrangement of the *Rotifera*, that of Ehrenberg, which is exceedingly defective, has been given under ROTATORIA. From the previous observations on structure it will be seen that this arrangement is open to many objections.

Dujardin, who was one of the earliest observers that pointed out the defects of Ehrenberg's arrangement, has proposed the following:—

Order I. *Systolides.*—Fixed by a pedicel.
  Family 1. Flosculariana.
  Family 2. Melicertians.

Order II. Swimming *Systolides.*
  Family 3. Brachionians.
  Family 4. Furcularians.
  Family 5. Albertians.

Order III. *Systolides.*—Alternately swimming and fixed.
  Family 6. Rotifers.

Order IV. Crawling *Systolides.*
  Family 7. Tardigrades.

Leydig has proposed an arrangement of his own, which is preferable to either of the above.

Ciliocrustacea.

Animals with a jointed body and a ciliary apparatus at the cephalic extremity. The nervous system consisting of a cerebral ganglion, and filaments radiating from it. Digestive and respiratory systems much developed. No heart or blood-vessels. Sexes separate. The female produces 'summer-ova' and 'winter-ova;' many undergoing metamorphosis.

A. Figure between clavate and cylindrical.

I. With elongated transversely-ringed attached Foot.
  1. *Floscularia proboscidea*, Ehrenberg: *F. ornata*, Ehr.; *F. appendiculata*, n. s.
  2. *Stephanoceros Eichhornii*, Ehr.; *S. glacialis*, Perty.
  3. *Œcistes crystallinas*, Ehr.
  4. *Conochilus volvox*, Ehr.
  5. *Lacinularia socialis*, Ehr.
  6. *Limnias ceratophylli*, Schrank.
  7. *Tubicolaria najas*, Ehr.
  8. *Melicerta ringens*, Schrank.

II. With elongated jointed Foot, retractile, like a telescope.
  1. *Callidina elegans*, Ehr.; var. *C. rosea*, Perty; *C. cornuta*, Perty.
  2. *Hydrias cornigera*, Ehr.
  3. *Typhlina viridis*, Ehr.
  4. *Rotifer vulgaris*, *R. citrinus*, *R. erythræus*, *R. macrurus*, *R. tardus*, Ehr.
  5. *Actinurus neptunius*, Ehr.
  6. *Monolabis conica*, Ehr.
  7. *Philodina erythrophthalma*, *P. roseola*, *P. macrostyla*, *P. citrina*, *P. aculeata*, *P. megalatrocha*, Ehr.

III. With elongated jointed non-retractile Foot.
  1. *Scaridium longicaudum*, Ehr.
  2. *Dinocharis Pocillum*, *D. tetractis*, *D. paupera*, Ehr.

IV. With a short Foot and long Pedal Forceps.
  1. *Notommata* (?), *N. tigris*, *N. longisetæ*, Ehr.
  2. *Monocerca rattus*, *M. bicornis*, *M. valga*, Ehr.
  3. *Furcularia gibba*, *F. Forficula*, *F. gracilis*, Ehr.
  4. *Microdon clavus*, Ehr.

V. With short Foot and Pedal Forceps, which are of equal length with or somewhat shorter or longer than the Foot.
  1. *Hydatina senta*, *H. brachydactyla*, Ehr.
  2. *Pleurotrocha gibba*, *P. constricta*, *P. leptura*, Ehr.
  3. *Furcularia Rheinhartii*, Ehr. (probably not a *Furcularia*, but a *Notommata*).
  4. *Notommata tuba*, *N. petromyzon*, *N. saccigera*, *N. copeus*, *N. centrura*, *N. brachyota*, *N. collaris*, *N. najas*, *N. aurita*, *N. gibba*, *N. ansata*, *N. decipiens*, *N. felis*, *N. parasita*, *N. tripus*, Ehr.; *N. tardigrada*, n. sp.; *N. vermicularis*, Duj.; *N. roseola*, *N. onisciformis*, Perty.
  5. *Lindia torulosa*, Duj.
  6. *Synchæta pectinata*, *S. baltica*, *S. oblonga*, *S. tremula*, Ehr.
  7. *Diglena grandis*, *D. forcipata*, *D. aurita*, *D.*

catelina, D. conara, D. capitata, D. caudata, Ehr.

8. *Rattalus lunaris*, Ehr.
9. *Distemma forficula, D. setigerum, D. marinum, D. forcipatum*, Ehr.
10. *Triophthalmus dorsalis*, Ehr.
11. *Eospora najas, E. digitata, E. elongata*, Ehr.
12. *Cyclogena lupus, C. elegans*, Ehr.
13. *Theorus vernalis, T. uncinatus*, Ehr

Note.—Ehrenberg's genus, *Enteroplea hydatina*, is the male of *Hydatina senta;* and his *Notommata granularis* stands in the same relation to *Notommata brachionus*, which latter genus however is placed far more correctly under the genus *Brachionus* than under *Notommata*. *Diglena granularis*, Weisse, lastly, is the male of *D. catellina*, Ehr.

VI. Without Foot.

1. *Albertia.*

Includes the *A. vermiculus*, found by Dujardin in the abdominal cavity of the Earthworm, and in the intestine of the *Limacina;* and *A. crystallina*, discovered by Schultze in the intestine of *Nais littoralis*.

B. Figure sacciform.

I. Foot short.

1. *Notommata clavalata, N. myrmeleo, N. syrinx*, Ehr.
2. *Diglena lacustris*, Ehr.

II. Foot absent.

1. *Notommata Anglica*, Dalrymple; *N. Sieboldii*, n. sp.
2. *Polyarthra platyptera*, Ehr.
3. *Triarthra longiseta, T. mystacina*, Ehr.
4. *Ascomorpha heloetica*, Perty; *A. Germanica*, n. sp.

C. Figure compressed.

a. Depressed from above downwards.

I. With a foot.

1. *Euchlanis triquetra, E. Hornemanni, E. luna, E. macrura, E. dilatata, E. Lynceus*, Ehr.; *E. emisetata*, n. sp.; *E. bicarinata*, n. sp. (*E. bicarinata*, Perty, I consider a *Salpina*.)
2. *Lepadella ovalis, L. emarginata, L. salpina*, Ehr.
3. *Monostyla cornuta, M. quadridentata, M. lunaris, M. carinata*, Ehr.
4. *Metopidia lepadella, M. acuminata, M. triptera*, Ehr.
5. *Stephanops lamellaris, S. muticus, S. cirratus*, Ehr. (Dujardin declares that *S. muticus* is *Lepadella ovalis*.)
6. *Squamella bractea, S. oblonga*, Ehr.
7. *Notogonia Ehrenbergii*, Perty.
8. *Noteus quadricornis*, Ehr.
9. *Brachionus pala, B. amphiceros, B. urceolaris, B. rubeus, B. Mülleri, B. brevispinus, B. Bakeri, B. polyacanthus, B. militaris*, Ehr.
10. *Pterodina patina, P. elliptica, P. clypeata*, Ehr.

11. Foot absent.

1. *Anurea quadridentata, A. squamula, A. falculata, A. curvicornis, A. biremis, A. striata, A. inermis, A. acuminata, A. foliacea, A. stipitata, A. testudo, A. serrulata, A. aculeata, A. valga*, Ehr.

β. Laterally compressed.

1. *Salpina mucronata, S. spinigera, S. ventralis, S. redunca, S. brevispina, S. bicarinata*, Ehr.
2. *Mastigocerca carinata*, Ehr.
3. *Monura colurus, M. dulcis*, Ehr.
4. *Colurus uncinatus, C. bicuspidatus, C. caudatus, C. deflexus*, Ehr.

(Leeuwenhoek, *Philosophical Transactions*, 1701-4; Baker, *Employment of the Microscope*, 1753; Bory St. Vincent, *Dictionnaire Classique d'Histoire Naturelle*, art. *Rotifères*, 1824; Ehrenberg, *Infusionsthierchen*, 1838; Pritchard, *Infusorial Animalcules;* Doyere, *Memoire sur les Tardigrades*, in *Ann. des Sc. Nat.*, 1842; Owen, *Lectures on Comparative Anatomy*, 1843; Grant, *Outlines of Comparative Anatomy*, 1843; T. Rymer Jones, *A General Outline of the Animal Kingdom*, 1841; Dujardin, *Histoire Naturelle des Zoophytes Infusoires*, 1843; Mantell, *Thoughts on Animalcules*, 1846; Lankester, *Cyclopædia of Anatomy and Physiology*, art. *Rotifera*, 1848; Dalrymple, *Description of an Infusory Animalcule allied to the Genus Notommata of Ehrenberg, hitherto undescribed*, 1849; Brightwell, *On a Diœcious Rotifer*, in *Annals of Natural History*, 1848; Gosse, *On the Anatomy of Notommata aurita*, in *Transactions of Microscopical Society*, 1851; Huxley, *On Lacinularia socialis*, in *Transactions of Microscopical Society*, 1851; Williamson, *On the Anatomy of Melicerta ringens*, in *Quarterly Microscopical Journal*, vol. i.; Gosse, *On the Habits of Melicerta ringens*, in *Quarterly Microscopical Journal*, vol. i.; Leydig, *On Rotifera*, translated in *Quarterly Microscopical Journal*, vol. iii.)

ROUTH, REV. MARTIN JOSEPH, D.D., was born September 15, 1755, at South Elmham, near Beccles, in Suffolk. His father was the Rev. Peter Routh, who was rector of South Elmham from 1753 to 1764, when he resigned it for Beccles. In 1774 he became master of Beccles grammar-school. Martin Joseph Routh, after having been educated under his father, matriculated as a battler at Queen's College, Oxford, May 31, 1770, but in July, 1771, was elected a demy of the college of St. Mary Magdalen. Having taken his degree of B.A., he became a Fellow in July, 1776, and on the 23rd of October, in the same year, took his degree of M.A. In 1781 he was appointed college librarian; in 1783 he was elected senior proctor of the university, and in 1784 junior dean of arts. He proceeded B.D. July 15, 1786, and in 1789 was appointed one of the college bursars. He was elected president of Magdalen College April 11, 1791, on the resignation of Dr. Horne, bishop of Norwich.

Dr. Routh's first literary publication was an edition of the Enthydemus and Gorgias of Plato, 'Platonis Enthydemus et Gorgias, recensuit, vertit, Notasque suas adjecit Martinus Josephus Routh, A.M., Collegii D. Mariæ Magd. Oxon. Socius,' 8vo, 1784.

Having taken his degree of D.D., Dr. Routh in 1810 became rector of Tylehurst, near Reading, in Berkshire, whither he used to retire occasionally for the benefit of his health, and to enjoy the vacation allowed him by the statutes of his college. In 1814 he published the first two volumes of his 'Reliquiæ Sacræ; sive Auctorum jam Perditorum Secundi Tertiique Seculi post Christum natum quæ supersunt,' 8vo. The third volume was published in 1815. In 1820 he married Eliza-Agnes, daughter of J. Blagrave, Esq., of Chalcot Park, near Tylehurst. In 1823 he edited Bishop Burnet's 'History of his Own Times.' In 1832 he published 'Scriptorum Ecclesiasticorum Opuscula,' 8vo, and a second edition in 1840. In 1833 he published an improved edition of Burnet's 'History of his Own Times.' In 1846 appeared four volumes of a new edition of the 'Reliquiæ Sacræ,' to which he added a fifth volume in 1848. He died December 22, 1854, at the age of ninety-nine, and was buried in the vault of the chapel of Magdalen College.

ROYLE, JOHN FORBES, M.D., a distinguished botanist, was educated for the medical profession, and was a pupil of the late Dr. Anthony Todd Thomson, from whom he acquired that love of botany and taste for materia medica for which he was afterwards so distinguished. After passing the usual medical examinations in England, he entered the service of the East India Company. In Hindustan he worked with great diligence in the collection of plants, and especially in acquiring a knowledge of their medical properties and history. He wrote a work 'On the Antiquity of Hindoo Medicine,' in which he included a great amount of valuable information on the subject of the practice of medicine amongst the Hindoos. Having spent a large portion of his time in the Himalayas, where he was superintendent of the East India Company's botanic garden at Saharunpoor, he was enabled to form a large collection of plants, and to make observations on other departments of natural history. On his return to England he published his great work, entitled 'Illustrations of the Botany and other Branches of the Natural History of the Himalaya Mountains.' This work, which appeared in parts, was commenced in 1839, and finished in two volumes 4to. It contained a large amount of valuable information on the natural products of India, especially those which are useful in medicine and the arts. Although Dr. Royle did not practise medicine, his knowledge of drugs and their uses pointed him out as a fit and proper person for the chair of Lecturer on Materia Medica at King's College, London, a position he occupied till the year 1856. The results of his experience in this department of knowledge were given in a volume entitled a 'Manual of Materia Medica,' which has been since the time of its publication a text-book in medical schools. Dr. Royle's botanical knowledge was often employed on the productive resources of

India. He several times read papers on the cultivation of tea and cotton in India at the meetings of the British Association for the Advancement of Science. His activity at those meetings led to his appointment for a short time as co-secretary with General Sabine of that association. In 1840 he published an 'Essay on the Productive Resources of India.' In 1855 he also published a volume on 'The Fibrous Plants of India,' pointing out those which could be made more especially available for the manufactures of Great Britain. He took an active part in the Great Exhibition of 1851, especially in arranging the East Indian department. He was a Fellow of the Royal and Linnæan societies, and held an appointment in London in connection with the East India Company. He died January 2, 1858, at his residence, Heathfield Lodge, Middlesex.

RUABON. [Denbighshire.]

RUBELLAN. [Mineralogy, *S.* 1.]

RUBIANA. [Chemistry, *S.* 2.]

RUBINIC ACID. [Chemistry, *S.* 2.]

RUE. [Ruta.]

RUFF. [Scolopacidæ.]

RUGELEY. [Staffordshire.]

RUSSIA. The following table, giving the popular divisions, area, and population of the Russian Empire, is taken from the Baron de Haxthausen's recent work on Russia:—

Divisions.	Area in Square Miles.	Population.	
		1846.	1852.
Great Russia	328,781	19,220,900	20,403,371
Little Russia	150,141	11,093,400	11,775,865
New Russia	96,636	3,070.700	3,259,612
White Russia	70,399	2,767,200	2,937,436
Western Provinces	47,076	2,704.300	2,870,667
Baltic Provinces	36,616	1,659,800	1,761,907
Northern Provinces	536,226	1,338,300	1,420,629
Ural Provinces	447,788	10.146,000	10,770,181
Cossak Districts	123,776	1,089,700	1,156,736
Poland	49.230	4,857,700	5,156,543
Finland	135,808	1,412,315	1,499,199
Total in Europe	2,022,477	59,360,315	63,012,146
Caucasian Provinces	86,578	2,850,000	
Western Siberia	2,681,147	3,500,000	
Eastern Siberia	2,122,000	237,000	
American Russia	371,350	61,000	
Total out of Europe	5,261,075	6,648,000	6,648,000
Totals	7,283,552	66,008,315	69,660,146

In respect to race, the Baron gives the following approximations in round numbers:—

1. Slavonic races—Russians, 49,000,000; Poles, 6,500,000; Lithuanians and Lettes, 2,000,000; Bulgarians and Illyrians, 500,000: total, 58,000,000.

2. Other races—Germans, 650,000; Dacian Romans (Wallachs), 750,000; Tschudes, 3,400,000; Tartars, 2,150,000; Mongols, 250,000; Munshus, 100,000; Hyperboreans, 200,000; Caucasian tribes, 2,750,000; Greeks, 70,000; Jews, 1,600,000; Gipsies, 30,800; Miscellaneous, 50,000: total, 12,000,000.

The revenues of Russia, of which we have no recent return, amount to about 350,000,000 silver rubles, of which 45,300,097 silver rubles were derived from the domains of the crown. The debt in January, 1856, amounted to 1,042,455,179 silver rubles. (The value of the silver ruble is about 3*s.* 4*d.*)

The state of the army and navy of Russia, in the year 1857, is given in the article Military and Naval Forces, *S.* 2.

RUSTSCHUK, a fortified town in Bulgaria, capital of an eyalet in European Turkey, is situated near the right bank of the Danube, about 40 feet above the level of the river, 40 miles S. from Bukharest, and has a population variously estimated at from 20,000 to 40,000. The Danube opposite Rustschuk is nearly two miles wide, but its surface is broken by a number of islets and shallows, and the banks are low. From a distance Rustschuk has an agreeable appearance, with its white chimneys and graceful minarets, rising up from among the foliage of extensive orchards. This impression however is removed by a view of the interior, which presents dirty ill-paved streets, flanked by low wooden houses, most of which stand in little courts or gardens. The Pasha's konak, or palace, and the mosques, are the only buildings worth notice. The town has baths, a bazaar, and about 3000 houses; it has also some trade with Vienna in cloth, indigo, corn, wine, &c. A harbour for river craft is formed below the town by a small recess of the river, which is sheltered towards the north-east by a cape crowned by a bastioned citadel. Rustschuk is commanded by heights to the south-west, on which five detached bastioned earth-works have been recently thrown up. The town itself is surrounded by an earthen rampart, which presents eight bastioned fronts, revetted half-way up with masonry, and surrounded by a moat and counterscarp. The front towards the river is irregularly fortified. The Russians took Rustschuk after enormous losses of men in 1811; it opened its gates to them in the invasion of 1828. The fortified enceinte of Rustschuk measures four miles. On the left or Wallachian bank of the Danube, opposite to Rustschuk, is *Giurgevo*, which was originally the fortified tête-de-pont to Rustschuk. Its defences were razed in carrying out the treaty of Adrianople, but have been since repaired. A ferry connects the two places. A tall clock-tower stands in the principal square. One of the islands in the Danube is fortified. A pentagonal fort built with stone defends the harbour. Beyond this fort the town of Giurgevo is built; its enceinte presents a semicircle towards Wallachia. Giurgevo trades with Austria in the produce of the country, and has about 7000 inhabitants. In the wars between Russia and Turkey, Giurgevo has been frequently the scene of hard fighting between the two nations. The Russians took it in 1711, and completely defeated the Turks in the vicinity the same year; they took it again in 1810. The Russians occupied Giurgevo in 1854, and were defeated by the Turks under its walls on July 7 of that year.

RUTHEN. [Denbighshire.]

RYDE. [Wight, Isle of.]

S

SABADILLENA. [Chemistry, *S.* 1.]

SACCHARIC ACID. [Chemistry, *S.* 1.]

SACCHARITE, a Mineral resembling granular felspar, of a greenish-white colour, and with the constitution of *Leucite*. It is found in Silesia.

SACCHULMIC ACID, SACCHULMIN. [Chemistry, *S.* 1.]

SACLACTIC ACID. [Chemistry, *S.* 1, under *Mucic Acid*.]

SACRAMENTO CITY, the capital of Sacramento County, State of California, United States of North America, is situated on the left bank of Sacramento River, at the confluence of American Fork, in 38° 34′ N. lat., 121° 40′ W. long., about 150 miles N.E. from San Francisco. The city was founded in the spring of 1849; in 1850 it contained 6820 inhabitants, of whom only 474 were females; and at the State Census in 1852 the population was above 10,000.

Sacramento City owes its origin to the discovery of gold, which gave so remarkable an impetus to California generally. It was on the south branch of American Fork, about 50 miles from Sacramento City, that gold was first discovered. The growth of the city was, from its foundation, remarkably rapid. In April 1849 there were only four houses on the site; in the following year it was a large and regularly laid-out town of nearly 7000 inhabitants. The city stands in the midst of a fine farming country, and about 30 miles from the commencement of the gold diggings. Occupying a low site, it has been found necessary, in order to protect it from inundations, to which it is liable in the rainy season, to construct a levee along the bank of the river. The streets of the city cross each other at right angles; those running east and west are designated by the letters of the alphabet, and those running north and south by the numerals. Many of the streets are lined with oak and sycamore trees, some of large size, imparting a considerable degree of picturesqueness to their general appearance. The city contains Episcopalian, Presbyterian, Methodist, Baptist, Roman Catholic, and other churches, schools, numerous stores, above 150 eating saloons and hotels (some of which are of a very costly and splendid character), several steam-mills, and a few manufactories. Like San Francisco, Sacramento City has suffered severely from several very destructive fires; but the parts of the city which were destroyed have always been quickly rebuilt, and generally in an improved style. Several daily and weekly newspapers are published here. Regular daily communication is maintained with San Francisco by steam-boats.

SADDLEWORTH. [Yorkshire.]

SAGUINUS. [Sagouin.]

SAGUS, or **SAGUERUS**, a genus of Plants belonging to the family of Palms. The leaves are pinnated; the flowers monœcious; the spadix branched, without any common spathe, but with numerous partial ones; the fruit hard, shining, its surface divided into numerous rhomboidal spaces. The species are natives of the islands of the Indian Archipelago, and yield sago.

S. lævis, the true Sago-Palm, has the petioles and spathes unarmed. This palm furnishes most of the sago sent to Europe.

S. Rumphii has the petioles and spathes guarded by strong prickles. According to Martin, the sago yielded by this plant is used principally in India, and seldom exported.

SAINT-ARNAUD, MARÉCHAL LEROY DE, was born in Paris, of poor parents, on the 20th of August 1798. Having entered the Royal Body-Guards at the age of sixteen, he rose to the rank of sub-lieutenant in the infantry of the line in 1818. Owing to some youthful vagaries, he left the army shortly after, and embraced the theatrical profession, when he first performed at the suburban Théatre des Batignolles. In this new vocation he continued upwards of ten years, but the revolution of July revived his taste for martial life; he returned to the army in 1831, and having entered the 64th regiment as sub-lieutenant, was made full lieutenant within six weeks. The insurrection of the partisans of the Duchesse de Berri, in La Vendée, soon afforded him an opportunity of earning the favourable notice of Marshal Bugeaud. He was subsequently appointed to the charge of the citadel of St. Blaye, where the Duchesse de Berri was confined—a post in itself, from the circumstances, somewhat painful to an honourable man, and his conduct in it incurred for him considerable odium.

In 1836 Saint-Arnaud was sent to join the army in Algiers, with the rank of captain; he behaved with much gallantry at the siege of Constantina, and received the decoration of the Legion of Honour. The brilliant courage he displayed in these campaigns obtained for him the rank of commandant of the 18th regiment of infantry in 1840, but his erratic disposition induced him to quit it to enter the Zouaves the same year. In 1842 he was created lieutenant-colonel; and in 1844, on the recommendation of Bugeaud, he became colonel of the 32nd regiment. During the next three years he was constantly in the field; his reputation increased, and he was made major-general in 1847. In 1850 he was appointed to command the province of Constantina, which was then in a very unsettled state; but he subdued the whole country within the year. In the early part of 1851 General Saint-Arnaud was despatched on an expedition against the Kabyles, which was entirely successful, and was considered one of the most brilliant campaigns of the French in Algeria. His little army did not amount to 7000 men, and with this he overran that rugged country, and in spite of a desperate resistance he conquered the whole province. This was the service which fixed upon him the attention of the President of the French Republic.

Saint-Arnaud returned to Paris in the autumn of 1851, as general of division. Louis Napoleon at once took him into his confidence, giving him the command of the second division of the army of Paris immediately after his arrival, and then appointing him minister of war. He acted cordially with the Prince-President: "Nothing," he wrote to his mother, November 19, 1851—"nothing in this world is wanting, but to go straight forward and be bold." In the famous coup d'état of the 2nd of December following he was the President's chief adviser and instrument. Honours now accumulated upon him: he was made marshal of France, then a senator, and received the grand cross of the Legion of Honour in 1852. His health had gradually declined under so harassing a life; yet he so strongly solicited the command of the French army intended for the east, at the outbreak of the war with Russia, that his request was granted. The events of that war are so well known that we need not dwell upon them. It will be enough to say that Marshal Saint-Arnaud entered upon it with the utmost eagerness. He evidently felt that a splendid chance was afforded of professional distinction. For a time his impetuosity enabled him to bear up under his constantly-increasing malady. The landing in the Crimea, which he calls his "favourite idea," he tried to the utmost to hasten forward; and fearing at last that his life was ebbing, he insisted on forward movements, regardless of the opinions of his colleagues. On the morning of September 20, 1854, Marshal Saint-Arnaud mounted his horse with great difficulty, and by the constant exercise of great spirit sustained all the fatigues of command during the battle of the Alma. He exhibited the same energy in his despatch after the victory, but the intensity of his feelings is only fully seen in his letters to his wife, published in the collection referred to below. But the effort proved too much for his remaining strength: his malady increased daily, and on the 27th he was obliged to embark on board the Berthollet to return to Constantinople. He died on the 29th of September, 1854, whilst yet on his passage.

The career of Marshal Saint-Arnaud, almost up to the outbreak of the Russian war, shows him too much in the light of a daring and not very scrupulous adventurer; and he did not live long enough, when a nobler field was opened to his ambition, to show whether he possessed the abilities of a great general. But while in his last days, as in his earlier, he exhibited the most brilliant and dashing courage, combined with judgment and energy, devotion to his duty was never so strongly evinced as at the close of his career. Two volumes of his private letters have been published by his brother, 'Lettres du Maréchal de St.-Arnaud,' Paris, 1855, which, though exhibiting many suppressions, give much curious information respecting the last twenty-five years of his remarkable career.

SAINT HYACINTHE. [Canada, *S.* 2.]

SALICARIA, a genus of Birds belonging to the family *Sylviadæ*, and separated by Mr. Selby from the genera *Locustella* and *Sylvia*. "The rounded form of the tail," says Mr. Yarrell, "the outer feathers being much shorter than those in the middle, and the partiality of these birds to moist situations, particularly conspicuous in the Sedge and the Reed Warblers, appear to separate them from the Sylvan Warblers." There are four British species of this genus.

S. locustella, the Grasshopper Warbler, is so called from its very peculiar and almost incessant cricket-like note. It comes to this country from the south, and appears about the middle of April, and departs in September. It is a shy bird, keeping at the bottom of a hedge, and creeping along more like a mouse than a bird. It feeds on small snails, slugs, and insects.

S. phragmites, the Sedge-Warbler, Sedge-Bird, is found during the summer in thick patches of reeds or willows, in marshes, or on the low sides of rivers, or on islands. Like the last, it is a summer visitor, arriving in April and leaving in September. White of Selbourne first observed its power of imitating the notes of other birds, as well as of its occasionally singing at night. It measures 4¾ inches, and is somewhat a less bird than the last.

S. luscinoides, Savi's Warbler, Willow Locustella. It is a rare bird in this country, but like the group to which it belongs, it frequents moist and shaded situations, among reeds and bushes, near water.

S. arundinacea, the Reed-Warbler, the Night-Warbler, the Reed-Wren. It is always found in company with the Sedge-Warbler, but is not so numerous in this country as that bird. It arrives here in April and departs in September. It sings usually in the day, but sometimes at night. "The character of the beak, the entire absence of the buffy white stripe over the ear-coverts, and the uniform colour of the whole of the upper surface of the body of this bird, distinguish it from either the Grasshopper-Warbler or the Sedge-Warbler, with both of which however it has many habits in common." [Sylviadæ.]

(Yarrell, *History of British Birds.*)

SALICIN. [Chemistry, *S.* 1.]

SALOP. [Shropshire.]

SALSIFY. [Tragopogon.]

SALTA, the most northern of the provinces of the Argentine Confederation, South America, extends between 22° and 26° 30′ S. lat., 61° and 68′ W. long. It is bounded S. by the province of Tucuman, E. by the Gran Chaco, N. and W. by the republic of Bolivia. The area is about 56,000 square miles; the population is about 60,000. It has been described generally under Plata, La, and we therefore only add the following more recent information.

The country possesses a remarkable variety of soil, and a climate ranging from extreme heat to the most intense cold, permitting the cultivation of almost every kind of natural production. But the country is too thinly peopled, the difficulties of transit are too great, and the inhabitants have too little energy and industry to allow the resources of the country to be other than most imperfectly developed, if even the country itself were in a less disturbed state. The inhabitants are now chiefly settled in the larger towns, and in the valleys of the lesser affluents of the Vermejo and Salado. The cereals grown are wheat and maize, which are raised in considerable quantities in the valleys of the south, for the supply of the other parts of the province. The vine is extensively cultivated in the same district, and a good deal of common wine made and exported to the neighbouring provinces. The cocoa plant is cultivated in the department of Oran. In the valleys of the Jujuy and its tributaries tobacco and the sugar-cane are grown in sufficient quantities to supply the whole of Salta, and to furnish exports to the rest of the upper provinces, and also to Chili. Cotton and indigo are also cultivated to some extent; and the cochineal insect furnishes a source of profit. Along the valley of the Vermejo there are very extensive forests of valuable timber-trees, as well as the palm, the carob, and other trees which furnish the natives with fruit and a substitute for bread, the maté plant, &c. The cochineal cactus and the aloe are found in every direction. One of the chief sources of wealth to the province has always been the rearing of mules, which are bought in the southern provinces in a very lean state, acquire strength in the rich pastures of Salta, and are sent to Peru and Bolivia in large numbers. Before the revolution from 50,000 to 60,000 mules were annually exported from Salta to Peru alone, but the trade with Peru has greatly declined. In the colder parts of the province alpacas, vicuñas, chinchillas, and guanacos are indigenous. The mountains contain gold, silver, copper, and other metals. The mines have not proved very successful; but the inhabitants of the valleys obtain considerable quantities of gold, after the rains, from the rivers, and in the alluvial soil which has been left by the receding waters. In the desolate country known as the Desplobado are extensive saline plains, from which the inhabitants of the adjacent districts obtain large quantities of salt, which they carry for sale to the towns of Salta and Jujuy.

Like the other provinces of the Argentine Confederation, Salta is a federal state, owning however little more than nominal dependence upon the central government. The executive power is vested in a governor elected by the junta or provincial assembly.

Salta, the capital of the province, is situated on the left bank of the Sileta, in the valley of Chicuana, in 24° 51′ S. lat., 64° 48′ W. long. Population about 8000. The streets are regular, but narrow. In the central square are the government-house, the cathedral, and other public buildings. *Jujuy* is built in an extensive basin, surrounded by high mountains, on the banks of the Rio de Jujuy. Population about 3000. It has some traffic, as the carriage-road leading to Bolivia terminates here, and the goods must be transported farther north on mules. At Jujuy begins one of the most extraordinary mountain-passes in the world. A narrow valley extends from the town to the summit of the range called Abra de Cortaderas, a distance of 90 miles by the road. The highest summit of this road appears to have an elevation of between 11,000 and 12,000 feet. ***Oran*** is a small town, founded in 1793, on the Rio de Tarija, about 30 miles above its junction with the Rio de Jujuy. As the centre of a very fertile district, Oran is a place of considerable trade.

SALTATORES. [Araneidæ, *S.* 2.]

SALVANDY, NARCISSE-ACHILLE, COUNT DE, was born at Condom, in the department of Gers, June 11, 1795, but was sent to Paris in early youth, and educated at the Lycée Napoleon. He enlisted as a volunteer in 1812, and served with so much distinction during the campaigns of 1813-14, that on the 6th of April, 1814, the emperor bestowed upon him, with his own hands, the decoration of the Legion of Honour.

After the restoration of the Bourbons, in 1814, M. de Salvandy was made an officer of the royal household, and in March 1815, attended Louis XVIII. to the frontiers. About this time, in his twentieth year, he began that long series of argumentative pamphlets, for which he afterwards became so celebrated, by the publication of two brochures, one called 'Mémoire sur les Griefs et les Vœux de la France,' the other 'Observations sur le Champ de Mai.' In 1816 he brought out 'La Coalition et la France,' in which he displayed considerable talent. It produced a great sensation in more than one court.

In 1819 he became a member of the conseil d'état, holding the office of Maître des Requêtes. But he was incapable of submission to any control. The measure presented by M. Barthélémi, on the 'Loi des Electeurs,' appeared to him an organic change unfavourable to the constituency; he therefore published his 'Vues Politiques,' in which, regardless of place and emoluments, he fully described the nature of political parties, their power, influence, and objects. This act of independence was followed by several others, as the restored family seemed to advance in their system of aggression upon public liberty, until the startling pamphlet 'Sur les Dangers de la Situation présente,' produced a rupture between him and the ministry.

In 1824 M. de Salvandy went to Spain, and shortly afterwards married Mademoiselle Oberkampf. The result of this journey was a work of more than usual length, 'Don Alonzo, ou L'Espagne,' comprising a full account of the Peninsula, and its various political changes. It was in the course of the same year, 1824, that he began to write his well-known articles in the 'Journal des Débats,' the most conspicuous of which at that period were entitled 'Les Funérailles de Louis XVIII.,' and 'Le Nouveau Règne et l'Ancien Ministère,' recommending a course of constitutional policy to Charles X. Like Châteaubriand, Armand Carrel, and other independent political writers, he steered a middle course between the opposite parties, and flattered neither of them. Ever constant to his principles, and equally averse to arbitrary rule and anarchical divisions, he maintained for forty-two years the same moderate opinions of equity and justice. In all his writings he took for his basis the maxim—there is no security for France but in constitutional monarchy. His style is energetic, and his arguments are expressed in warm language; yet he never abandons the fundamental principle; notwithstanding the strong measures adopted by the French government to embarrass him, especially by the revival of the 'censure.'

In 1827, during the short liberal ministry of M. de Martignac, M. de Salvandy was created Conseiller d'Etat, on which occasion Charles X. said to him: "You must admit that you have sometimes gone a little too far." But when the Polignac cabinet was formed, in 1829, he resigned immediately.

From 1830 to 1848, during the whole reign of Louis Philippe, M. de Salvandy continued to publish his separate pamphlets, and his articles in the 'Journal des Débats.' Amongst these few have been more admired than his 'Seize Mois; ou la Révolution de 1830 et les Révolutionnaires.' M. de Salvandy became a deputé in 1832, when he observed the same course of moderate and liberal policy as in his writings. He was more than once called to fill some of the highest ministerial offices of state, during the reign of the Citizen King. He likewise became a member of the French academy, and was created a count. After the coup d'état, in December 1851, he withdrew, like most of his eminent fellow-countrymen, into comparative retirement. He died December 15, 1856, at the age of sixty-one.

SAN DIEGO. [CALIFORNIA, *S.* 2.]

SAN FRANCISCO, a city, port of entry, and the capital of San Francisco county, State of California, United States of North America, is situated on a narrow neck of land forming the southern side of the entrance to San Francisco Bay, and between that bay and the Pacific Ocean, in 37° 47′ N. lat., 122° 26′ W. long. The population, which was only 150 in 1845, was omitted from the Census of the United States in 1850; but in 1852 it was, according to the State Census, 34,776, of whom only 5245 were females. The government of the city is vested in a mayor, recorder, aldermen, county assessors, street commissioners, &c.

The sudden rise of the present city of San Francisco, is perhaps the most remarkable on record. But the place is not devoid of interest in other respects, being one of the earliest settlements of the old Spaniards for the charitable purpose of converting the Indians to Christianity. Their fort, or stronghold, called the Presidio, was fixed near the entrance of the bay, on the southern shore, about half a mile inland. It was a square inclosure, the sides of which were about 300 yards in length, surrounded by a mud wall about 15 feet high, pierced for musketry. Against the inner sides of the walls were the dwellings of the settlers, the centre being left clear for exercise and military evolutions. The walls are now in ruins. From this primary settlement, which was termed the Mission Dolores, emanated the five following missions, which were established in various parts of the adjacent country under the protection of the Presidio:—San Francisco, founded in 1776; Santa Clara, 1777; San José, 1797; San Francisco Solano, 1823; San Rafael, 1827.

The town, which arose in connection with the mission of San Francisco, was called Yerba Buena, or Good Herb, from a plant used as a beverage, and also as a medicine, which grew abundantly in the vicinity. From its foundation the mission continued in a very flourishing condition till about 1831, when in the political disturbances which distracted Mexico, the Indians were driven away from Yerba Buena, and the settlement soon fell to ruin. In 1839 the site was regularly laid out as a town, which, however, six years later, as already mentioned, only contained 150 inhabitants. But about this time it began to attract the attention of adventurers from the United States, and soon became in effect an American settlement, though still nominally belonging to Mexico: it was not formally ceded to the United States till 1848. A local government was established, similar to that which prevails in the towns of the United States; an American school was founded, and in January, 1847, an 'ordinance' was issued by the town council directing that the name of the town should henceforth be San Francisco, instead of Yerba Buena. Towards the end of 1847 the first discovery of gold was made, and soon after San Francisco, the port of California, experienced the most extraordinary influx of adventurers ever heard of, accompanied by an unparalleled rise in the cost of provisions and the value of property. The remarkable scenes which were subsequently witnessed in the town, or city as it had now come to be designated, its rapid extension in every direction, the reckless habits and almost extravagant energy of the strangely diversified population, are too familiar to need more than a word of reference. Nor less well known are the terrible conflagrations which have so often laid large portions of the city in ruins, to be however restored with surprising rapidity to far more than its previous condition, the opportunity afforded by every fire being seized upon to rebuild the destroyed places on a larger, more costly, and substantial scale.

The magnificent bay of San Francisco, on which the city stands is described under CALIFORNIA, *S.* 2. The city is built on the western side of the bay, at the extremity of the peninsula, which forms the southern side of the entrance to the bay. It occupies an inclined plane of about half a mile in extent from the hills in the rear of the city. The houses have been carried far up these hills, and a shallow portion of the bay lying between two projecting points of land in front of the city, has been filled up and built upon. The city is regularly laid out, with broad streets intersecting at right angles, and squares at convenient distances. The streets are now tolerably well paved, and many of them are laid with planks; well lighted, and watched; and arrangements have been made for their sanitary supervision. Several of the public buildings and churches are comparable with those in most of the cities of the United States, but the city is still so entirely in a transition state, that the most accurate account of to-day would be inapplicable a few months hence. Besides the churches there are several schools, general and marine hospitals, and numerous benevolent institutions. The warehouses, stores, and shops, are on a capacious scale, and abound with every variety of articles of necessity and luxury. The hotels are among the most noticeable features of the place as it now is, and some of them are carried on in a very costly manner. There are also numerous eating and drinking saloons, theatres, concert-rooms, lyceums, and other places of amusement or dissipation, including not a few gaming-houses of various grades. The manufactures of the city are comparatively inconsiderable.

The commercial facilities of San Francisco are very great. The bay, which is 8 miles wide, affords excellent anchorage, and is the natural outlet, not only for the almost unparalleled mineral riches of California, but of a district the extreme fertility of which has as yet hardly begun to be developed. The city fronting the bay is now lined with wharfs and quays, and vessels of great burden can lie alongside to land and take in their cargoes. Steamers are in regular and constant communication with New York and the Atlantic ports, and with the ports of Central America. The character and extent of the commerce of San Francisco have been given pretty fully under CALIFORNIA, *S.* 2, and it is needless to repeat the details here. In the years subsequent to that there given, there has been a considerable, though fluctuating, increase in the number and tonnage of vessels arriving and departing at San Francisco, but the returns are informal and incomplete. The annual clearances of shipping from the port at present, average about 500,000 tons; the entrances somewhat less. The amount of gold dust annually shipped from San Francisco exceeds in value 50,000,000 dollars. Up to the close of 1853 there had been deposited at the United States mint and branches, gold from California amounting to 207,316,177 dollars, nearly all of which had passed through San Francisco; besides which a very large quantity has been received in this country and elsewhere direct from San Francisco. Coal is found near the city; and there are quarries of good limestone. Eight or ten daily and several weekly newspapers are published in the city.

SAN JOSÉ. [CALIFORNIA, *S.* 2.]

SAN JUAN DE LA FRONTERA, one of the provinces of the Argentine Confederation, South America, extends between 30° 30′ and 32° S. lat.; 67° 30′ and 70° 20′ W. long. It is bounded S. by the province of Mendoza; E. by that of San Luis; N. by La Rioja; and W. by the republic of Chili. The area is about 40,000 square miles. The population is estimated at from 22,000 to 25,000.

The province lies to the north of Mendoza, which it resembles in its general character and productions. [PLATA, LA, *States of*.] The surface of the country is described generally under PLATA, LA. Extending along the eastern declivity of the Andes, San Juan comprehends the northern part of the Vale of Uspallata and a large portion of the plain which separates the Paramilla range from the mountains of Cordova, and contains the Lakes of Guanacache. The Vale of Uspallata is barren and nearly uncultivated. The soil of the plain consists of sand, and is without grass, but covered with stunted prickly trees of the mimosa kind. It is quite barren, and produces no kind of grain or vegetables, except where it is irrigated by the sweet water of the Rio de San Juan and some of its minor affluents. This irrigation renders the land exceedingly fertile; without any other manure, they produce most plentiful crops of wheat and maize. The ordinary crops of wheat are fifty for one, in better lands eighty or a hundred for one, and at Augaco, about 5 leagues north of the city of San Juan, they have been two hundred and even two hundred and forty. The distance from a market and the difficulties attendant on the transport of heavy goods through desert plains, greatly diminish the value of this fertility. But as fruit trees, especially vines, succeed very well in this soil, wines and brandies are exported to a considerable amount. In the northern district, called Jachal, there are some gold-mines, whose produce is however not very great. Like the other provinces of the Argentine Confederation San Juan is a federal state, owning little dependence on the central government. The executive power is vested in a governor, elected by the junta, or provincial assembly.

San Juan, the capital of the province, is situated on the Rio de San Juan, in 31° 4′ S. lat., 68° 57′ W. long.: population about 7000. It contains the government house and other public buildings, and has considerable commerce, being the mart whence the wines and brandies of the province are exported, and from which foreign goods are distributed to the interior. In 1833 the city was nearly destroyed by an inundation of the Rio de San Juan, by which three churches and several other public buildings, with numerous private houses, were thrown down, and many of the inhabitants lost their lives.

SAN LUIS DE LA PUNTA, one of the provinces of the Argentine Confederation, South America, extends between 31° and 35° S. lat., 64° and 67° 30′ W. long. It is bounded S. by the province of Buenos Ayres, E. by Cordova, N. by La Rioja, N.W. by San Juan, and S.W. by Mendoza. The area is about 36,000 square miles. The population is about 20,000.

The country included within this province is described under PLATA, LA, *States of*. It comprehends that immense tract of country which extends between the provinces of Mendoza on the west and Cordova on the east. Its north-western part runs northward to the border of the Great Salina, and it reaches southward to the country of the Ranqueles Indians, but now claimed by the province of Buenos Ayres. No part of it possesses any considerable degree of fertility. The greatest number of the widely-separated and isolated settlements, consisting mostly of estancias, or cattle-farms, occur along the road leading from Buenos Ayres to Mendoza, in the hilly country, where tracts of grassy land alternate with ridges of hills and sandy deserts overgrown with mimosas. As the grass is coarse and long, the pastures are indifferent; still cattle, horses, mules, and sheep are abundant, and are exported to a small amount, together with some wool. The corn and maize which are raised are not sufficient for the consumption of the scanty and widely-scattered population. The country between the Sierra de Cordova on one side, and Mendoza and San Juan on the other, is still worse. As no fresh-water stream runs through it, it cannot be irrigated; and with the exception of a few spots, is a complete desert. The climate is dry and hot; rain seldom falls. The gold-mines of La Carolina, about 60 miles N. from the city of San Luis, have ceased to be worked; but the people of the village sift the alluvial soil at certain places in the neighbourhood, and collect annually a small quantity of gold in dust and small lumps (pepitas). Like the other provinces of the Argentine Confederation, San Luis is a federal state; the executive power being vested in a governor elected by the junta, or provincial assembly, but for many years there has been no really effective government.

San Luis de la Punta, the capital of the province, is pleasantly situated on the western slope of a hill, 2417 feet above the level of the sea, in 33° 17′ S. lat., 65° 46′ W. long.; but it is merely a straggling village-like collection of mud-huts, and does not contain more than 1500 inhabitants. There is no other place in the province above the rank of a hamlet.

SAN PAULO, the capital of the province of San Paulo, Brazil, South America, is situated on two of the head streams of the river Tiete, in the plain of Piratininga, at an elevation of 2464 feet above the level of the sea, in 23° 33′ S. lat., 46° 45′ W. long. The population is about 22,000, exclusive of the suburbs. San Paulo is one of the oldest towns in Brazil, having been founded by a colony of Portuguese in 1560. The streets are wide, and lined with houses of two stories, built of 'taipa,' which is a frame-work of wood filled in with earth. The public buildings are—the palaces of the governor of the province, formerly a Jesuit college, and of the bishop; a spacious cathedral, 12 churches, and a convent of the Carmelites; a college, schools, &c. The only manufactory is a government establishment for making fire-arms. Some coarse woollen cloths and hats are made. San Paulo is the general emporium of the commerce of the plain in which it stands. The exports are—maize, tobacco, cotton, coffee, sugar, rum, jerked beef, hides, horns, and tallow; the manufactured goods of Europe and North America are imported. Santos, the port of San Paulo, is 42 miles S.W. from the city; and the descent to it is so steep that nearly all goods are carried on the backs of mules.

SAN QUENTIN. [CALIFORNIA, *S.* 2.]

SAN SALVADOR, Republic of, Central America, extends along the Pacific Ocean from the Bay or Gulf of Conchagua to the Rio de Paz. It lies between 13° 10′ and 14° 15′ N. lat., 86° 45′ and 89° 45′ W. long.; and is bounded E. by Nicaragua, N. by Honduras, W. by Guatemala, and S. by the Pacific Ocean. The area is about 6880 square miles. The population is about 300,000.

San Salvador is the smallest, but, in proportion to its size, much the most populous, of the republics of Central America. The surface is very unequal. The main portion of the coast extends along the Pacific in a generally west-north-west and east-south-east direction for about 140 miles; while on the east a smaller portion of it forms the western half of the Bay of Conchagua. There are four harbours—Acajutla or Sonsonate, Libertad, and La Union, which are ports of entry, and Jiquilisco or Triumfo de los Libres. Except La Union, which is on the west shore of the Bay of Conchagua, and is extensive and safe, these harbours are, properly speaking, only open roadsteads, hardly accessible during the rainy season and the prevalence of the south-west winds. As far northward as Libertad the shore is bordered by a narrow tract of low and generally level land from 10 to 12 miles wide; but farther north, up to Sonsonate, the coast is more elevated and broken. The interior is very rugged, being broken by several short ranges of mountains of moderate height, but separated into distinct groups. About 12 to 15 miles from the coast, and nearly parallel to it, are the five volcanoes of Apaneca, Yzalco, San Salvador, San Vicente, and San Miguel. San Salvador and San Vicente are the loftiest, being upwards of 8000 feet above the level of the sea. The eruptions of San Salvador have at times been very destructive; but Yzalco is by far the most remarkable, from its unceasingly active condition, surpassing it is said, in this respect, and in the impetuosity of its eruptions, any other volcano in America. Neither of the other volcanoes has exhibited other than very slight eruptions of late years.

The rivers of San Salvador have only a short course, and are in their natural state of little importance; though it is asserted that they might easily be rendered of great service for irrigation, and some of them be made navigable for barges and other small craft. The chief river is the Lempa, which rising in Esquipulas, in Guatemala, forms for a short distance the boundary between Honduras and San Salvador, receives the outflow from Lake Guixar, thence crosses San Salvador in a southern direction, and falls into the Pacific a little to the westward of the Bay of Jiquilisco. It is a deep but rapid stream, and the bar at its mouth prevents vessels of even moderate burden from entering it. The other larger streams are the Rio de Paz, at the western extremity of the republic; the Jiboa, which falls into the sea between the Lempa and Port Libertad; and the Sirama, or San Miguel, all of which have their mouths obstructed by sand-bars. There are two lakes of some size in the state. The Lake of Guixar, near the north-western boundary of the state, has a circuit of about 80 miles, and is one of the principal feeders of the Rio Lempa. It is said to communicate by a subterranean channel with the much smaller Lake of Metapa. Lake Ylopango, about 6 miles E. from the city of San Salvador, is about 9 miles long and 3 miles wide: its only outlet is a small tributary of the Jiboa. Mineral- and thermal-springs occur very numerously in various parts of the country.

Owing to the great inequality of surface, there is considerable variety of climate. As a whole, it is warmer than in Guatemala; but it is generally regarded as healthy. The hottest and least healthy part is the low tract along the coast.

San Salvador has great agricultural capabilities. The soil is generally good, and in some parts remarkably rich, and the climate permits a considerable variety of crops to be profitably cultivated. The inhabitants are an industrious race, and more skilful agriculturists than the natives of other parts of Central America. Nearly all the available land in the country is appropriated to individuals, and much attention has been paid to its cultivation, though now, from the long continuance of civil dissension, agriculture is in a very neglected condition. Maize is cultivated to a considerable extent; wheat succeeds well only in a few places; several varieties of frixoles, and most of the usual vegetables, are raised for the ordinary food of the people. Oranges, lemons, pine-apples, plantains, and various fruits are extensively grown; sugar, cacao, coffee, tobacco, and cotton succeed very well, and might, were the country in a more settled state, be raised largely for exportation. Since the gold discoveries in California, a very large quantity of sugar has been grown in the neighbourhood of Sonsonate, chiefly for the purpose of distilling rum for the Californian market. Indigo has however always been the chief source of wealth to San Salvador. During the Spanish supremacy, upwards of 1,800,000 lbs. are said to have been annually exported, and though the quantity raised has greatly fallen off, it is still considerable. The coast west of Point Libertad is commonly known as the Balsam Coast, it being the only place where the article known as the Balsam of Peru is collected. This part of the coast is in the possession of the Indians, who live in five villages, have their own chiefs, with a kind of municipal government, and subsist chiefly on the produce of the balsam, which they collect to the amount of about 15,000 to 20,000 lbs. annually, and dispose of in Sonsonate. They also cut and carry to Sonsonate a considerable quantity of cedar-trees. There are large forests on the slopes of the mountains of the interior.

Cattle are numerous, and of a good breed; sheep do not succeed very well; hogs are everywhere abundant. Turkeys and fowls are plentiful; but there are few ducks and geese. An inferior kind of cheese is made in large quantities; butter is seldom made.

The mineral wealth of the state appears to be considerable, but it has been very imperfectly developed. Gold has been obtained in several places. Some rich silver-mines were formerly worked, but, owing to the general insecurity of life and property, they have been for many years almost entirely neglected. Excellent iron-ore is obtained near Metapa. Lead and copper have also been found.

The only manufactures are of the common articles of domestic consumption. They consist chiefly of coarse cotton goods, cutlery, and iron ware, and some of them used to be in considerable request throughout Central America. The foreign trade is of comparatively little importance. The exports in 1852 amounted in value to 700,000 dollars; the imports to 1,360,000 dollars.

San Salvador is divided into four departments, which are named after their respective capitals—San Salvador, San Vicente, San Miguel, and Santa Anna. In all, the republic contains 6 principal towns, 142 smaller towns, and 62 villages. The following are the more important places; the populations are merely a loose approximation:—

San Salvador, the capital of the republic, is situated on the Rio de Aselhuate, a small affluent of the Lempa, in 13° 44′ N. lat., 89° 8′ W. long. The site of the city is more than 2000 feet above the level of the sea, on undulating ground, in a kind of valley, surrounded by high hills covered with wood, among which, in a north-eastern direction, and at a distance of about nine or ten miles, is the volcano of San Salvador, which at different periods has caused great devastation by its eruptions. The city itself was laid out with considerable regularity, and had in the centre a plaza, or square, three sides of which were lined with shops, with porticoes before them, supported by a colonnade; while on the fourth side was the cathedral, an edifice which had no great claims to architectural beauty. The population was about 20,000. But on the night of the 16th of April, 1854, the city was entirely destroyed by an earthquake, and a very large number of the unfortunate inhabitants killed. For several days previous to the sad catastrophe there had been slight tremblings of the earth, but as they caused no mischief, little heed was given to their premonition. On the evening of the night named however the shocks became more frequent and severe, and, being unattended with noise, the inhabitants became seriously alarmed, and many of them assembled in the great square. At length, at about ten minutes to eleven o'clock, a violent heaving motion of the earth occurred, which in a few seconds levelled the cathedral, churches, university, and every other public building in the place. Of the private houses a few were left standing, but these were rendered uninhabitable; and the wells and fountains were either filled or dried up. Many of the inhabitants, as we have said, perished, and of the survivors many fled to other towns. The movements of the earth continued for some time after the fatal night; and the president of the republic, in his address to the departments calling on them to assist the destitute citizens, intimated that measures were to be immediately taken for the selection of a better site on which to rebuild the city. Some manufactures of iron, especially of cutlery and coarse cotton stuffs, were carried on in San Salvador; and some sugar and indigo used to be exported. Sugar-plantations are numerous in the neighbourhood, as are also extensive orchards. Mestizoes, or ladinoes, as they are called here, constituted the bulk of the population. Near the city there are some warm and some cold rivulets, which afterwards unite, affording the inhabitants the advantage of having natural baths of every degree of temperature.

San Miguel, some distance east of the Rio Lempa, population about 7000, is noted for its fairs, of which the most important is held in November after the indigo crop.

San Vincente, on the right bank of the Lempa, contains about 8000 inhabitants in the town and its suburbs. In its neighbourhood are extensive plantations of indigo, and near the village of Istepeque excellent tobacco is grown, which is known under that name all over Central America.

Santa Anna, situated in the western part of the state, at a considerable elevation above the sea, population about 9000, has in its neighbourhood extensive plantations of indigo and sugar; in the mountains near the town are iron-mines, which were formerly profitably worked.

Sonsonate, near the western extremity of the state, population about 8000, carries on at present considerable commerce by means of the port of Acajutla, exporting sugar to Peru and Chili, and rum, &c., to California. The Indians inhabiting the country about the town make very beautiful mats, which are also exported. In the neighbourhood of Sonsonate is the Yzalco, a very active volcano.

Other towns of less importance than those above mentioned are—Aguachapa, Apastepeque, Cojutepec, Metapa, Sacatecoluca, &c.

San Salvador is a republic with a legislative chamber of 25 deputies, but the government is really vested in the president. The history of San Salvador is similar to that of the other republics of Central America. [Costa Rica, *S.* 2; Guatemala, *S.* 2; Honduras, *S.* 2; Nicaragua, *S.* 2.] On the formation of the republic of the United States of Central America, San Salvador became one of the federal states, and its capital was made the seat of the federal government; but the union was speedily dissolved, and San Salvador, like the other states, became an independent republic, and like them its progress has hitherto been arrested by constant internal discord.

(Juarros, *History of Guatemala*; Haefkens, *Reize naar Guatemala*; and *Centraal Amerika*; Baily, *Central America*, &c.)

SANA is the capital town of the province of Yemen in Arabia, situated in 15° 5′ N. lat., 44° 5′ E. long. Sana, though the chief town of Yemen, is the seat of an independent chief, the Imam of Sana, who exercises authority over a wide district around, and is often opposed to the Egyptian government, which has advanced its frontiers to Beit-el-Fakih, a town in the Jehameh, about midway between Sana and the port of Mokha, on the Red Sea. Sana is pleasantly situated on an elevated table-land, surrounded on three sides by higher mountains. The valley thus formed is about nine miles broad, but extending uninterruptedly to the north. The country round about supplies a considerable quantity of coffee, which at present is transmitted to Mokha on camels; but the exactions of the Egyptian government are so great, that it has been considered likely that the traffic may be turned to Aden, to which port Sana is as near as to Mokha. Coffee forms almost the only export; the imports are piece-goods, thread, and twist, Persian tobacco, glass, silks, spices, and sugar. The town is walled, and indifferently fortified. It is about 5½ miles in circumference, with narrow streets, but with many good houses; those of the more opulent having windows of stained-glass. The imam has two handsome palaces, both built of hewn-stone and fortified, in the town, and there are about twenty mosques, some very handsome, and many baths and public fountains. Across the principal street a handsome bridge has been thrown, as in rainy seasons a torrent runs down the street, but occasionally the town is seven years without rain, and is much too dry in general to be healthy. The population is estimated at 40,000; and of three neighbouring towns in the same valley, Rodah, Wady-Dhar, and Jeraf, the population is at least 30,000 more. In Sana, and probably in the other towns, the principal part of the artisans are Jews, who pay a capitation-tax for permission to reside in the town: they live in a quarter by themselves, and their number is about 3000. (*Geog. Journal*, vol. viii.; *Journey of Mr. J. C. Cruttenden to Sana*, 1836.)

SAND-TUBES. [FULGURITES.]

SANDWICH. [CANADA, *S.* 2.]

SANGUINARINE. [CHEMISTRY, *S.* 2.]

SANICULA, a genus of Plants belonging to the natural order *Umbelliferæ* and the tribe *Saniculeæ*. The calyx has 5 leaf-like teeth; the petals erect, obovate, with a long inflexed connivent point. Fruit sub-globose, covered with hooked spines; no ridges; vittæ numerous.

S. Europæa, the Wood-Sanich, is a native of Great Britain, in woods and thickets. The lower leaves are palmate, 3-5-lobed; lobes bifid, unequally serrate. The fertile flowers are sessile; barren flowers slightly stalked.

(Babington, *Manual of British Botany*.)

SANTA FÉ one of the riverine provinces of the Argentine Confederation, South America, has been described under PLATA, LA, (vol. xviii. p. 26). It was formerly the centre of communication between Buenos Ayres and the western provinces, with Paraguay, whose enormous supply of maté to those provinces, Chili, and Peru, mostly pass through Santa Fé. But the closure of Paraguay to external commerce, the disturbed state of Santa Fé, owing to domestic dissensions, and the frequent encroachments of the Indians from the Gran Chaco, almost entirely destroyed its trade, and reduced the inhabitants to poverty. Santa Fé is however so admirably situated for commerce that it cannot be doubted that, if the tranquillity of the country could be secured, the partial revival of trade, which has taken place since the opening of the navigation of the Rio Paraná, will be more than maintained; indeed it might be almost indefinitely extended with a larger, more wealthy, industrious, peaceable, and energetic people. The major part of the inhabitants are of Guarini origin, who settled here after the expulsion of the Jesuits in 1790. There are also many Indians, who reside in villages (of which Sauce, 7 miles west of the city of Santa Fé, is the chief), and spin the cloth and make the ponchos usually worn in the country; they are however generally wretchedly poor and degraded. Santa Fé, like the other provinces of the Argentine Confederation, owns a nominal dependence on the central government; the executive power is vested in a governor elected by the provincial assembly.

Rosario, situated on the high and precipitous bank of the Paraná, a considerable distance below Santa Fé, appears likely to become the commercial emporium of the province, being situated in a fertile district, conveniently placed for the steamers navigating the Paraná; and much the most convenient port for the foreign commerce of the western and north-western provinces. It wears already a far more commercial appearance than the capital; has a larger population; and the inhabitants are said to be industrious and diligent. Mr. M'Cabe, whose visits were made for commercial purposes, says, in his 'Two Thousand Miles Ride through the Argentine Provinces,' that "next to Monte Video, Rosario is the most rising port in this part of South America."

SANTA FÉ. [NEW MEXICO, *S.* 2.]

SANTIAGO DEL ESTERO. [PLATA, LA.]

SAPHIRINE. [MINERALOGY, *S.* 1.]

SAPONINE. [CHEMISTRY, *S.* 2.]

SAPONITE, a Mineral consisting of silica, magnesia, alumina, iron, and potash. It is found at Lizard's Point, Cornwall. When first extracted it may be kneaded like dough. It becomes brittle on drying, and is of a white, yellow, blue, or red colour.

SARĀWAK, a province on the north-western coast of the island of Borneo, of which Sir James Brooke is the Rajah, or governor, under the appointment of the Sultan of Borneo. The province of Sarāwak extends between 1° and 2° N. lat., 109° 40′ and 111° 40′ E. long. It is watered by the river Sarāwak and its tributaries. [BORNEO.] The capital, Sarāwak, formerly Kuchin, contains a population of about 12,000.

SARCOCOL. [PENÆACEÆ, *S.* 2.]

SARCOCOLLIN. [CHEMISTRY, *S.* 2.]

SARDINIAN STATES. The dominions of the House of Savoy constitute a monarchy, the head of which derives his title of king from the island of Sardinia. A general account of them will be found under SARDINIAN STATES; and we add the more recent information. These states consist of—1, the duchy of SAVOY; 2, the principality of PIEDMONT; 3, the duchy of GENOA; 4, the county of NIZZA; 5, the island of SARDEGNA. The continental territories have an area of 19,775 square miles. The population in 1848 amounted to 4,368,972. The total area of the kingdom, including the island of Sardinia, is 29,075 square miles (about one-seventh of the area of France), and the total population in 1848 (the latest census) amounted to 4,916,084 (less than one-seventh of the population of France at the census of 1851). The continental territories are divided into 11 administrative divisions and 39 provinces; the area and population of which are given in the following table:—

Divisions.	Provinces.	Area in Square Miles.	Population in 1848.
Torino . .	Torino . .	1,117	411,959
	Pignerol . .	593	138,233
	Susa . .	539	81,834
Genoa . .	Genoa . .	358	285,280
	Chiavari .	354	116,077
	Novi . .	289	65,013
	Levante .	261	78,859
Savona . .	Savona . .	311	78,906
	Acqui . .	445	101,102
	Albenga . .	263	59,993
Nizza . .	Nizza . .	1,180	118,377
	Oneglio . .	175	60,072
	San Remo .	265	64,541
Coni . .	Coni . .	1,003	179,636
	Mondovi . .	679	148,450
	Alba . .	408	118,844
	Saluzzo . .	622	153,942
Alessandria .	Alessandria .	332	117,870
	Asti . .	351	136,065
	Voghera . .	308	101,695
	Tortona .	257	58,853
	Bobbio . .	269	37,833
Novara . .	Novara . .	533	178,069
	Lomellina .	480	139,649
	Pallanza . .	312	64,030
	Ossola . .	521	36,331
	Valsesia . .	292	35,879
Ivrea . .	Ivrea . .	562	168,561
	Aosta . .	1,233	81,232
Vercelli . .	Vercelli .	473	121,806
	Biella . .	377	130,691
	Casale . .	335	120,428
Chambéry .	Chambéry .	634	152,468
	Alta Savoia .	377	50,872
	Moriana . .	798	64,239
	Tarantasia .	[illegible]	45,723
Annecy . .	Annecy .	620	107,474
	Faissigny . .	786	105,474
	Chablais .	356	57,562
Total .	. . . . .	19,774	4,368,972

An account of these divisions and their chief towns is given under their respective heads.

Each province is administered by a governor called Intendente, appointed by the king. The province is an aggregate of communes; each commune has a sindaco, or mayor, who is subordinate to the intendente. For judicial purposes each province has a court, called Tribunale di Prefettura, which sits in the chief town. The provinces are divided into districts called Mandamenti, in each of which there is a justice of the peace, who has a secretary. There are in all 412 of these mandamenti. There are four supreme courts, which are also courts of appeal. The supreme court of Turin has jurisdiction over all the provinces on the Italian side of the Alps and north of the Ligurian Apennines. The jurisdiction of the High Court of Genoa extends to all the provinces of the duchy of Genoa, with the exception of San Remo. The High Court of Nizza has jurisdiction over the provinces of Nizza, Oneglia, and San Remo. The High Court of Savoy, which sits at Chambéry, decides all suits within the limits of the duchy of Savoy. Each court has two chambers, one for civil and the other for criminal matters. The judges are irremovable. There is an Admiralty Court which sits at Genoa; and tribunals of commerce are established in all the leading towns. The tribunals of commerce of Nice, Genoa, Chiavari, Savona, Novi, and San Remo, Turin, Chambéry, and Nice are called Consolati. The towns and other communes have a communal council composed of notables of the place, at the head of which is the syndic. The council superintends the local and economical administration of the commune, but its acts are subject to the sanction of the intendente of the province.

The government until lately was an absolute monarchy. The late king, Carlo Alberto, published a constitution for his subjects, dated February 8, 1848, which has been since faithfully acted upon. It declares the Catholic religion to be the dominant religion, but gives perfect freedom of conscience to dissenters. The executive is vested in the king, who acts by responsible ministers; the command of the army, the right to make peace or war, to make appointments to office, to sanction laws, also rest in the king. The legislative power is exercised by the king and two chambers—a Senate and Chamber of Deputies—which must be convoked every year by the king; or if dissolved, the king must convoke a new chamber within four months. All financial laws must first be introduced into the second chamber. The freedom of the press and of the person is guaranteed. The judges are irremovable.

The army is recruited yearly by means of a conscription. Every conscript, unless he provides a substitute, is bound to serve eight years in the regular army, after which he is enrolled for eight years more in the provincial battalion of his respective district. In time of war the provincial battalions are called into active service, and the army becomes thereby increased to about 150,000 men. The regular army in 1854 numbered 47,524 men and 7602 horses. The corps of carabineers, in number about 4000 (of whom 885 are in the island of Sardinia, which is free from the conscription), are charged with the police of the country, being scattered in detachments over the various provinces. In 1855 the army was increased in consequence of the king sending 15,000 men to aid the French and English against Russia in the Crimea. In 1857 it numbered 48,273.

The naval force consists of 4 sailing and 4 steam frigates, 4 corvettes, 3 brigantines, 1 brig, 6 war steamers, and several smaller vessels, carrying in all 900 guns, and manned by 2860 men, besides officers. The stations of the royal navy are at Genoa, Villafranca, and in the island of Sardinia. The mercantile navy numbered in 1857 2934 ships, carrying an aggregate of 197,924 tons, and 31,987 men, including captains, sailors, and workmen.

The public revenues of the state, as estimated in the budget of 1857, amounted to 135,967,321 francs; and the expenses to 147,326,866 francs. The national debt on the 1st of January 1851 amounted to 680,605,040 francs (27,224,200*l.*), including the loan guaranteed by the British government in 1855. The revenue is derived chiefly from land-tax, customs and excise duties, post-office, public works, &c.

The ecclesiastical administration of the continental states is under the 4 archbishops of Turin, Chambéry, Genoa, and Vercelli; and 26 bishops of Maurienne, Tarantaise, Annecy, Aosta, Susa, Pinerolo, Acqui, Alba, Asti, Cuneo, Fossano, Ivrea, Mondovi, Saluzzo, Alessandria, Biella, Casale, Novara, Vigevano, Albenga, Nizza, Bobbio, Sarzana, Savona, Tortona, and Ventamiglia. The number of parishes is 3756; that of collegiate churches, besides cathedrals, is 74; and that of clerical seminaries, 54. There is an ecclesiastical academy for the higher theological studies at Superga, near Turin. There are in all the continental states about 240 convents of monks and 82 convents of nuns; by a law passed by the Sardinian Chambers in May 1855, all religious orders are suppressed, with the exception of those employed in "preaching, teaching, or tending the sick." The Valdenses are the most numerous Protestant sect as yet in the Sardinian states. They dwell chiefly in the valleys of Pignerol. Their clergy study at Geneva or Lausanne in Switzerland. They have churches in Genoa and Turin.

Public instruction is afforded by the royal and communal colleges. In every province there are one or more royal colleges, in which grammar, rhetoric, and philosophy are taught; and in some of them there are chairs of law, medicine, and divinity. In most towns there is a communal college, besides grammar schools. Female education is afforded almost exclusively in convents of nuns, of which there are forty-two thus engaged. Scientific instruction is given in the two universities of Turin and Genoa, in which cities there are academies of sciences and of the fine arts. [GENOA; TORINO.] There are a veterinary school at La Veneria near Turin, a school of mineralogy at the mines of Moutiers in Tarantasia, and a naval school at Genoa. Most communes have schools for boys.

The continental states of the king of Sardinia have several fine carriage-roads across the Alps and Apennines, which intersect their territory. The most remarkable are:—1, the great road of Mont Cenis, leading from Chambéry to Turin, constructed by Napoleon; 2, that of the Simplon, leading into Switzerland, likewise constructed under Napoleon; 3, the road from Genoa to Sarzana and Lucca along the Eastern Riviera; 4, the road from Genoa to Novi by Serravalle; 5, the road Della Cornice, from Genoa to Nizza, along the Western Riviera, begun under Napoleon, and finished under king Charles Felix. There is a well-regulated and cheap post-office system throughout the Sardinian dominions, as well as diligences for travellers on all the high roads; and public conveyances, called 'velociferi,' on the provincial or cross roads. Under the late king, Carlo Alberto, railroads were begun to be constructed in the continental states. Lines now extend from Turin to Genoa through Alessandria; from Turin to Cuneo, to Pignerolo, and to Susa; from Alessandria a line runs up to Novara. Along these roads electro-telegraphic wires are laid down; and the city of Turin has electric communication through Chambéry with Paris, and by the Gulf of Spezzia with the island of Sardinia, from the south-western point of which it has been proposed to carry electro-telegraphic cables to Bona in French Africa. A railway is projected from Annecy to Chambéry, thence to Montmelian on the Isère, up the left bank of that river to the confluence of the Arc, and up the valley of the Arc to Modane. This line in all probability will be extended from Annecy to Geneva, from Montmelian to Grenoble, so as to form a junction with the French railway system; and the project of cutting a tunnel through the Alps under Mont Cenis, so as to unite the Savoy railroad at Modane with an extension of the Turin-Susa line to Grande-Croix, has been long entertained with great favour by the people and government of the Sardinian States.

The plains of Piedmont are well supplied with canals, chiefly for the purpose of irrigation, the principal of which are in the provinces of Alessandria, Vercelli, Biella, Casale, Ivrea, Alba, and Turin. The river system of Piedmont is described under Po.

The staple products of the continental Sardinian territories for exportation are—silk, rice, hemp, wine, and oil. Most of the wine is consumed in the country. The principal manufactures consist of paper, silks, woollens, linen, glass, and cotton-yarn. The importation of colonial articles and foreign manufactures takes place chiefly through the port of Genoa. A considerable trade is carried on with Switzerland and Germany by the Lago Maggiore, and the Bernardin road leading to the Grisons.

The Sardinian States have Switzerland on the north, France on the west, the Mediterranean on the south, Austrian Italy, Parma, and Tuscany on the east. They comprise the countries between the Var and the Magra, the Rhône and the Ticino. The Sardinian portion of the Lunigiana lies east of the Magra. The surface is covered on the west and north by the Alps, on the south by the Apennines, and between these two great mountain systems lies the most extensive and valuable portion of the country, comprising the slopes, valleys, and plains that form the basin of the Po to the junction of the Ticino. The face of the country is described in the articles ALPS, APENNINES, GENOA, PIEDMONT, SAVOY, and under the names of the several administrative divisions or provinces.

SARGASSUM. [FUCACEÆ, *S.* 2.]

SASIN. [ANTELOPE.]

SATURNIA, a genus of Insects belonging to the order *Lepidoptera* and the family *Bombycidæ*. The antennæ are fringed in the male; the head is small; the wings are very broad and entire; the palpi and trunk are wanting.

S. Pavonia minor, the Emperor Moth, is one of the handsomest of the British species of Moths. It is about 3 inches wide. The colour is grayish-brown, faintly tinged with purple; the hinder margin of all the wings has a band of pale brown and purple, the hinder band being much waved. The centre of each wing has a large spot or ocellus, which is placed on a light ground; it consists of a black pupil, with a yellow or gray iris, and partly surrounded by a light blue crescent. The larva is of a green colour, having a black band on each segment adorned with pink tubercles, bearing a whorl of six hairs diverging like a star. It constructs a curious cocoon, the extremity not being close, but terminated by a converging circle of very stiff hairs, which enables the insect to make its escape from within, but completely prevents all ingress.

To the genus *Saturnia* some of the largest of the *Lepidoptera* belong. *S. Atlas*, the Giant Atlas Moth, has wings measuring 7 or 8 inches across. This species also, with *S. Cecropia* and *S. Luna*, have their wings produced into a tail. The cocoons of *S. Cynthia* and *S. Mylitta* are used in India for the production of silk. Latreille states that these are the wild species of silk-worm of China. *S. Cynthia* is the Arrindi Silk-worm of India. (Roxburgh, 'Linn. Trans.,' vol. vii.) *S. Promethea*, a North American species, forms its cocoon within the leaf of a sassafras-tree, having previously fastened the stalk of the leaf to the stem by a strong silken web, whereby it is prevented from falling with the other leaves. (Westwood.)

SAURIANS. The following is a synopsis of the families of the *Sauria*, adopted by Dr. J. E. Gray in his 'Catalogue of the Specimens of Lizards in the British Museum.' The genera and species of the *Lacertinidæ* are given, the other large families are described under their proper names :—

Order I. Lizards. *Saura.*

Mouth not dilatable, jaws toothed, the lower jaw-bones being united by a bony suture in front. Eye generally with distinct eyelids; drum of the ear generally distinct. Limbs four, distinct, rarely in such a rudimentary state as to be hidden under the skin. Toes clawed. Body elongate, rounded, covered with imbricated or granular scales; ribs distinct, mobile, and with a distinct sternum. Tail elongate, tapering, rarely prehensile, generally covered with whorls of scales. Egg with hard skin. The young not undergoing any metamorphosis.

Sub-Order I. *Leptoglossæ.*

Tongue flat, elongate, and bifid.

Tribe I. *Cyclosaura.*

Scales of the belly square, in cross bands, of the back and tail rhombic and imbricate, or circular and subgranular. Tongue elongate, flattened, free, nicked, or with two elongate cylindrical horny tips. Eyes diurnal, with two valvular lids. Feet for walking; toes unequal, compressed.

a. Head with small many-sided shields. Tongue sheathed at the base.

1. ***Monitoridæ.***—Head-shields flattish, scales small. Inhabit the Old World and Australia. [Monitors.]
2. ***Helodermidæ.***—Head-shields and scales of body convex, tubercular. Teeth with a groove behind. Inhabit the New World.

b. Head with large regular shields. Tongue mostly free at the base.

* Sides flattish, covered with small often granular scales.

3. ***Teidæ.***—Supra-orbital plate horny. Teeth solid, rooted. Scales small, granular, often with large plates. Inhabit the New World. [Teidæ, *S.* 2.]
4. ***Lacertinidæ.***—Head pyramidical, covered with regular many-sided shields; supra-orbital plate rigid. Throat scaly, often with a cross fold in front, and a collar of larger scales behind. Tongue elongate, flat, free at the base, exsertile, long-forked. Teeth hollow, rooted. Scales granular or rhombic, keeled. Sides flat, covered with small granular scales. The species inhabit the Old or Eastern world and Australasia.

Synopsis of the Genera.

i. Nostril erect, in the lower hinder angle of the nasal shield, just above the labial shield, with one or two shields behind it. Eyelid distinct.

A. Toes simple, compressed, not keeled nor fringed. Collar distinct.

a. Scales granular or 6-sided, elongate. Posterior nasal shield single. Collar distinct.

Zootoca.—Lower eyelid scaly, opaque.

Z. vivipara, the Scaly Lizard, Common Lizard, and Nimble Lizard. It is the *Lacerta vivipara* of Jacquin; *Lacerta agilis*, Pennant; *Zootoca muralis*, Gray. It has the ventral shields 8-rowed, the temple covered with many-sided shields, with a large central shield; its colour olive; back with a white-edged blackish streak on each side, and a central black streak; belly orange (in summer), black-spotted.

This little lizard is a common inhabitant of heaths and banks in most of the districts of England, extending even to Scotland. It is also one of the few reptiles found in Ireland. Its range is very limited on the Continent, and is not found in Italy or France. Its movements are graceful and rapid, it comes out of its hiding place during the warm parts of the day, from the early spring till autumn. It lives upon insects, which it seizes with its mouth. In this species the eggs are retained in the oviduct until the young are ready to be hatched, and they are thus produced alive. The young when brought forth are fully-formed, and capable of running about and taking their own food. The usual length of this lizard when full grown is from 5½ to 6½ inches.

Z. muralis, the Tiliquesta, is a native of the south of Europe.

Z. oxycephala, the Long-Headed Lizard, is a species brought by Mr. Webb from either Spain or Madeira.

Z. Taurica, a native of the Crimea, Morea, Corfu, and Sicily.

Z. tæniotata, the Striped Lizard, a native of South Africa.

Z. Derbiana, a native of Australia.

Z. Galloti, Madeira.

b. Scales granular or 6-sided, elongate. Posterior nasal shields 2, small, one above the other. Collar distinct.

Lacerta.—Lower eyelid opaque. Chin-fold distinct. Abdominal shields narrowed behind.

L. agilis, the Sand-Lizard. It is the *L. stirpium* of Milne-Edwards and others. The upper hinder nasal small, rather in front of the larger lower one; scales of the temple small. unequal, irregularly many-sided, often with a larger central one; throat fold indistinct, brown, spotted or eyed with black; sides green, brown-eyed, beneath white. This species is a native of Great Britain, and is especially abundant in the neighbourhood of Poole in Dorsetshire. Its general abode is on sandy heaths, where, from the rapidity of its movements, it is often mistaken for some form of snake. On account of the rapid locomotion it is not often caught. It does not bear confinement, but pines away and dies. When caught it often bites, but no ill-consequences are the result. The female lays her eggs to the number of 12 or 14 in hollows in the sand, which she excavates for the purpose. They are subsequently hatched by the heat of the sun. The eggs appear to be laid a considerable time before they are hatched. In this respect this species differs very much from the common lizard, which always brings forth her young alive. This lizard is larger than the *Zootoca vivipara*, as those of average size measure about 7 inches in length.

L. viridis, the Green Lizard, has the scales of the temple inequilateral, many-sided, with a central larger one: back granular, oblong, with shelving sides; throat-fold distinct. This species is a native of Guernsey and Jersey, and also of the south of Europe. It is much more readily caught than the last species, and never attempts to bite. It may be readily tamed and taught to come to the hand for food. It will lie coiled in the two hands, and never attempt to escape.

L. ocellata and *L. lævis*, both natives of the south of Europe, are the only other species of the typical genus *Lacerta*.

Thetia.—Lower eyelid transparent. The only species is *T. perspicillata*, a native of Algiers.

Teira.—Lower eyelid opaque. Chin-fold distinct. Abdominal folds and shields square. *T. punctata*, a native of Madeira, is the only species.

Nucras.—Lower eyelid opaque. Chin-fold indistinct. Abdominal shield narrow behind. Preanal shields one before the other.

N. Lalandii, is a native of the Cape of Good Hope.

N. tesselata, is a native of South Africa.

N. exigua and *N. chalybdea*, the Small Lizard and Steel-Black Lizard, are natives of the Caucasus.

c. Scales rhombic, keeled. Posterior nasal shields 2, small, one above the other.

Notopholis.—Collar and throat-fold distinct.

N. Fitzingeri is a native of Sardinia.

N. Capensis is a native of South Africa.

N. Moresticus inhabits the Morea.

N. nigropunctata, a native of the island of Corfu.

Tropidosaurus.—Collar and throat-fold indistinct. *T. montana*, a native of Java, is the only species.

d. Scales rhombic, keeled. Posterior nasal shields single. Collar indistinct.

Algira.—Ventral shields roundish, thin.

A. barbarica, the Zermoumeah, is a native of Algiers.

A. Capensis and *A. Dumerilii* are natives of the South of Africa.

B. Toes keeled beneath, and sometimes fringed on the sides. Scales keeled. Posterior nasal single.

Acanthodactylus.—Toes fringed on the sides.

A. velox. A native of North Africa.

A. Bellii. Found in Algiers.

A. Capensis. South Africa.

A. Savignii. Algiers.

A. lineato-maculatus. Marocco.

A. Boskianus. North Africa.

A. inornatus. Tripoli.

Psammodromus.—Toes not fringed on the sides. Collar indistinct.

P. Hispanicus, the Garriques, is a native of Spain.

P. cinereus inhabits the South of France.

II. Nostril horizontal on the ridge, between three swollen scales, one between the nostril and labial. Toes keeled beneath or fringed on the side.

a. Eyelid distinct.

Scrapteira.—Toes depressed, fringed on the edge, not keeled beneath. Collar indistinct. *S. graminea*, a native of Nubia, is the only species.

Eremias.—Toes compressed, keeled beneath, not toothed on the edge. Collar distinct. Preanal shields small, in several series, in central series one behind the other.

E. arguta. The Arguta is a native of Tartary.

E. velox. The Crimea.

E. Knoxii. South Africa.

E. Capensis; E. Burchellii; E. dorsalis; E. Namaquensis; E. lugubris, are also described by Dr. Smith as natives of South Africa.

E. guttulata. North Africa.

E. lineo-ocellata. South Africa.

E. pulchella. South Africa.

Mesalina.—Toes compressed, keeled beneath, not toothed on the edge. Collar distinct. Preanal shield single, semicircular, with 1 or two arched series of smaller ones round it.

M. Pardalis. North Africa.

M. rubro-punctata, North Africa.

Cabrita.—Toes rather compressed, keeled beneath, not fringed on the sides. Collar none.

C. Leschenaultii, a native of India, is the only species.

b. Eyelid rudimentary. Eye circular, exposed.

Ophiops.

O. elegans is found on the shores of the Mediterranean.

O. macrodactylus is a native of Asia Minor.

** Sides with a distinct longitudinal fold, covered with small granular scales.

5. *Zonuridæ.*—Ears distinct. Limbs distinct, or rarely quite hidden.

6. *Chalcidæ.*—Ears hidden under the skin. Limbs very short; femoral pores none. Lateral fold indistinct. [CHALCIDES.]

*** Sides rounded, covered with scales like those on the back.

7. *Anadiadæ.*—Scales of the back and sides thin, imbedded, smooth, in alternating cross series; of the tail elongate, smooth, in longitudinal series. Ears distinct. Femoral pores distinct.

8. *Chirocolidæ.*—Scales of the back imbricate, 6-sided, lanceolate, keeled, narrow, in cross series; of the tail in rings, alternating with each other. Ears hidden. Femoral pores distinct.

9. *Cercosauridæ.*—Scales of the back, sides, and upper part of the tail keeled, in longitudinal series. Limbs 4: feet for walking.

10. *Chamæsauridæ.*—Scales imbricate, all elongate, rhombic, keeled in longitudinal series, the keels forming longitudinal ridges. Limbs simple, undivided. Temple scaly.

Tribe II. *Geissosaura.*

Scales of the belly and (almost always) of the back and sides quincuncial, rounded, imbricate. Sides rounded. Tongue narrow, short, flat, and slightly nicked. Head with regular shields.

a. Eyes distinct, exposed, eyelid rudimentary. Head conical.

11. *Gymnophthalmidæ.*—Head-shields normal. Nostrils lateral, in a nasal shield. Limbs 4 or 2. Body fusiform.

12. *Pygopidæ.*—Head-shields normal. Nostrils over the upper edge of the first labial. Pupil round or oblong. Abdominal shields 6-sided, in 2 or 3 series. Tail with a central series of larger shields. Limbs 2, posterior. Australasia.

13. *Aprasiadæ.*— Head-shields normal. Nostrils in a suture between the nasal and first labial (sometimes united ?). Limbs none. Ventral and dorsal scales nearly similar. Australasia.

14. *Lialisidæ.* — Head-shields subimbricate, scale-like. Cheeks scaly. Nostrils in a small single nasal on ridge of the face.

b. Eyes distinct, eyelids distinct, connivent. Head conical.

15. *Scincidæ.*—Rostral shield moderate, triangular. Nostrils in a plate between the frontal and labial shields. [SCINCOIDIANS.]

16. *Ophiomoridæ.*—Rostral moderate, triangular. Nostrils in a notch on edge of nasal and the supranasal shields.

17. *Sepsidæ.*—Rostral rather large, square. Nostrils in a notch in the hinder edge of the rostral.

18. *Acontiadæ.*—Rostral large, cup-like. Nostrils in the rostral, with a narrow slit to its hinder edge.

c. Eyes hidden under the skin.

19. *Typhlinidæ.*—Head conical. Rostral shield cup-like. Nostrils in the rostral shield, with a slit to its hinder edge.

20. *Typhlopsidæ.*—Head short, depressed. Rostral shield elongated, extended up the forehead. Nostrils in an elongated nasal shield. [TYPHLOPS.]

Sub-Order II. *Pachyglossæ.*

Tongue thick, convex, attached to the gullet at the base.

Tribe III. *Nyctisaura.*

Scales of the belly small, rhombic, imbricated; of the back and sides granular. Tongue thick, short, convex, end slightly nicked. Eyes nocturnal; eyelids circular, not connivent, pupil linear, erect. Feet for walking; toes subequal, scaly beneath, and generally dilated.

21. *Geckotidæ.*—The Old and New World. [GECKO.]

Tribe IV. *Strobilosaura.*

Scales of the belly small, rhombic, imbricate; of the back and sides imbricate. Tongue thick, short, convex, end slightly nicked. Eyes diurnal, with valvular eyelids; pupil round. Feet for walking; toes unequal, compressed.

22. *Iguanidæ.*—Teeth on the inner side of the jaw-bone. New World. [IGUANA.]

23. *Agamidæ.*—Teeth on the edge of the jaw-bones. Old World and Australasia. [DRACONINA, *S.* 2.]

Tribe V. *Dendrosaura.*

Scales of the belly, sides, and back, granular. Tongue elongate, subcylindrical, worm-like, very exsertile. Eyes globular, very mobile, with a small, central, round opening. Toes equal, united into two opposing groups.

24. *Chameleonidæ.*—Teeth on the edge of the jaw-bone. Old World. [CHAMELEONS.]

SAUSSUREA, a genus of Composite Plants belonging to the sub-order *Cynarocephaleæ.* The florets are all hermaphrodite and tubular; the anthers with ciliated setæ at the base; the involucre is imbricated and unarmed, the receptacle scaly; the pappus in 2 rows, the outer one consisting of short rough bristles, the inner one feathery.

S. alpina has a stem from 3 to 12 inches high, erect, downy, and simple, terminating in a small corymb of heads with pinkish florets and purple anthers; the leaves are nearly glabrous above, cottony beneath, the lower ones ovate-lanceolate, the upper ones sessile-lanceolate, all distantly toothed, the heads in a dense corymb, the involucre subcylindrical, with depressed hairy scales. This is the only British species. It is found in alpine situations.

(Babington, *Manual of British Botany.*)

SAXIFRAGE. [Saxifraga.]

SAXIFRAGE, GOLDEN. [Chrysosplenium, *S.* 1.]

SCARLATINA RHEUMATICA. [Physic, Practice of, under *Dengue*, *S.* 2.]

SCHADOW, JOHANN GOTTFRIED, an eminent German sculptor, was born at Berlin in 1764. Passionately found of art when a boy, he was yet unable, owing to the poverty of his father, to obtain any instruction until a sculptor kindly offered to teach him to draw. He soon mastered the rudiments of art, and eventually determined to devote himself to his teacher's profession. But having formed an attachment to a young lady, he fled with her in his twenty-first year to Vienna, and there married her. The event proved the commencement of his good fortune; for his father-in-law not only forgave the young couple, but furnished funds wherewith Schadow might proceed to Italy to complete his studies. He remained at Rome from 1785 to 1788, chiefly occupied in the study of the antique. He then returned to Berlin and soon found ample patronage. The first important work executed by him after his return was the monument to Count Von der Mark, natural son of Frederick William II., erected in 1790 in the church of St. Dorothy at Berlin. Among other great works with which his chisel has adorned Germany are the colossal statue of General Ziethen in hussar's uniform; the equestrian statue of Frederick the Great at Stettin; a life-size marble group of Queen Luise of Prussia, and her sister the Duchess of Cumberland; a statue of Duke Leopold of Dessau for the Lustgarten at Berlin; an equestrian statue of Field-Marshal Blücher at Rostock; the monumental statue of Tauenstein at Breslau; that of Luther at Wittenberg; the quadriga on the Brandenburg Gate; and the sculpture on the Mint at Berlin: he also executed a considerable number of portrait busts of his more eminent countrymen.

For many years before his death Schadow was regarded as the patriarch of the modern school of sculpture in Germany: as an evidence of the honour in which he was held, it deserves to be mentioned, that whilst the old man still lived, the street in which he dwelt in Berlin was called by his name. Schadow was one of the very first of his countrymen to break through the classic conventionalisms of his predecessors, and, without departing from the sober dignity of sculpturesque style, to add a more forcible expression of character, and a stricter adherence to the actual model in attitude as well as in drapery. His great excellence lay in portrait, and he had ample opportunities of putting forth his powers. Appointed professor in the Academy of the Fine Arts at Berlin some time prior to the close of the 18th century, he from 1822 to his death held the office of director of that institution, and among those who were successively his pupils are a large proportion of the best sculptors of Germany, including Rauch, Dannecker, Tieck, Zauner, &c., in most of whose works evident signs of his influence may be traced. He died at Berlin January 26, 1850.

Schadow has enriched the literature of art with the following works: 'Wittenberg's Denkmäler der Bildnerei, Baukunst, und Malerei, mit historischen und artistischen Erläuterungen' ('Monuments of Statuary, Architecture, and Painting, with historical and artistic Illustrations'), Wittenberg, 4to, 1825; 'Polyklet, oder von den Massen des Menschen nach dem Geschlechte und Alter, mit Angabe der wirklichen Naturgrösse nach dem Rheinlandischen Zollfaden, und Abhandlung von dem Unterscheide der Gesichtszüge und Kopfbildung der Völker des Erdbodens' ('Polyklet, or the Groups of Mankind, according to their Races and Periods, with an Appendix on their natural Size according to the Rhenish Standard, and an Essay on the Distinction of Features and Forms of the Head among the Peoples of the Earth'), Berlin, 4to, 1834; and 'Nationalphysiognomien, oder Beobachtungen über den Unterschied der Gesichtszüge und die äussere Gestaltung des Menschlichen Kopfes in Umrissen bildlich dargestellt' ('National Physiognomy, or Observations upon the Distinction of the Features and of the external form of Human Heads, represented in Typical Outlines'), Berlin, 4to, 1835.

SCHELLING, FRIEDRICH WILHELM JOSEPH, one of that famous series of modern German philosophers, of which Kant, Jacobi, Herbart, Fichte, and Hegel are the other chiefs, was born at Leonberg in Würtemberg, in 1775. He studied first at Tübingen, where he had Hegel for his college-fellow, and where the two future rivals in philosophy formed an intimate friendship. Schelling, though somewhat the younger man, was somewhat the older philosopher, and Hegel was first indoctrinated by him in philosophy. From Tübingen, Schelling went to Leipzig and Jena—his attraction to Jena being Fichte's philosophical lectures. He started in his philosophical career as an ardent admirer and disciple of Fichte; and it was not till 1798—when, on Fichte's removal from Jena, Schelling succeeded him in the Philosophy chair of that university—that Schelling became aware of his own differences from Fichte's system. He had already been a contributor to Fichte's Jena Journal; but now, in preparing his own course of lectures, he necessarily enlarged his speculations. In 1799 he published 'Erster Entwurf eines Systems der Naturphilosophie, zum Behuf seiner Vorlesungen;' but it was orally by means of the lectures themselves that he first effectively disseminated his new philosophical ideas. Hegel, who had in the mean time been living at Frankfurt-on-the-Main and elsewhere, now joined his friend at Jena (1800), and Schelling's doctrine was advocated in common by himself and Hegel—the two acting as joint editors of a journal, and Hegel appearing independently, in Schelling's interest, as the author of an essay on the 'Difference of the Systems of Schelling and Fichte.' In 1803 Schelling left Jena for Würzburg, Hegel succeeding him at Jena, as he had succeeded Fichte; and in 1807 he removed from Würzburg to Munich, where he remained till 1841.

By the year 1814, when Fichte died at Berlin, the philosophy of Schelling, who had then been seven years settled at Munich, may be considered as having gained the ascendant throughout Germany, as a development beyond that of Fichte and superseding Fichte's system. This had been owing partly to the diffusion of Schelling's views by himself personally in the lecture-room at Jena, at Würzburg, and at Munich; but partly also to various scattered writings—some in the form of contributions to journals, some as reports of the substance of his lectures, some as public addresses, and some as distinct essays for the press—published by him up to the date in question. Among the more important of these publications were the following:—'On the System of Transcendental Idealism,' 1800; a discourse entitled 'Bruno: oder, über das göttliche und natürliche Princip der Dinge,' 1802; an essay entitled 'Ideen zu einer Philosophie der Natur, als Einleitung in das Studium dieser Wissenschaft,' 1803; 'Darlegung des wahren Verhältnisses der Natur-Philosophie zu der verbesserten Fichtes'chen Lehre,' 1806; a discourse, 'Über das Verhältniss der bildenden Künste zu der Natur,' delivered before the Royal Academy of Sciences in 1807; a work entitled 'Von der Weltseele, eine Hypothese der hoheren Physik zur Erklärung allgemeinen Organismus; nebst einer Abhandlung über das Verhältniss des Realen und Idealen in der Natur,' 1809; the first volume of a collection of his 'Philosophische Schriften,' published in the same year; and a series of fourteen lectures, 'Über die Methode des Academischen Studium,' published in 1813.

Living at Munich on the reputation of these writings, Schelling continued from time to time to develop portions of his doctrines in public addresses or in detached essays; but on the whole there was in these no important alteration of his philosophy as already given forth in the first fifteen years or so of the present century. Meanwhile, as he had burst away from Fichte, so his old friend and associate Hegel had burst away from him. The germs of a difference between Hegel's philosophical teaching and that of Schelling had manifested themselves in Hegel's lectures at Jena as early as 1806, if not earlier; they had been developed in subsequent works of Hegel; and at length, in 1817—when Hegel was appointed to the Philosophy chair at Berlin, which had been vacant since Fichte's death—Hegelianism began to appear in the German atmosphere as a system calculated to dispossess Schellingism, as that had dispossessed the system of Fichte. The struggle between Hegelianism and Schellingism increased—the former system evidently victorious on the whole—till 1831, when Hegel died at Berlin, and Schelling remained alone, in a Germany already filled with the adherents of his opponent, and regarding *him* as superannuated and left behind in the philosophic march. Schelling was aware of his position; but he was of opinion that, without altering the essence of his own system as it had preceded Hegel's, but by only bringing out aspects of it not formerly made apparent, and developing some modifications, the necessity of which he had overlooked, he should be able to present Schellingism in a form which would enable it to stand its ground or recover its ground even in Hegel's Germany, and which would at the same time bring it into harmony with other modern movements of German thought with which he sympathised, and especially with the religious movement which aimed at a restoration of deep Christian faith as opposed to Rationalism. Accordingly, the later portion of Schelling's life—first at Munich, and afterwards at Berlin, to which he was transferred in 1841—was spent in the rumination, and partly in the public announcement of this second or matured edition of his philosophy. In Berlin—where he retained his chair but for a few years, but where he afterwards lived habitually—the old man was revered as a philosophic patriarch, and his society, like that of Humboldt, was sought after by savans and thinkers. Bunsen, and others of the modern German school of theology, appear to have held him in high esteem. To them the nature of his second or final philosophy may have been made clear by his own conversations; but he had not published any connected exposition of it, nor was it known throughout Germany otherwise than vaguely when he died, in August 1854, at the age of seventy-nine. His death took place at Ragaz in Switzerland, whither he had gone for the benefit of his health.

For the right appreciation of Schelling's philosophy, it is necessary to remember it in its historical relations as a portion of that continuous development of philosophic thought in Germany which Kant began. Kant may be said to have bequeathed two contrary tendencies to the philosophy of his countrymen—the tendency to Objective Realism, which supposes a firm external reality in the universe, underlying all phenomena, and constituting the Not-Me; and the tendency to Subjective Idealism, which regards the thinking mind as the sole reality, and sees all the so-called objects and phenomena of the universe only as modifications or projections of the Me, or as so much various *thought* of the thinking being. "All subsequent German philosophy has been the prosecution of one or other of these speculative directions, or the attempt to reconcile them." Earliest on the realistic side were Jacobi and Herbart; the latter of whom especially fought against the too great Subjectivism that there was, or that there might be found, in Kant's system as a whole. Fichte, on the other hand, appeared as the thorough-going champion and exponent of the Kantian Idealism. Not content with the notion of the thinking mind and the external universe, the Ego and the Non-Ego, as being two co-ordinate realities to be both accepted on the evidence of consciousness, Fichte allowed independent reality only to the Me, and regarded the universe only as variations of this Me in thought or consciousness. Out of this doctrine he developed his powerful philosophy. Towards the end of his career however he was becoming unsteady in his Idealism, from fear that Nihilism might be its logical consequence, and he was straining after a doctrine of so-called 'absolute identity,' which should refer all to one absolute eternal substance, involving both the Me and the Not-Me. What Fichte was striving after Schelling accomplished. His system is properly post-Fichtean in historical order, and its main characteristic consists in a kind of universal Objectivism arrived at by first passing through Fichte's universal Idealism. In fact, Schelling was not at first aware that he was doing more than pushing Fichte's doctrine out in a direction in which Fichte meant it to be pushed.

Fastening, as it were, on the universal Me or 'World-Me,' which Fitche had set forth as the one reality on which philosophy should gaze, Schelling conceived the idea that this absolute eternal subject might be regarded and proceeded from as also the absolute eternal object, out of which all things, both in the mode of the Me and in that of the Not-Me, might be considered as evolving themselves. This doctrine of absolute identity, of a universal and infinite subject-object out of which all things have proceeded by a law of self-movement, is the cardinal doctrine of Schelling. According to Schelling, a knowledge of the absolute is the only true philosophy, and such knowledge is possible. But it is possible only by a capacity above consciousness and understanding—by what he calls 'Intellectual Intuition;' which is a kind of falling back or swooning of human reason into the absolute as being identical with itself. If man can know the absolute, it can only be because man himself is identical with that absolute; because knowledge is the same thing as existence, because thinking and being are one. But this is but one aspect of the doctrine of the identity of thought and being, of the subjective and the objective. That absolute, which we come to cognise only through identification with it, and which we name Deity, is to be regarded in its original condition as neither object nor subject, neither nature nor mind, but as the union, the indifference, the slumbering possibility of both. It has *become* all that exists by a process of self-movement, continually potentiating itself higher and higher, from the lowest manifestations of what is called matter, up to organic existence and the activity of reason itself in the guise of humanity. In this movement of Deity or the Absolute One, which constitutes the Life of the Universe, there are two modes—first, the expansive movement, or objectivising tendency, by which the absolute rushes forth, so to speak, into actual existence, and out of the *natura naturans* there comes the whole variety and complexity of the *natura naturata;* and, secondly, the contractive movement, or subjectivising tendency, by which the *natura naturata* falls back on the *natura naturans*, and becomes conscious of itself. The study of the absolute as engaged in the first movement—that is, as coining itself off into the objective—is natural philosophy; and only when the philosophy of nature is so considered—that is, when nature is considered as so many successive potentiations of the absolute in the form of thought—can it be rightly studied. "A perfect intellectualising of the laws of nature into laws of intuition and of thinking would be the highest perfecting of the science of nature." Of this style of treating the laws of nature, as modes by which the absolute proceeded in the process of thinking itself gradually out into all that as yet exists, Schelling himself set the example. He interpreted what is called inorganic nature, with its laws of gravity, light, magnetism, and electricity, as being the absolute in what he called its "first potence," or working on in its first efforts for converting the possible into the actual. Even here the subjective and the objective were already differentiated, but objectivity predominated. Then came the second potence, or potence of chemism, representing a higher stage in the life, or intellectual activity of the absolute. To this succeeds the third potence, of organically living nature, where we first see the aspect of consciousness or predominating subjectivity. Though Deity is immanent in all nature, it is in man that Deity becomes most conscious; and the highest reason of man is identification with Deity—a relapsing into the infinite. The ideal in man also corresponds to the real in nature; and in the perception of this is the true philosophy of art.

Such was the doctrine of 'absolute identity,' as it was propounded in Schelling's first or earlier philosophy. For a fuller view of the immense extension which he gave to it as affecting every possible department of thought, we must refer to his own writings; or to a very accurate and profound summary of Schelling's system given by Chalybæus in his 'Historical Development of Speculative Philosophy from Kant to Hegel' (of which there are two English translations); or (for more popular purposes) to Mr. Morell's account of 'Speculative Philosophy in the Nineteenth Century.' Information on the same subject is to be obtained from Cousin; and there is a French work entitled 'Schelling; Ecrits Philosophiques, et Morceaux propres à donner une Idée générals de son Système: traduits de l'Allemand par Ch. Bénard,' 1847. This work includes Schelling's lectures on the methods of academic study. His discourse on the philosophy of art is accessible in English. (Chapman's 'Catholic Series,' 1844.)

Apart altogether from the scientific comprehensiveness and precision at which Schelling aimed, there was much in the spirit and phraseology of his system—in such phrases, for example, as the 'rhythm of the Universe,' the 'Infinite becoming finite,' the 'Immanence of Deity in Nature'—to captivate poetical and enthusiastic minds. In fact, the system was a species of sublime Pantheism, which accorded well with the tone of German thought as affected or determined by Göthe, Tieck, and other poets. But, as we have said, the system did not remain satisfactory even in Germany. On the one side Hegel had tried to tear it to pieces on the score of its substitution of enthusiasm and poetry for logic, and had promulgated a system which found more acceptance with harder minds; on the other, the re-awakened Christian zeal of German theology complained that it was but a vague pantheism, leaving no room for that 'personal God' which the human soul demanded as essential to true religion, and, moreover, in its identification of man with deity, contradicting those notions of sin, redemption, and the like, which form the basis of Christianity. To prop up his system against these attacks, or, at least, to re-issue his system in a form which would save it from attacks from the latter quarter, was Schelling's object during the last portion of his life. A summary of his 'later views,' so far as they are ascertainable, will be found in Chalybæus. Suffice it here to say that, by a peculiar modification of his theory of the absolute,—according to which modification he now maintained that, though nature and Deity were identical, yet nature might not be and was not co-extensive with all Deity, that is, that the absolute might be considered as being in all objects and yet as not being exhausted in all objects taken collectively, but as being moreover a certain force or fund of unobjectivised will and reason,—Schelling imagined that he set himself right with theology at all points, and emerged out of Pantheism into pure Theism, and out of Rationalism into warm Christian faith. Working his new notion into such phrases as that "the part of the absolute immanent in the finite cannot be the whole nor the most peculiar part of Deity," and that "what is immanent in nature is that in God which is least God himself," he arrived at the doctrine of a 'personal God,' and also at the notions of 'human imperfection,' and 'moral evil,' and so he reconciled his philosophy with the Christian scheme of the world's history as a fall from good and a divine recovery.

SCHIRRHUS. [Physic, Practice of, under *Microscopic Diagnosis*, S. 2.]

SCHIST. An Argillaceous Rock, of a coarse laminated structure. [Slate.]

SCHNORR VON KAROLSFELD, JULIUS, was born at Leipzig on the 26th of March, 1794. His father, Hans Schnorr von Karolsfeld (born 1764, died 1840), a painter of some celebrity in his day, was director of the Art-Academy at Leipzig, and Julius received his earliest instruction in art from him, though he was desirous that his son should adopt a different profession. But the boy displayed at an unusually early age such remarkable talent for art, and so earnest a desire to follow it, that the elder Schnorr was induced to yield, and at the age of sixteen Julius was entered a student in the Academy of Painting, at Vienna. There he distinguished himself, though the formal conventionalisms inculcated were anything but favourable to the development of original genius. Happily in good time he proceeded to Rome (1815) where he at once attached himself to the society forming under the auspices of Cornelius and Overbeck, and when that remarkable cluster of young German painters brought their productions fairly before the artistic world, Julius Schnorr was recognised as one of the most accomplished of the promising band. His work the 'Wedding in Cana,' attracted so much notice that he was chosen along with Cornelius and Overbeck to paint the walls of the villa Massimi at Rome, in the revived art of fresco, with designs from the trio of great Italian poets, Dante, Ariosto, and Tasso. To Schnorr was assigned Ariosto, and his designs were received with general approbation. He also produced while at Rome 'Jacob and Rachel,' 'Madonna and Child,' 'Ruth in the field of Boaz,' 'Flight into Egypt,' and other important works.

At Rome Schnorr had gained the friendship of Niebuhr, Humboldt, and Bunsen, by whom he was introduced to the munificent patron of artists, Ludwig, crown-prince and afterwards king of Bavaria. When Ludwig set about the construction of his magnificent works at Munich, Julius Schnorr was one of the artists he summoned to assist in decorating them. He removed to Munich in 1825, and in 1827 was appointed professor of historical painting in the Academy of the Fine Arts there. His first great commission was to paint the state apartments of the new palace, with a series of frescoes from the ancient national poem of the Nibelungenlied. After these had proceeded some way however, they were suspended in order to complete the decoration of that portion of the palace called the Fest-Saalbau, three grand saloons of which were given to Schnorr to adorn with paintings of large dimensions representing leading events in the history of Charlemagne, Frederic Barbarossa, and Rudolf of Hapsburg, the three rooms being severally named after those personages. These three series of paintings occupied Schnorr above ten years. He made all the designs, prepared the working cartoons, and executed several of the more important paintings, but the greater number were painted under his supervision by his pupils. They are painted in encaustic, and have a grand appearance. In some may be discovered much superfluous energy and occasional exaggeration, in others simplicity carried to excess, in many a great redundancy of drapery, and exceptions may, perhaps justly, be taken to much of the colouring; but after every drawback is allowed, it must be confessed that they display abundant and vigorous imaginative power, immense technical skill, and that they produce a very impressive effect.

On the completion of his historical, Schnorr returned to his mythic series. Having destroyed such of the frescoes already done as did not satisfy his more mature judgment, he set himself with characteristic diligence to his great task. As completed the Nibelungen series occupies five chambers, each named from the section of the Lied which is depicted in it. The first called the 'Entrance Hall,' contains the personages of the poem. The second or 'Marriage Hall' is devoted to the leading events in the life of Siegfrid. The third, the 'Hall of Treachery,' contains the story of Hagen's treachery, from the moment when Kriemhild informs Hagen of the secret of Siegfrid's vulnerability, to its consummation in Siegfrid's murder. The fourth, the 'Hall of Revenge,' carries the story on to the death of Hagen by the hand of Kriemhild, and her own death by the sword of Hildebrand. The fifth is the 'Hall of Lamentation.' These paintings, which are in fresco, were likewise all designed by Schnorr and painted by himself and his pupils. They have all the artistic excellences of the historic series just noticed, and are painted with a broader and more genial feeling. Of all the many great modern paintings in Munich, these are perhaps the most generally popular, both among the artist's countrymen, and with strangers.

Schnorr continued to reside in Munich till he had completed his great works in fresco and encaustic, busy also during the whole time on other paintings, and designs for engravings, of various degrees of importance, but sufficient alone to have secured him a foremost place among modern painters. In 1846 he accepted an invitation to become director of the Picture Gallery, and professor in the Academy of the Fine Arts at Dresden, where he remained pursuing a course of persevering diligence till his death, which occurred on the 13th of April 1853.

Several of the works of Julius Schnorr have been engraved. In England he is perhaps best known by his extensive series of Bible-Pictures 'Die Bibel in Bildern,' Leipzig, 4to, 1852, &c. These have been reprinted in London from the original wood-blocks, and though more suited to the taste of Germans than ordinary English Bible-readers have met with a large sale. They exhibit wonderful animation, variety, and power, though like most of Schnorr's works most successful in passages admitting of somewhat exaggerated expression and action. Schnorr also made the designs for an illustrated edition of the Nibelungen published in 1843, but he is seen to a disadvantage in designs of so small a size. An elder brother Ludwig Schnorr, born in 1789, also acquired considerable notice in early life by a large altar-piece of St. Cecilia, a Faust, and some other pictures, but he scarcely maintained the position his early success promised. He settled at Vienna where he painted many portraits, as well as various historical and genre pictures.

SCHOLEFIELD, REV. JAMES, M.A., was born November 15, 1789, at Henley-on-Thames, Oxfordshire. His father, Nathaniel Scholefield, was minister of the Independent Dissenters' chapel, in that town. He was educated in the school of Christ's Hospital, London, became a Grecian there, and obtained several prizes. He was entered of Trinity College, Cambridge, in 1809. Having been elected Scholar in 1812, he in that year obtained the Craven University Scholarship. He took holy orders in 1813, by special permission, before he had taken his degree of B.A. Soon afterwards, on proceeding to his degree, he attained the place of Senior Chancellor's Medallist, and was first in the list of Senior Optimes. About the same time he became curate to Mr. Simeon, of Trinity Church, Cambridge. In October 1815, he was elected a Fellow of Trinity College. Having taken his degree of M.A., he obtained in July 1823, by presentation of his college, the perpetual curacy of St. Michael's, Cambridge, where for thirty years he performed the duties of his sacred office with unwearied zeal and assiduity. On the death of Mr. Dobree, he was elected, October 22, 1825, Regius Professor of Greek in the University of Cambridge. In 1827 he married, and in the same year he commenced the courses of lectures on the principal Greek authors, which, with few interruptions, he continued for a quarter of a century. In the Lent Term of each year he delivered lectures on Æschylus, Plato, Aristophanes, Thucydides, Sophocles, Demosthenes, and Pindar, returning to each, on an average, once in seven years. In 1844 he made a tour in Scotland, and he visited that country three times afterwards. On the 11th of November 1849 the church of St. Michael was burnt down. On the following day Dr. French, canon of Ely, died, and Mr. Scholefield succeeded him in the canonry, the preferment being attached to the Regius Professorship of Greek. St. Michael's church was rebuilt, and was re-opened January 11, 1852. Professor Scholefield's health, however, had been failing for some time, and he was ordered by his medical adviser to refrain from preaching, and take rest in some healthful and pleasant place. For that purpose he retired to Hastings, on the coast of Sussex, and there died, April 4, 1853. He was buried at Fairlight, near Hastings.

Professor Scholefield's principal literary publications are as follows: In 1826 he published a new edition of Porson's Four Tragedies of Euripides; in 1828 an edition of Middleton's 'Treatise on the Greek Article;' an edition of Æschylus, with notes critical and explanatory; and a new edition of Bishop Leighton's 'Prælectiones.' His next work was 'Petri Pauli Dobree Adversaria,' containing Dobree's notes on the Greek historians, philosophers, and minor orators, of which Part I. was published January 1831; Part II. November 1831; and Part III. January 1833. In 1832 he published 'Hints for an Improved Translation of the New Testament,' and in 1834 an edition of the New Testament, in which the original Greek and authorised English version are printed in parallel columns. In 1843 he published an edition of the 'Eumenides' of Æschylus. Several of his sermons have been published in a separate form.

(*Memoirs of the Rev. James Scholefield, M.A., late of Trinity College, Regius Professor of Greek in the University of Cambridge, Perpetual Curate of St. Michael's, and Canon of Ely*, by his Widow, *with Notes on his Literary Character* by the Rev. William Selwyn, M.A., Canon of Ely, 8vo, 1855.)

SCHOLZ, JOHANN MATTHIAS AUGUST, was born at Kapsdorf near Breslau in Prussian Silesia on February 8, 1794. He received his early education in the Roman Catholic gymnasium of Breslau, in 1812 entered the university there, where he studied theology and philology; and in 1814 gained a prize in the Roman Catholic theological faculty for his essay on the Parable of the Vineyard. Shortly afterwards he commenced his critical labours on the text of the New Testament, and with this object after he had for two years availed himself of the materials in the library of Vienna, in 1817-19 he visited Paris and London, Switzerland and Italy. In 1820, immediately after being appointed professor extraordinary of theology at Bonn, he joined the expedition under Minutoli for the exploration of Egypt and the neighbouring countries. The travellers disagreed and parted, but Scholz journeyed through Egypt, Palestine, and Syria for four months, when he returned to Trieste. At Breslau in 1821 he took priest's orders, exercised his functions at Bonn, and in 1823 was made professor of theology in the university and a canon of the cathedral. He died in November 1852. Among his principal works we may mention 'Reise in die Gegend zwischen Alexandrien und Parätonium, die libysche Wüste, Siwa, Ägypten, Palästina, und Syrien, in den Jahren 1820 und 1821,' which was a selection from his diary, and was published in 1822. In 1825 he issued at Bonn his 'Commentatio de Golgathæ et Jesu Christi Sepulcri Situ,' in 1834 his 'Handbuch der biblischen Archäologie,' and in 1830 and 1835, the great object of his studies, the text of the New Testament, under the title of 'Novum Testamentum Græce,' in two volumes. Scholz's excellence as a philologist has been generally acknowledged, and his labours are held in high estimation.

SCHOOLS.—Under the head of SCHOOLS in vol. xxi. page 50, we remarked on the increased interest which was then taken in the subject of the education of children especially those of the poorer classes. From that period the interest has greatly increased; many plans have been proposed, some have been adopted, and even in the establishments for the education of the more wealthy classes, much improvement has taken place.

From the time of the Reformation, when the Scriptures were freely opened to all, no one believed that it was a necessary qualification for a Christian man or woman that he or she should be able to read the Scriptures. The oral instruction of the Church was thought all-sufficient in religion. To have an educated class, as distinguished from a class totally uneducated, was the object of those who most valued sound learning. The first colonists of New England founded a common school wherever they met to clear the forests and to raise their towns. All who sought a country where opinion should be free, felt the duty of keeping the light of religious intelligence burning amongst them. Not so in the mother country. Neither the motive of love nor the motive of fear led us to think of the education of the masses till the times in which we now live. The education that was amongst our forefathers was sufficient, in their estimate of what was good. There *was* a system of education amongst them which they cherished and upheld. We live in another era; but it is not wise to contemn those who walked by other lights.

There are four clear divisions in the progress of education in England, limiting the inquiry to that education which is wholly, or in part, gratuitous:—

1. Education by the Church, from the establishment of monastic institutions to the Reformation.

2. Education by endowment, immediately subsequent to the Reformation, for the most part limited to schools for the higher branches of learning, called grammar-schools.

3. Education by what are commonly termed free schools, mostly established by endowment, and further supported by subscription, for the instruction of a select portion of the poor in reading, writing, and arithmetic.

4. Education by voluntary associations, whether as Sunday schools or day schools, some of which have, within a few years past, received a limited measure of assistance from the State.

The exclusive education by the Church has passed away. Education by the State never existed in England—even in the most restricted sense of state-counsel and small money-aid—till within the last eighteen years. The education of the people since the Reformation has proceeded from the people. It has been uniformly in a state of progress, though occasionally exposed to corruption and consequent decay. The endowed grammar-schools are coincident with the progress of the middle class; the free schools which are not grammar-schools go along with the gradual rise and progress of the operative class; the Sunday schools, and the other schools of voluntary association—the schools of the present century—belong to a new era, when the universal education of the people is held to be a matter of duty and necessity. The advance of public opinion as to this duty and necessity forces on the last condition of progress—education by the State.

The endowed grammar-schools were the natural successors of the schools and chantries of the unreformed Church. They contemplated no education except the most liberal. Children were to be brought up as scholars, or to be taught nothing. The grammar-schools were the nurseries of the learned professions, and they opened the way for the highest honours of these professions to the humblest in the land. About the time of the Revolution the commercial classes, who had grown into wealth and consequent importance, began naturally to think that schools in which nothing was taught but Latin and Greek, were not altogether fitted for those who were destined to the life of traffic. Uneducated men who had pushed their way to fortune and honour, generously resolved to do something for their own class; and thus we came to see in every town, not a free grammar-school, but a free school, over whose gates was generally set up the effigy of a boy in blue or green, with an inscription betokening that by the last will of Alderman A. B. this school had been founded for twenty poor boys, to be clothed, and taught reading, writing, and arithmetic. With a comparatively small population these free schools, we venture to think in opposition to modern authorities, were admirable beginnings of the education of the poorer classes. While the grammar-schools were making divines and lawyers and physicians out of the sons of the professional classes and the wealthier tradesmen, the free schools were making clever handicraftsmen and thriving burgesses out of the sons of the mechanics and the labourers; and many a man who had been a charity-boy in his native town, when he had risen to competence, pointed with an honest pride to the institution which had made him what he was, and he drew his purse-strings to perpetuate for others the benefits which he had himself enjoyed.

According to the digests of the Reports made by the Commissioners for Inquiry into Charities presented in 1842, the annual income of the grammar-schools of England and Wales amounted to 152,047*l.*, but some schools were excluded from the inquiry. The annual income of the free schools, described by the Commissioners as "schools not classical," was 141,385*l.*

The digest of the Commissioners' Reports does not give us the number of endowed schools, nor of children therein educated. But we may form a tolerable approximation to the number, from the returns furnished by the ministers of the respective parishes in England to a committee of the House of Commons, in 1818. According to these returns the annual revenue of the endowed schools of England was 300,525*l.*, to which if we add 7000*l.* for Wales, we have a very near approach to the revenue of the digest of 1842; the same returns state the number of endowed schools in England as 4167, and of children educated therein, 165,433; and in Wales, schools 209, children 7625. In 1833 a series of questions was addressed to the overseers of the poor in England and Wales, the answers to which would show a falling-off both in the number of endowed schools and of children therein educated, giving the schools as 4106, and the children as 153,764. If there were such a falling off, it may be accounted for by the fact that some of the endowed schools had been illegally converted into national schools. Comparing all the returns, we may say in round numbers that the income of the endowed schools was 300,000*l.*; the number of schools 4000; and the number of scholars 150,000.

The 300,000*l.* thus derived from the rent of land, rent charges, funded securities, &c., during three centuries, has been the foundation upon which has been built up much of the sterling worth of the English character. One hundred and fifty thousand children have been receiving, for a long series of years,—some the most liberal education, some the commoner rudiments of worldly knowledge, all of them religious instruction,—at an average cost of 2*l.* per child. The average cost of each scholar in the national schools is 11*s.* 2*d.* per annum. There have been many attempts, and some have been successful, to turn the funds of the endowed schools, contrary to the wills of their founders, into schools for universal education; and had these attempts been supported by the Court of Chancery, or encouraged by the legislature, we might now have been educating out of the same funds, upon the monitorial system, about 540,000 children, instead of 150,000. We apprehend that, with the best intentions, some unsound opinions have been taken up on the subject of endowed schools. The registrar-general, in his very able Seventh Annual Report (1846), says: "The insufficiency of the national education is the more to be regretted, as the means of education exist, and the funds left for educational purposes, *if properly applied*, in the charities and public institutions, would, with some assistance from Parliament, supply the children of the poor with the sound knowledge which the scanty earnings of the parents do not enable them to purchase." We affirm that these funds are properly applied when they are applied to the precise objects contemplated by the endowment. There have been great abuses in the management of some of these institutions, which have been corrected. The Commissioners of Inquiry into Charities reported a vast amount of delinquency and neglect, especially with regard to grammar-schools. The Court of Chancery, upon the representations of the Commissioners through the attorney-general, has remedied many of the most glaring evils; and we have now many institutions distributing a large measure of good, where formerly were only decay and uselessness. "Incompetency of the master,"—"school discontinued,"—"no scholars for many years,"—"master non-resident,"—"grammar-school abolished by trustees,"—"no free scholars taught,"—these are not uncommon statements amongst the original reports upon grammar-schools. There is a better spirit now abroad; and trustees and visitors at the present day would be ashamed of such gross misapplications of the means of preserving sound learning amongst the people. Legislative action has been brought to bear upon some; and the Harpur Charity at Bedford, and Dulwich College, for which an Act was passed in 1857, now make their ample means much more generally advantageous. Abuses, no doubt, still exist; but, as a whole, the grammar-schools have worked well in this country. They have kept alive amongst us the liberal studies which have nourished a race of divines, lawyers, physicians, statesmen, that may challenge comparison with those of any nation. They have opened the gates of the higher employments to industry and talent unsupported by rank and riches. They have mitigated the inequalities of society. They have ploughed up the subsoil of poverty to make the surface-earth stronger and richer. What the grammar-schools have done for the higher and middle classes, the free schools have done for the lower, in a different measure. They were the prizes for the poor boy who had no ambition, perhaps no talent, for the struggles of the scholar; they taught him what, amongst the wholly untaught, would give him a distinction and a preference in his worldly race,—and he was unenvied by the less fortunate, because they knew that there was no absolute bar to their children and their kindred running the same course. Do we assert that there is nothing to be desired beyond this state of things? Unquestionably not. But we do desire that no feelings falsely called utilitarian, should induce us to wish the appropriation of funds to one purpose, that were appropriated to another purpose. An American writer, speaking of the property given to endowed schools, says: "It is easy to see that, if this sum were consolidated, and then distributed on principles of equality, it would be productive of incomputable good." (Horace Mann's 'Educational Tour,' 1844.) The evil is computable, as well as the good. The good would be the education after some universal manner of 400,000 more children than are now educated out of these funds; the evil would be, that they would not be educated after the manner prescribed by the founders of these schools, and we think that the manner prescribed by the founders is more than ever necessary as education of some sort becomes universal. We desire most ardently to see the whole body of the people educated; but we also desire to see some portion of the people—not the rich only, but some portion of the poor—better educated than the great bulk of the community ever can be. It is a common saying that, if the founders of these schools could remodel their endowments, they would distribute their benefits as widely as possible, by teaching the larger number cheaply instead of the smaller number expensively. We doubt if any sound lover of knowledge, even at the present day, would not feel that he was doing more good as an individual by leaving a thousand pounds to support a highly meritorious poor scholar by an exhibition at the university, than by leaving a thousand pounds to instruct fifty boys and girls in reading and writing. And why? The elementary education of the whole people has become too large a matter for individuals to deal with. They can more properly employ their charity in raising the character of education, by encouraging the higher branches of knowledge. The spirit of voluntary association, aided in a considerable degree by the State, must do the work of instructing millions. That spirit is not slumbering when we know—as we shall have to show in detail—that nearly 900,000 scholars are now receiving instruction more than the number that were instructed in 1833. These 900,000 scholars cost more for their annual instruction—in addition to the cost of the schools which contain them—than the annual revenue of all the endowed schools that survived the Reformation, that have been founded since the Reformation, and which furnished, with the exception of private schools, the only systematic education which the people of England received, up to the beginning of the present century.

Up to the year 1833 the legislature had limited its duties with regard to education to inquiries into its state, and lamentations over its inefficiency. In the session of 1833 the principle was first established that it is just and wise to appropriate some portion of the public income to the purposes of education in England. Twenty thousand pounds were then voted, in aid of private subscriptions for the erection of schools for the education of children of the poorer classes. The Treasury regulations for the application of this sum prescribed, that no grants should be made except under a Report from the National School Society, or the British and Foreign School Society. Upon this foundation, narrow indeed with reference to the amount of the grant, but ample and solid as regards its capacity of extension, was raised up, in 1839, a new branch of administration,—the Council on Education. It is beside our purpose to recount the facts opposition to this great measure, which had been adopted upon the responsibility of the executive government. The administration persevered in their plan, against a powerful minority in the House of Commons, and a vast majority in the House of Lords, who prayed her Majesty to revoke the order in council by which the Board of Education had been appointed. The first parliamentary grant placed under the direction of the Council on Education was 30,000*l.*, which was continued annually to 1842; it was then raised to 40,000*l.* for 1843 and 1844; in the session of 1844-45, it was 75,000*l.*; in those of 1846 and 1847, 100,000*l.* each year; in 1848 and 1849, 125,000*l.* each year; in 1850, 110,000*l.*; in 1851, 150,000*l.*; in 1852, 160,000*l.*; in 1853, 260,000*l.*; in 1854, 263,000*l.*; in 1855, 396,321*l.*; in 1856, 451,213*l.*; and in 1857, 541,233*l.*; a total since 1833 of 3,206,767*l.*

But the efforts of the legislature have not been confined to grants of money. Without noticing the number of schemes proposed, and the debates upon them, in which the adherents of the voluntary principle, and those advocating a national superintendence and support, have contrived to neutralise each other's efforts, we will shortly notice what has been actually done. In 1842 an Act was passed for facilitating the acquisition of sites for school-houses, which was repeated, amended, and extended in 1850, 1852, and 1853. In 1843, land and buildings occupied by societies for literary and scientific purposes were exempted from the payment of county, borough, parochial, and other local rates; and in 1854 further facilities for the institution of such societies was afforded by another Act. In 1844, in a Poor-Law Amendment Act, the Poor Law Commissioners were empowered to combine parishes and unions into school districts, to form boards for their governance, which boards, subject to the regulations of the Commissioners, were to appoint, pay, and control its teachers and other officers, for the purpose of instructing the children of the poor; but no child was to be compelled to attend any religious service contrary to the principles of, or be instructed in any religious creed contrary to that professed by, the parents; and in 1848 the provisions of the Act were amended, by extending them to parishes not in unions, and removing the limitation of expense, previously limited to one-fifth of the aggregate of the poor-law expenditure. In 1847 the law regulating the attendance at school of children employed in print-works was amended. In 1850, an Act was passed empowering town-councils to establish public libraries and museums, by imposing a small rate, such libraries and museums to be open to the public free of expense; extended in 1855 to places not having councils and to parishes; and similar Acts were passed for Scotland and Ireland in 1853, 1854, and 1855. While this attention was continually bestowed on the subject of general instruction of the children of the honest poor, it was felt that there was a lower class, in which, probably to a great extent, ignorance was the parent of crime. In Aberdeen a successful effort had been made to recall youthful vagrants or petty offenders to the paths of rectitude by judicious instruction; and after an experience of several years, both in England and Scotland, supported by voluntary contributions, it was endeavoured to diffuse the benefit by the legal establishment of reformatory schools, and in 1854 there was passed 'An Act to render Reformatory and Industrial Schools in Scotland more available for the benefit of Vagrant Children;' and in the same year an Act was passed 'for the Better Care and Reformation of Youthful Offenders in Great Britain;' in which, after paying a tribute to the existing establishments, it enacts that they shall be licensed by the Secretary of State, and then receive youth of both sexes, who, on being convicted before a magistrate, shall by him be considered proper objects for the institution, the expense to be defrayed in the first instance by the Treasury, but to be recoverable from the parents, if able to pay. Other Acts, with the same object, were passed in 1856 and 1857, by the last of which justices of the peace in session, or the council of a borough, may grant money in aid of such schools. In 1857 there was also passed an Act to make better Provision for the Care and Education of vagrant, destitute, and disorderly Children, and for the Extension of Industrial Schools.' By this Act, without waiting for any actual crime, a neglected child may be transferred to a place of education, and his careless or probably dissolute parents may be forced to contribute to his support.

Besides the above, which relate chiefly though not entirely o England, an Act was passed in 1845 for amending the provision for parish schoolmasters in Scotland; a provision, however, yet far from equivalent to the services they perform. To Ireland the grants of money for the diffusion of education have also been large, and, on the whole, increasing. An Act for establishing Public Libraries and Museums in Ireland (18 & 19 Vict. c. 40) was passed in 1855; and a number of schools have been established, chiefly under the direction of the Roman Catholic clergy, which to some extent supply the place of Reformatory schools. The repeal of the compulsory tax on newspapers in 1855, and the reduction of postage on printed papers, books, and MSS., may also be fairly considered as aids to education.

In addition to this legislative action, the general public have not been wanting in efforts to diffuse education. In most of the large towns Ragged Schools have been formed and supported for the instruction of the more destitute children; and, in conjunction with mere school learning, it has been endeavoured to inculcate habits of industry, by establishing Shoe-Black Brigades and Crossing Sweepers, by which boys during the day are enabled to earn money, a part being devoted to their support, and the remainder placed to their account, to form a fund for their future advancement; their evenings being spent in school. The results, on the whole, have been very satisfactory. Schools have also been established for teaching girls Common Things, chiefly in domestic economy. The preparation of teachers has been also more attended to, and few of the paid instructors, either male or female, are now appointed to any of the schools, without certificates of capability from recognised examiners. For this purpose the British and Foreign School Society and the National Society have established normal and model schools, where instruction is afforded, capability tested, and certificates granted. Inspectors are appointed to visit all the schools by the Board of Education, and also by the above-named societies to visit their own; and in the Report of the British and Foreign School Society in 1857, one of them, Mr. William Davis, B.A., says: "Remembering, as I do, the kind of education given in most of our British schools some ten years ago, it is with no ordinary gratification that I observe the vast improvement that has been effected, both in the quality of instruction and in the methods of imparting it." The Report, in 1854, of Mr. Horace Mann on Education, compiled upon the materials furnished by the census of 1851, confirms this. He states that there were then 40 colleges, supported at an annual cost of 90,000*l.*; and that from five belonging to the National School Society, 270 qualified teachers issue annually. By the whole about 400 masters and 250 mistresses are annually prepared for their duties.

Looking, then, to the prodigious exertions that have been made since 1833, we may conclude that from official returns we should find such an increase of school accommodation, and of children under instruction, as would leave little to be done beyond a steady perseverance in the same course of voluntary exertion with Government aid. We speak here with reference only to the numerical amount of education; the quality of the education given embraces a much wider range of inquiry. Important as it is to ascertain with exactness the number of children daily receiving instruction by the aid of voluntary benevolence, or by endowment, the means of such computation are not yet perfect; and the computations of those who take different views as to the necessity of State interference are so widely different, that it requires a very careful analysis, and, what is more, a complete abnegation of the spirit of partisanship, to enable us to arrive at safe conclusions.

The Rev. Mr. Hook, in a pamphlet published in 1846, calculated that for the proper instruction of the people, one in every six of the total population should be at school. Some enthusiasts say the proportion should be one in four. Mr. E. Baines in 1845 estimated that one in every nine was then at school. Mr. Mann, in his Report, thinks that one in eight would be sufficient for all useful purposes. In 1833, with a population of 14,386,415, the number of day scholars was 1,276,947, which gives one in every 11·27; and of Sunday scholars, of 1,548,890, or one in 9·28; the total is 2,825,837, or one in every 5·25. But to include the Sunday schools would be a fallacy; for the instruction, though extremely beneficial in itself, only extends, generally, to so much reading as to enable children to read their Bible and a few other religious books, and many of the children are also attendants at day schools. By the census of 1841 the number of children between five and fifteen years of age, the period during which children generally commence and conclude their school education, was, in round numbers, 3,620,000, leaving nearly 800,000 unprovided for. But among the industrious and working classes comparatively few can afford to keep their children at school till they are fifteen, and the far greater portion will only be at school for periods of four or five years, or even less. It is not easy to test the amount of education imparted, but in the year ending July 30th, 1839, out of 121,083 marriages, 40,587 men and 58,959 women signed the register with marks, so that only 59·5 per cent. of the males could write, and only 41·1 of the women.

In 1851 the total number of children between five and fifteen, was 4,005,716. But, probably from the extension of infant schools, it was found by the census that a large number of children were sent to school at the ages of three and four, and therefore the number between three and fifteen is raised to 4,908,696, of whom 2,466,481 were boys, and 2,442,215 were girls. Of this number, beginning at five years old, 381,774 boys and 218,055 girls were employed. Between five and ten, upwards of 2000 boys are messengers; nearly 6000 are farm labourers; upwards of 5000 boys and 7000 girls are engaged in the cotton and woollen manufactures and in straw-plaiting; and 1209 boys and 11 girls in coal-mining. Between ten and fifteen the numbers employed in nearly every profession become very large, showing clearly that, though fifteen may be taken as one extreme of the period of education, the ordinary term seldom extends beyond twelve or thirteen. The demand for juvenile labour, and the prospect in a labourer's family of gaining an additional shilling or perhaps two shillings per week, must frequently overcome the prospective advantage of sending the children to a school, where the instruction gives little promise of promoting the child's pecuniary interest. To the number thus withdrawn from school, must be added a considerable number educated at home, sometimes by teachers and often by the parents themselves: the returns give 17,302 boys and 27,323 females, which there is little doubt represent those having teachers. Deducting these classes, we have 4,264,242 children who ought to be provided with the means of education. Though illness will, of course, prevent attendance, yet as it is not likely to be continuous through the period, we make no deduction on that account. To supply the want, the census return shows an attendance of scholars in day schools of 2,144,378, a proportion of one in 8·36 of the population, but little more than half of the number of children. The Sunday schools make an addition of 2,407,642, which carries the number above what is required; many, however, of the younger day-scholars attend them, and some of the employed may attend, but, as we have said, the education afforded at these schools is ineffective for practical purposes.

The Report gives a table showing the number of scholars for each year of age between three and fifteen, by which it would appear that the average attendance of scholars between their third and fifteenth year is five years, and between five and fifteen, four and two-fifths. What a child can learn from three years old to eight cannot be much, supposing it is kept at school for the five years, and then leaves, and is almost certainly lost when subsequently employed in labour, without the aid of secondary schools to keep their scholastic acquisitions in use. This is shown by the marriage registers for 1856, in which, out of 304,226 persons married, 44,806 men and 62,672 women signed with marks, or 34 per cent. of the whole. This is certainly a great advance on 1839, but as in the last eighteen years such great efforts have been made, a more satisfactory result might have been expected, although the greater part of the marriageable people must have received their education before the most material improvements had been introduced.

Great part of what we have written applies equally to Scotland and Ireland. Scotland shares in the Parliamentary grants we have enumerated, and has also adopted most of the extensions of school education we have mentioned. On the whole, in that country education is more widely diffused than in England, and in the parochial schools it is of a higher order, the teachers in most of them having received collegiate instruction; and mathematics and Latin, with occasionally Greek, is taught where the scholars are capable and desirous of receiving such instruction.

By the census of 1851, the population of Scotland was 2,888,742, and by the returns, the number of scholars was 368,517, or one scholar to every 7·84 inhabitants, but under the heading of 'Occupations,' the number returned as 'scholars' was 426,566, or one in every 6·87. In the latter number the term 'scholar' may have been loosely understood, but the probability is that all were being taught something. Of the number in the census return 205,348 were boys and 163,169 were girls, attending at 5342 schools. At public day schools there were 280,045 scholars, and at private day schools there were 88,472 scholars. It must be noticed, however, that the census includes all persons at school, and that of the 286,611 of whose teaching accounts were obtained, 17,768 were from fifteen to twenty and upwards. This would reduce the comparative number with England to rather more than one in every eight. Sunday schools are not so much frequented as in England. At the time of the census there were but 292,545 scholars, or little more than one in ten of the population. At adult evening schools there were, however, 15,071 scholars.

Of the total number of boys in the public day schools, out of 153,712 of whom information was given, 134,327 were being taught reading, 83,005 writing, 68,174 arithmetic, 42,282 English grammar, 48,802 geography, 6770 modern languages, 9111 ancient languages, 5400 mathematics, 4197 drawing, 31,887 music, and 1092 industrial occupations. Of 112,058 girls in public day schools, 98,612 were being taught reading, 51,890 writing, 34,495 arithmetic, 24,435 English grammar, 28,279 geography, 3990 modern languages, 556 ancient languages, 190 mathematics, 1570 drawing, 21,816 music, and 17,096 industrial occupations. The proportions are nearly the same in the private day schools. We may remark, however, that in the parochial schools music only means psalmody. A similar enumeration has not been given for England; only the number of schools in which such subjects are professed to be taught. In Scotland the average yearly salary of the parochial schoolmaster is 50*l*., with, in general, a residence; of the mistresses the salary is 16*l*., with a residence. In 1846 an Act was passed for amending the condition of parochial schoolmasters, but the improvement was not great, as is shown by the census returns.

In Ireland the endeavour to promote education has been constant, but till lately very ill-applied. Under Henry VIII. an Act was passed that every clergyman should teach the English tongue to all in his cure. By the 12 Eliz., cap. 1 (1570), a free school was to be established in every diocese. The statute of Henry VIII. was re-enacted under William III. Of course, the object in the two last-named reigns was that Protestantism should be taught; of course the schools were ineffective; and almost of course they became a mere form, the clergyman giving forty shillings a year to some one called a schoolmaster, and taking no further trouble. In 1731 'The Incorporated Society for Promoting English Protestant Schools in Ireland' was established, and was liberally assisted from the public funds. In 1741 they had formed 15 schools, at which they had educated 372 children (who were rigidly separated from their parents), and had expended 10,000*l*. These were the Charter Schools. In 1784, after an expenditure of 490,000*l*., the celebrated John Howard proved that the children were ill-treated, their education neglected, and that they were made to work for their masters, and yet only the children of Roman Catholics were admitted for the purpose of conversion. The Irish House of Commons admitted the facts, but continued to vote money. In 1803 orphans and children of Protestants were admitted as well as Roman Catholics, but with the same separation from their families as before. The number of scholars increased, but were still under 2000, and the annual cost was 35,000*l*., of which sum three-fourths were paid by the State. After a report on their condition in 1825, the government support was gradually withdrawn from them. But though these efforts utterly failed, the Irish poor were far from being an uneducated people. There were 'Hedge' schools, where the children of the peasantry were taught by the priest so effectually, that Wakefield in his 'Tour in Ireland' calls the Irish an "universally educated" people. In 1817 the Kildare Place Society began their operations. They were to form two model-schools in Kildare Place; they were to assist with grants the founding of schools; to receive and qualify masters and mistresses; to publish and furnish gratuitously proper books; to cause the schools to be inspected annually; and to encourage deserving masters and mistresses by gratuities. These schools were at first a success. They were supported by government grants, and were attended by scholars of all religious persuasions. In 1825 there were 1490 schools, and upwards of 100,000 scholars, but they at length became distasteful to the Roman Catholics. In 1831, therefore, after a Parliamentary inquiry, a Board of

National Education in Ireland was established, composed of eminent men from all the religious beliefs in Ireland, who were commissioned to draw up a scheme of instruction, and provide such books as were necessary, to enable the children of all creeds to attend them. This was done very successfully. The government were liberal in their grants; and at the close of 1833 they had established 789 schools which were attended by 107,118 scholars. These schools continued to thrive, and the government grants to increase. From 1848 to 1850 those grants were 120,000l. annually; in 1851, 134,560l.; in 1852, 164,577l.; in 1853, 182,073l.; in 1854, 193,400l.; in 1855, 215,200l; in 1856, 227,641l.; and in 1857, 213,000l.; a decrease arising probably from a decrease in the scholars attending the schools, in consequence of the large emigration of the few preceding years. The census returns of 1851, however, tell a very unsatisfactory tale. The total population of Ireland was 6,551,970; and the number of males who could neither read nor write was 1,202,650; of the females, 1,563,633. But in that year the number of the National Society schools had increased to 4704, there were 94 in progress of erection, and 13 had been suspended. The number of children on the rolls was 520,421; there had been 257 teachers trained in the school during the year, and 33 at their own expense. Of the 290, there were 21 of the Established Church, 39 Presbyterians, 2 other Protestant Dissenters, and 228 Roman Catholics. There were also 28 model and 37 ordinary agricultural schools, with 2003 pupils, of whom most pay either fully or in part. On Dec. 31, 1855, the number of schools was 5193, and the number of children on the rolls was 538,246, a decrease from 1854 (up to which year the number had regularly increased), probably arising in part from an unfortunate feeling of dislike taken to the schools by the Roman Catholic priesthood, and partly from the large emigration that had taken place from the kingdom. In 1855 the annual Report of the Church Education Society claimed 90,572 scholars, but these include "schools in connection;" and in 1851, under the same heading, they numbered 103,878 scholars. The Sunday schools in 1855 mustered 213,919 scholars.

In 1845 an Act was passed for endowing Maynooth College for the better education of the Roman Catholic priesthood. In the same year was also passed an Act "enabling her Majesty to endow new Colleges," in consequence of which the Queen's Colleges of Belfast, Cork, and Galway have been built and endowed. A sum of 100,000l. was assigned out of the Consolidated Fund for purchasing the sites, and erecting and furnishing the buildings of the three Colleges. Her Majesty and her successors were made visitors, with power to appoint, by sign manual, persons to execute the office. The appointment of the presidents, vice-presidents, and professors, was entrusted to the Crown, until parliament should otherwise determine. The Commissioners of the Treasury were empowered to issue annually a sum not exceeding 7000l. for the payment of salaries and other expenses in each college; it being moreover provided that reasonable fees should be exigible from the students. Lecture-rooms were directed to be assigned for religious instruction; and it was enacted that no student should be allowed to attend any of the colleges unless he should reside with his parent or guardian, or some near relation, or with a tutor or master of a boarding-house licensed by the president, or in a hall founded and endowed for the reception of students.

A president and vice-president for each college were soon after nominated, and the erection of the buildings was begun. The other appointments were made in August 1849, and the three colleges were opened in the end of October following. An additional sum of 12,000l. had shortly before been granted by Parliament for providing them with libraries, philosophical instruments, and some other requisites.

Originally it was intended that the number of professors in each college, exclusive of the president and vice-president, should not exceed twelve, and letters patent constituting them upon that basis were passed for each under the great seal of Ireland in December 1845. Afterwards it was determined that the number should be augmented for the present to nineteen, but that it should not at any time exceed thirty. The vice-president however is also a professor. New letters patent embodying that extended scheme were granted in favour of each of the three colleges in November 1849.

Under the existing constitution, then, the body politic and corporate of each college consists of a president, with a salary of 800l. and a house; a vice-president, with a salary of 500l. and a house; and professors of Greek, Latin, mathematics, history, and English literature, logic and metaphysics, chemistry, natural philosophy (each with a salary of 250l.), modern languages, natural history, mineralogy and geology (each with a salary of 200l.), English law, jurisprudence, and political economy, civil engineering, and agriculture (each with a salary of 150l.), the Celtic languages, the practice of surgery, the practice of medicine, materia medica, and midwifery (each with a salary of 100l.). There are also attached to each college a registrar (with a salary of 200l.), and a bursar and librarian (each with a salary of 150l.). A sum of 300l. annually is allowed for the payment of porters and servants. The total annual expenditure for salaries is thus (deducting 250l. for the professorship held by the vice-president) 5500l.

The remaining 1500l. of the annual charge on the consolidated fund is allocated to the payment of scholarships and prizes. The scholarships awarded at the commencement of the session at Belfast are: 48 of 24l. each to students of the faculty of arts; 4 of 20l. each to students of the faculty of medicine; 2 of 20l. each to students of the faculty of law; 2 of 20l. each to students of civil engineering; and 4 of 15l. each to students of agriculture; the number being equally divided in all cases between students of the first and students of the second year. The scholarships are all held for one year only.

The session in all the colleges extends from the third Tuesday in October to the second Saturday in June, and is divided into three terms by recesses of a fortnight at Christmas and at Easter. The fees for each class vary from 1l. to 2l. 10s.; and there is besides a payment from each matriculated student to the bursar on behalf of the college of 3l. at the commencement of the first year, and 2l. at the commencement of every subsequent year.

It had been all along contemplated that matriculation and attendance at these colleges, as at similar institutions established by public authority in our own and other countries, should conduct to graduation both in arts and in every other faculty, except only that of divinity; and all the regulations and arrangements of the academic curriculum in each have been moulded upon that understanding. It was a question however we believe, for a considerable time whether, with a view to the conferring of degrees and other purposes, each college should be erected into a distinct university, or the three constituted into one university. The latter plan has been adopted, undoubtedly to the placing of the new establishments in a greatly superior position to what they would have held if they had been left each to its provincial insulation; for it could never have happened that a mere Belfast, Cork, or Galway degree would have carried the same weight with one from the Queen's University in Ireland. In the letters patent creating such a university, her Majesty has declared that "graduates of our said University shall be fully possessed of all such rights, privileges, and immunities as belong to persons holding similar degrees granted them by other universities, and shall be entitled to whatever rank and precedence is derived from similar degrees granted by other universities."

The peculiarity of and the need for such colleges arose from the state of religious feeling in Ireland. The greatest proportion of the people are Roman Catholics, and there is a large number of Presbyterians; but in Trinity College, Dublin, there are no arrangements which even recognise the existence of any form of religious belief but that of the Established Church; not only is the student who may hold any other creed (in so far as such dissenting students are admitted at all) left without any spiritual superintendence whatever, but the entire system of teaching and discipline is in the hands of members of the Church established by law, and is regulated and administered in all respects in conformity with the doctrines and ritual of that Church. Freedom of admission to Oxford and Cambridge has always been one of the demands which Protestant Dissenters have urged most clamorously. Notwithstanding considerable opposition the experiment has succeeded. The colleges are attended by students of all religious creeds; but while thus free to all, the morals and the peculiar faith of the student is sedulously attended to.

Neither in England have the efforts to promote education been confined to the poor. At Durham the bishop and dean and chapter obtained an Act of Parliament in 1832, authorising the institution and endowment of a university, which was opened for students in October 1833. In 1837 a royal charter of incorporation was obtained by which the style and title of 'the Warden, Masters, and Scholars of the University of Durham' was given to the institution. The charter gave the power of conferring degrees, and confirmed the rights and privileges assured to it by Act of Parliament, usually enjoyed by chartered universities. The bishop is appointed visitor; the dean of Durham is constituted warden. To the professorships of divinity and ecclesiastical history and of Greek and classical literature, which are both in the patronage of the bishop, canonries in the cathedral are annexed. The professor of mathematics and astronomy, the readers in law, Hebrew, history and polite literature, and natural philosophy, the lecturer of chemistry and mineralogy, and other officers of the university, are appointed by the dean and chapter. Of University College the warden of the university is master. Bishop Hatfield's Hall, instituted in 1846, is for divinity students. It has four tutors, one of whom is principal, a censor, and a chaplain. The academical year consists of three terms of not less than eight weeks each, which are called Michaelmas, Epiphany, and Easter Terms. The age of admission to the academical course is from 16 to 21; and for the divinity course, between 21 and 26; beyond this age students must be admitted by special leave. Care has been taken that the necessary expenses of students should be as moderate as is consistent with comfort, and any approach to extravagance is sedulously guarded against.

In 1854 an Act of Parliament extended the right enjoyed by the graduates of Oxford and Cambridge to practise physic without farther examination, to the graduates in medicine of the University of London. In the same year by another Act, a commission was appointed to draw up regulations for the improvement of Oxford University, and in 1857 a similar one was passed for Cambridge. Under these commissions many valuable improvements have been effected, and more may be confidently expected. Among those effected are the breaking up of the close scholarships (especially those of Winchester school) and throwing them open to general competition; the dispensation with the taking of a number of unnecessary oaths; the establishment of private halls; and the abolishing of the oath on matriculation and on taking the degree of B.A.; by which last regulation Dissenters are admitted to the whole advantages of a university education. In Scotland also an agitation is being made for some improvement in the universities.

SCHORL. [TOURMALIN.]

SCHUMACHER, HEINRICH CHRISTIAN, was born on September 3, 1780, at Bramstedt in Holstein. He distinguished himself by his mathematical proficiency and by his predilection for astronomy. At the age of thirty he was created professor-extraordinary of astronomy in the university of Copenhagen, whence he was called in 1813 to be director of the observatory at Mannheim, returning to Copenhagen in 1815 as professor of astronomy and director of the observatory there. In 1817 he was employed by the Danish government to measure the degrees of longitude from Copenhagen to the west coast of Jutland, and those of latitude from Skagen, the northern cape of Jutland, to Lauenburg, on the frontiers of Hanover; afterwards continued through Hanover by Gauss. In 1821 he received from the Royal Scientific Society of Copenhagen the direction of the survey and mapping of Holstein and Lauenburg; and in that year the king caused a small but excellently furnished observatory to be built for him at Altona, where he resided till his death. In 1824, in conjunction with the English Board of Longitude, he fixed the measure of differences between the observatories of Greenwich and Altona, for which purpose the English admiralty furnished a steam-vessel, provided with twenty-eight English and eight Danish chronometers. In 1830 he was employed in ascertaining the length of the seconds' pendulum, which had been made the base of the Danish scale of measures. In 1813 he commenced the publication of the 'Astronomische Nachrichten,' a work that is still continued, and is the only one that serves as a vehicle for the communication of opinions and facts from the astronomers of all the world, and contains a number of highly valuable essays. From 1820 to 1829 he published his 'Astronomische Hülfstafeln,' a good example of a carefully calculated ephemeris. In 1836 in conjunction with Bessel he undertook the editing of the 'Astronomischen Jahrbuchs.' He was a diligent and correct observer; in 1822 he announced the exact distances of Venus, Jupiter, Mars, and Saturn from the earth; and the phenomena connected with Encke's planet Astræa attracted much of his attention in the latter part of his life. He died at Altona on December 28, 1850. Schumacher united great talents with much modesty. He enjoyed the confidence of his sovereign, which he repaid by his diligent services, and he uniformly treated his fellow-labourers with the greatest courtesy, and imparted his assistance with unostentatious liberality.

SCHUMANN, ROBERT, a composer who has a great reputation in Germany, but whose works are little known in this country. He was born about the year 1815, and spent a retired and uneventful life, chiefly at Leipzig, immersed in the study and practice of his art. His excessive application disordered his mind; and when he died, July 29, 1856, he had been several years the inmate of a lunatic asylum. He married Clara Wieck, the most celebrated female pianist of the day, who, with several children, survives him. Schumann was undoubtedly a man of great genius; but he has injured his reputation with his contemporaries by his endeavours to found a musical school, or sect, professing to disregard the authority of the older masters, and to establish a new system of musical composition. As music has always been in a progressive state, posterity may perhaps do him justice by adopting his innovations of style. His only work of magnitude which has been publicly performed in England is a cantata, 'Paradise and the Peri,' the words of which are a translation of a part of Moore's poem. It was produced at one of Philharmonic Society's concerts in 1856, when the principal part was sung by Madame Goldschmidt (Jenny Lind); and, though our critics were at variance respecting its merits, yet it was generally regarded as a work of no ordinary power and beauty.

SCHWANTHALER, LUDWIG MICHAEL, one of the most eminent of modern German sculptors, was born at Munich on the 26th of August 1802. For some generations his ancestors had been sculptors in the Tyrol; his father, Franz Schwanthaler, was settled in Munich, where he acquired a very respectable standing as a monumental sculptor. Ludwig received a good classical and general education; and being intended to pursue the family calling, was early initiated into the arts of drawing and modelling, and the use of the chisel, in his father's studio. At the Munich Academy of the Fine Arts he was regarded with coldness if not dislike on account of his free notions in art, by Von Langer the director, who is said to have urged his friends to devote him to some other profession. The death of his father in 1821, by rendering it necessary that he should conduct the business for the maintenance of the family, fixed his destiny as a sculptor. The first commission which opened to him a prospect of making himself known was one from the King Maximilian Joseph in 1824, to design a centre ornament in silver for the table. It was to be of very large size, and the figures in relief, each about six inches in height, were to represent the procession of the gods of Olympus to the palace of Jupiter. So much as was executed is described as being very beautiful, but the death of Maximilian (October 1825) prevented its completion.

Schwanthaler now proceeded to Rome, where he remained a year, deriving great benefit from the advice and friendship of Thorwaldsen. He carried back with him to Munich two elegant bassi-rilievi of the 'Birth of Venus' and 'Cupid and Psyche,' and through the influence of Cornelius he was employed to execute two extensive Homeric bassi-rilievi friezes for the Glyptothek, then in course of construction. Among other works which about this time he produced were a statue of Shakspere for the theatre, and a grand basso-rilievo frieze, extending in all to a length of 150 feet, of the 'Apotheosis of Bacchus' for the dining-room of the palace of Duke Maximilian. In 1832 he again went by desire of King Ludwig to Rome, to complete Rauch's design for the south pediment of the Walhalla as well as to execute various other royal commissions for the new palace.

From the period of his return in 1833 his life was one of unceasing activity. The admitted head of the sculptors of Munich, the professor of sculpture (from 1835) in the Academy there, and the favourite of the art-loving King Ludwig, whose constant guide and assistant he was in planning and working-out the sculpturesque decorations of his vast architectural undertakings, Schwanthaler produced in rapid succession an astonishing number of works of unusual magnitude and grandeur, and was the centre of a crowd of able and devoted scholars and assistants. During the few remaining years of his life, all spent in ill-health, he executed a succession of great works, such as would seem more than enough to have tasked the energy and industry of the most indefatigable and laborious workman whose days had been extended to the longest span, and who had been blessed with the most robust health.

We can name but some of his more prominent works. The southern pediment of the Walhalla at Ratisbon, filled with a design intended to typify the liberation of Germany from the French, was only in part by him; but the design in the northern pediment, a later work, was wholly by himself, and was of a much higher order of merit. It is called the 'Hermann-Schlacht,' or 'Battle of Arminius,' and is one of the finest renderings of old Teutonic story which has ever been realised by the sculptor's chisel. He also executed some of the statues in the Walhalla, and the fourteen caryatides representing the Walkyren of the Teutonic mythology. For Ludwig's New Palace (Neue Königsbau), Schwanthaler not only executed several friezes and statues, but made the cartoons for numerous pictures which were painted in encaustic by Hiltensperger, Streidel, and others. Among these are a series of twenty-four compositions from Æschylus, twenty-one from Sophocles, twenty-seven from Aristophanes, a series from the tales of the Argonauts, another from the 'Works and Days' and the 'Shield of Hercules' of Hesiod. His most famous piece of sculpture here is however the 'Myth of Aphrodite,' but the story of Venus was never more coldly told. For the Fest-Saalbau he designed the two lions, and the eight figures representing the eight circles of Bavaria, on the entablature; the frieze in relief of the 'Crusade of Barbarossa' ('Der Kreuzzug des Kaisers Friedrich Barbarossa'), placed above the paintings by Schnorr [Schnorr, Julius von Karolsfeld, *S.* 2], one of his best works; the bassi-rilievi of Greek Dancers in the Ball-Room; and the twelve colossal gilt bronze statues of the princes of the House of Wittelsbach, in the Throne-Room, &c. For the façade of the Pinakothek he executed statues of twenty-five of the greatest painters. For the pediment of the New Art-Exhibition Gallery (Neue Kunstanstellungs-Gebaüde) he executed a representation of the Arts placing themselves under the protection of Bavaria. For the magnificent Ludwigs Kirche he modelled statues of Christ and the four Evangelists, which are placed in a row of niches over the porch, and for the ends of the gable two colossal statues of St. Peter and St. Paul. There are also by him in Munich statues, some of them of colossal size, and most of them in bronze, of Count Tilly, Field-Marshal Prince Wrede, Kreitmayer, the author of the Bavarian code, and one or two others. But the chief work with which he adorned his native city was his immense statue of Bavaria, which occupies the centre of the Bavarian Hall of Fame (Bairische Ruhmershalle). Bavaria is represented as a maiden crowned with the oak-garland; one hand is stretched out, and holds a laurel crown, the reward of merit; the other presses a sword against her bosom, to defend her independence; by her side reclines a lion. The group, which is of bronze, exceeds in magnitude any other modern work. The figure of Bavaria is about 60 feet high, that of the lion is nearly 30 feet; the pedestal is 28 feet high: a staircase inside leads up to the head of Bavaria, which is large enough to contain several persons. This vast work was commenced in 1844, but neither the sculptor nor the founder of this unparalleled work [Stiglmayer, Johann Baptist, *S.* 1], lived to see it placed on its pedestal. It was inaugurated with great ceremony, October 9, 1850. Remarkable as this work is for its size, it is equally so for its grandeur. It was the crowning work of Schwanthaler's life, and as long as it endures it will be the most impressive monument to his genius. The Ruhmershalle however conains other proofs of his versatile imagination. In the ympana at the end of the wings of the building are four ecumbent figures by him, representing the four national divisions of the kingdom, Bavaria, the Palatinate, Swabia, and Franconia; and the frieze contains 92 metopes, all of hem designed by him: 44 containing figures of Victory, and the remaining 48 the arts and occupations of civilised ife.

Among important public works which he designed for ther places may be mentioned, his grand fountain in the Neumarkt, Vienna, around the basin of which he has placed gures typifying the Enns, Ips, Traun, and March, the four rincipal rivers of the archduchy of Austria, pouring their waters into the Danube, which is represented by a colossal gure in the centre; another and finer fountain in the reiung, Vienna, in which are five beautifully designed bronze figures of Austria with her four great rivers, the Danube, Vistula, Elbe, and Po; the monument of Carl Friedrich, grand-duke of Baden, with its four allegorical figures, at Carlsruhe; monumental statues of the Emperor Rudolf von Habsburg at Spire, King Charles John of Sweden, the Grand-Duke Ludwig at Darmstadt, Mozart at Salzburg, Göthe at Frankfurt, Jean Paul Richter at Baireuth, and many more, one of the more remarkable being a series of twenty statues of eminent Bohemians for a national monument at Liborch, near Prague, which however he left unfinished. Among the works executed for private patrons we can only name his statues of Venus, Apollo, Cupid, Diana, Vesta, Ceres, Bacchus, Pan, various nymphs, and the like, from the Grecian mythology; statues and statuettes of knights and old Teutonic heroes; and a vast number of sepulchral and portrait statues, busts, and medallions, which are to be found not merely in the princely galleries and churches of Bavaria and Austria, but scattered throughout Germany, and occasionally in England.

Ludwig Schwanthaler died—his feeble frame, it is said, literally worn out by his unceasing labour—on the 17th of November, 1848, having only a few months before completed his forty-sixth year. The above very incomplete enumeration of his works will more than suffice to show the wonderful energy and industry of the man; but it is necessary to examine the works themselves to form a just estimate of his various and apparently inexhaustible genius. It will not of course be supposed however that he accomplished the impossible task of carving all these works with his own chisel. From the establishment of his studio at Munich he had about him a large body of pupils, some of whom have since come to be among the more eminent of living German sculptors, and to them was in most instances entrusted the duty of carrying out the designs of the master. But Schwanthaler himself was a rapid, often an impatient designer, and hence, the imperfect design being left to be completed by insufficiently experienced assistants, it not seldom happens in his less important works that there is an absence of finish, an appearance of carelessness even, which is disappointing to the spectator and injurious to the reputation of the sculptor. Schwanthaler's strength is seen in his realisation of old Teutonic fable and history, like his Hermann-Schlacht, or those types of German ideas, such as he has so grandly presented in his 'Bavaria.' Among the Grecian deities he falls into the old conventionalisms, or Germanises the Hellenic thought.

By his will Schwanthaler bequeathed to the Munich Academy of the Fine Arts his studio, with models of all the principal works executed by him. The studio stands opposite to the house in which he died, in the street named in honour of him, the Schwanthalerstrasse, and in it is carefully preserved the extensive collection of his works. It is open daily to the public, and is one of the great art-sights of the German metropolis of art. The Crystal Palace at Sydenham contains casts of the head of the colossal 'Bavaria,' the 'Shield of Hercules,' and several other of Schwanthaler's productions.

SCIENCE AND ART, DEPARTMENT OF. This department of the Committee of Privy Council on Education owes its origin to the suggestions contained in the Second Report of the Commissioners for the Exhibition of 1851. After urging the necessity of the industrial classes of this country receiving more systematic instruction in science and art in order to enable them to maintain their pre-eminence in the neutral markets of the world, the Commissioners impressed on the government the advantages which would result from bringing the various institutions connected with science and art that were supported by the public funds, into close connection with each other, instead of their remaining under different departments of the government. The government took a favourable view of the suggestion; and as a part of the "comprehensive scheme for the advancement of the fine arts and of practical science," announced from the throne at the opening of the session of 1852-53, the Lords of the Treasury, in March 1853, gave their formal concurrence to the proposed arrangement of the Privy Council to "unite in one department, under the Board of Trade, with the Departments of Practical Art and Science, the kindred and analogous institutions of the Government School of Mines and Science, the Museum of Practical Geology, the Geological Survey, the Museum of Irish Industry, and the Royal Dublin Society, all of which are in part supported by Parliamentary grants;" and, the Treasury minute proceeds, "my Lords have given directions that the estimates for all these institutions shall be brought together under the general head of 'Board of Trade Department of Science and Art.'" The immediate purpose of this amalgamation, it was declared, was to bring the whole of these institutions under one common superintendence, to establish a central metropolitan school of practical science as well as of art, and to encourage and extend the formation of minor local institutions which should be in connection with, and assisted by, the central institutions, but as far as possible self-supporting and under the management of the local authorities.

As was said above, the institutions thus brought together under one department, were all in part supported by Parliamentary grants. The sums voted for each in the year previous to the amalgamation were: Government School of Mines and Science, 800*l.*; Museum of Practical Geology, 5272*l.*; Geological Survey, 5500*l.*; Museum of Irish Industry, 3348*l.*; Royal Dublin Society, 6340*l.*; Department of Practical Art, including the provincial Schools of Design, 17,920*l.*; in all 39,181*l.*; but the sum actually granted was 41,586*l.*, additions having been sanctioned of 150*l.* to the School of Mines, and 2255*l.* to the Department of Practical Art.

Of these institutions the character may be briefly indicated. The Government School of Mines and of Science applied to the Arts was founded in 1851, in consequence of memorials addressed to government by the mining districts of the United Kingdom, in which it was shown that the schools for the instruction of persons engaged in mining pursuits by various Continental governments had much increased the economy, efficiency, and safety of mining operations in the countries in which they had been established, and that the want of similar schools had long been felt in the mining districts of this kingdom. The Government School of Mines was accordingly opened in connection with the Museum of Practical Geology in 1851. It is now merged in the Metropolitan School of Science applied to Mining and the Arts, which forms one of the two great branches of the department which is the subject of this article.

The origin and purpose of the Museum of Practical Geology were stated under the head MUSEUM OF ECONOMIC GEOLOGY, *S.* 1 (vol. ii. p. 340), and it will be enough to add here, that it was in 1850 removed to the building erected for its reception in Jermyn Street, St. James's—now the head quarters of the Metropolitan School of Science. Ever since the establishment of the Museum, the Geological Survey of the United Kingdom has been carried on in connection with it, and thus extensive collections have been formed, and are continually augmenting, illustrative of the structure of the British Islands, and of the applications of geology to the useful purposes of life. The geological survey has been proceeding simultaneously throughout the United Kingdom, and in England and Ireland has advanced far towards completion. In Scotland it has, however, made but little progress owing to the maps of the Ordnance Survey of Scotland having been only recently issued.

To these metropolitan scientific institutions we may add the Royal College of Chemistry, founded in 1845, it having been, in 1853, transferred to the Department of Science and Art.

The Department of Practical Art was a development, or rather reconstitution of the central Schools of Designs of which a full account is given under DESIGN, SCHOOL OF, *S.* 1 (vol. i. 473). The Department of Practical Art was created but a short time before its amalgamation with the other institutions in the Department of Science and Art, and before it had come into full operation as a separate institution.

The Royal Dublin Society for the Improvement of Husbandry, Manufactures, and other useful Arts and Sciences, was founded in 1731, and incorporated by royal charter in 1749. It possesses a valuable museum of natural history; an agricultural museum; an excellent library; a museum of sculpture, casts, &c. From its establishment, we believe, it has had its schools of painting, sculpture, and the fine arts, from which many of the best native artists have proceeded. It has also a good chemical laboratory; and a convenient theatre for the delivery of lectures. The Botanic Gardens at Glasnevin belong to the Society, and the Zoological Gardens, Phœnix Park, are in connection with it. Though amalgamated with the Department of Science and Art, the Society is conducted wholly by its own council, the duties of the department being confined to supervision and suggestion.

The Museum of Irish Industry was established by the Government in 1845, and placed under the direction of Sir Robert Kane, so honourably distinguished for investigations in connection with the industrial pursuits of Ireland. In object, the Museum of Irish Industry resembles pretty closely the London Museum of Practical Geology, but takes a somewhat wider and more diversified range. It has a staff of professors who lecture in the theatre of the Royal Dublin Society, the professors since the union with the Department of Science and Art, being common to the two institutions. The system of lectures, which has some peculiarities, is an extension of that previously adopted by the Royal Dublin Society. Short courses are given during the day, chiefly to the upper classes; and other courses are given in the evenings chiefly to the sons and assistants of persons engaged in trade, and to artisans. Examinations take place at the end of every course, when prizes are awarded to the more successful students, and a general competitive examination is held at the end of every year. In addition to this, lecturers on science are sent to the provincial towns, and local examinations take place at stated periods in connection with their instruction.

The institutions which were united to form the Department of Science and Art, it will have been noticed, all belonged to England and Ireland. But in 1854 the necessary steps were taken for the formation of a National Museum of Industry for Scotland, similar to those of London and Dublin. A site was purchased by the government near the University of Edinburgh for the building; and the museum belonging to the town-council, and the valuable collection of models, minerals, &c., of the Highland Society, was transferred to the Crown, and thus an excellent basis was obtained for the proposed museum. These collections are at present exhibited in the University, and lectures are given in connection with them by competent professors.

The Department of Science and Art was originally constituted a section of the Board of Trade, but in February 1856 it was, by an Order in Council, transferred to the Committee of Privy Council on Education. Of that Committee it now forms a distinct division: its functions having reference to the secondary instruction of all classes of the community in those principles of art and science which conduce to the industrial interests of the country, while the functions of the other division of the Committee of Education refer to the primary instruction of the young; the two divisions being kept entirely unconnected. The Department itself consists of two sections—a School of Science, with its connected museums and affiliated institutions, having its head-quarters at Jermyn Street, and a School of Art, with its various collections and associated schools, having its head-quarters at South Kensington, where also are the offices of the Department. The sum voted for the Department of Science and Art in 1857 was 73,855*l.*, being an increase of 9180*l.* over the previous year, and 32,269*l.* more than the vote for the several institutions prior to their consolidation.

It remains to notice shortly the present position of the two sections of the Department. The Metropolitan School of Science, applied to Mining and the Arts, has, in the words of the official prospectus, "for its chief object and distinctive character (to which everything else is subsidiary), to give a practical direction to the course of scientific study." And the course of instruction which is imparted to the student, while it does not profess to qualify him to undertake the direction of mining or other technical operations, is intended, in combination with future training, to "render him in the highest degree competent, not only to engage in any special branch of industry, but to promote its further development." The institution is under the general supervision of a director, Sir R. I. Murchison, the eminent geologist, who succeeded the late Sir H. T. de la Beche, and the instruction is given by professors of Chemistry, Natural History applied to geology, Physical Science, Applied Mechanics and Mechanical Drawing, Metallurgy, Geology, and Mining and Mineralogy, each men of the highest standing in their respective departments. The mode of instruction is by lectures, by written and oral examinations, by practical teaching in the laboratories and drawing office, and by field surveying and geological and natural history excursions. The field of study is separated into—a general division, for those who desire a general knowledge of science; a mining and metallurgical division; a technical division for those who propose to engage in arts or manufactures depending chiefly either on chemical or on mechanical principles. For each of these divisions the course of study extends over two years, of three terms in each. Students must be at least 16 years of age on admission. Several exhibitions have been founded, to be competed for by matriculated students. The lectures are open to occasional or non-matriculated students, on payment of a somewhat higher fee; and special short courses of evening lectures, at an extremely low fee, are given every session to working men only, and are attended always by as large a number (600) of diligent students of that class as the theatre will accommodate.

The Metropolitan School of Science enjoys rare advantages from the ready access which the students have to the treasures accumulated in the Museum at Jermyn Street. These, as was said above, consist of the extensive and admirably arranged collections formed during the progress of the Geological Survey of the United Kingdom, "illustrative of the structure of the British islands, and of the applications of geology to the useful purposes of life," under the able directors and indefatigable staff of the Survey. To these have been added a numerous selection of models of mines, mining tools, and working models of mining machinery; and of tools, and models, and specimens of machinery for general purposes. The Museum is open gratuitously to the public during five days of the week.

The maps and sections of the Geological Survey, and a large collection of plans and sections of mines, &c., belonging to the Mining Record Office, are deposited in the building in Jermyn Street. The chemical laboratories are those of the Royal College of Chemistry in Oxford Street, which, as already mentioned, became in 1854 the property of the Government.

In connection with the Metropolitan School of Science, Special Schools of Science have been established since 1853 in several of the large manufacturing, mining, and pottery towns. These schools—of which there are, we believe, nine in operation—in accordance with the principle laid down by the government on the formation of the Department of Science and Art, are in a great measure self-supporting, the Department exercising a certain amount of control, and, in return, affording a limited pecuniary aid to certified masters of the schools. According to Dr. Playfair, the Chief Inspector of Science Schools, and Scientific Referee of the Department, "some, in fact all, of these schools are successful as to the disposition of the working classes to support them; but even those most numerously attended and increasing in numbers, running the risk of abandonment at any time, because, with one or two exceptions, the expenses are greater than the receipts." Dr. Playfair is, in short, of opinion, from his experience as inspector of these schools, that the "system of self-support is not adapted to secondary schools of science, having only a constituency of working classes to support them."

But another class of schools has been established in connection with the Department, which appears to have been on the whole more successful. These are called Trade and Navigation Schools, and are intended to afford instruction to officers of the mercantile marine on the subjects of their examination for certificates of the Board of Trade, and similar instruction to youth about to enter on a seafaring life. Besides three in London, Trade and Navigation Schools have been opened in nine of the principal outports, and could be readily established in other shipping towns if the Department could train masters fast enough to meet the demand. One of these schools had "its present locality," when Dr. Playfair wrote, "somewhere in the ocean between England and India;" Mr. Green, of Poplar, having fitted out "one of his finest ships as a School of Navigation, carrying a number of midshipmen under one of our [the Department] masters, who is bound also to instruct the common sailors in the principles of navigation." An example which might be well followed in our naval as well as mercantile marine.

The Art Schools are of older date than the Schools of Science, and, appealing to a wider circle, have almost necessarily made greater numerical progress. The Art branch of the Department has, as we have already said, its head-quarters at South Kensington, on the estate purchased by the Commissioners of the Exhibition of 1851 [Exhibition of 1851, *S.* 2], and is a development or reorganisation of the old Schools of Design, whose history and constitution are given elsewhere. [Schools of Design, *S.* 1]. As at present organised, the special objects of the Art section of the Department are, in the words of the official programme—"1. To train male and female teachers to give instruction in Art, to certify them when qualified, and to make them annual fixed payments, varying according to their acquirements. 2. To aid and assist Committees in the provinces desirous of establishing Schools of Art. 3. To hold public inspections and examinations, and to award medals and prizes to the most deserving candidates. 4. To collect together works of art, pictures, &c., in the central Museum, and books and engravings in the central Library. 5. To circulate among the Schools of Art objects from the Museum, and books and engravings from the Library."

The buildings at South Kensington include the offices of the Department, the Training School for Masters and Mistresses, the Normal Central School of Art, the Art Library, and the various Art collections.

"The Training School has for its special object the education of Art-teachers, male and female, but it also aids in supplying certificated Art-masters or mistresses to teach drawing to schools in connection with the Committee of Council on Education. The course of studies embraces, besides all the ordinary branches of Art-Education, instruction in various direct applications of Art-power to mechanical and manufacturing industry. It comprehends the following subjects:—Free-hand, architectural, and mechanical, drawing; practical geometry and perspective; painting in oil, tempera, and water-colours; and modelling, moulding, and casting. These classes include architectural and other ornaments, flowers, landscape, objects of still-life, &c., the figure from the antique and the life, and the study of anatomy as applicable to Art; and some technical studies, such as enamel painting, and drawing and engraving on wood. The students have full access to the Museum and Library, either for consultation or copying, as well as to all the public lectures of the Department. Special classes are arranged in order to qualify schoolmasters and schoolmistresses of parochial and other schools to teach elementary drawing as a part of general education."

The collections brought together at South Kensington are already of great value and interest, and they are rapidly increasing. The Museum of Ornamental Art has been formed entirely by the Department. It was commenced in 1852, when a suite of rooms in Marlborough House was appropriated to its reception. It was removed to the new buildings, South Kensington, in February, 1857. It embraces the entire circle of ornamental art, and already includes the richest collection in existence of majolica and other examples of ancient, as well as many most admirable specimens of modern, ceramic ware; a fine collection of old furniture of an artistic character; watches, jewellery, and enamels; stained glass windows; casts, engravings, and photographs of fine specimens of ornamental art from the Imperial Collections of France and elsewhere; casts of classical, mediæval, and renaissance architectural ornaments, &c. There are also deposited in the Museum buildings rich trade collections; a collection of animal productions; educational collections; models of patented inventions (deposited here by the Commissioners of Patents); a collection of original statues and casts by British artists, lent for a stated period by the sculptors or owners of the works, &c. The very fine gallery of British Art, containing no less than 234 oil paintings, and a considerable number of sketches, by eminent living, or recently deceased. British painters—the munificent gift of Mr. Sheepshanks to the nation—is also, by his desire, deposited in a building erected for it, in immediate contiguity with the Museum; it having been "given for the purpose, as the primary object, of being used for reference and instruction in the Schools established in connection with the Department of Science and Art." All these collections are open free to the public on three days of the week; on the other three days (being 'students' days') the public are admitted on payment of 6*d.* each person. The collections are also opened to the public free on two evenings of the week—an innovation which has proved exceedingly popular. To the Art Library—a very excellent one—though formed primarily for the students, any person is admitted on payment of a trifling fee, which affords access for a week. Evening lectures to working men are also occasionally delivered in the Museum.

In connection with the Central School of Art there are seven Metropolitan District Schools, and one school for female students only. The provincial Schools of Art have increased greatly in number since the formation of the Department. These schools are, like the Schools of Science, in the main self-supporting, but the Department assists in paying the certified teachers, and in various ways aids in providing the school materials, and in rendering assistance to the institution. They are now in all sixty-nine in number; and at the last return they were the means of affording instruction in drawing and painting to upwards of 35,000 students—but this number "includes children in poor schools under instruction in drawing," who can hardly in fairness be ranked as Art-students. The Department, in fact, now, besides the training which it affords in its central and metropolitan schools, and the Special Provincial Schools of Art in connection with it, proffers the services of a certified teacher in drawing to any school or schools, furnishing an aggregate of 500 children for instruction in drawing; and it further offers the aid to such schools of examinations and prizes, at stated periods. It is intended also, as soon as arrangements can be made, further to extend the aid of the central institution to local schools and provincial towns, by sending any object or class of objects contained in the Museum for exhibition and study upon application from the local authorities.

SCIRE FACIAS. A simpler, less expensive, and less dilatory method of proceeding than that by *scire facias*, has been provided by the Common Law Procedure Acts, 1852 and 1853. The former statute has at the same time extended the period during which execution may issue, from a year and a day to six years. In case of a change by death, marriage, bankruptcy, or otherwise, in one of the parties to an action, the representative of that party may enter a suggestion of the fact, and put himself in his place. The opposite party is also enabled to call upon the representative to do so, and if he fails to stop the proceedings. The proceeding by suggestion on the roll is adapted to the most simple cases of change in the parties to a suit. If it be not adopted, a writ of *Revivor*, as it is now called, may be issued, the object of which is the same as that of a *scire facias*. It is however directed to the party and not to the sheriff, and may be served anywhere. The writ of *sci. fa.* was directed to the sheriff of the county where the *venue* in the original action was laid, and was served by him. The subsequent proceedings in Revivor resemble those of an ordinary action. The writ of *scire facias* in Chancery to repeal patents is not affected by the above-mentioned statutes. Nor is the writ of *sci. fa.* itself abolished. In some cases it is still the only method of proceeding; for instance, to enforce a judgment against the *terre tenants* of a deceased judgment debtor.

SCILLITIN. [Chemistry, *S.* 1.]

SCITAMINACEÆ, a natural order of plants embracing the *Marantaceæ*, with 1 anther-valve, and the *Zingiberaceæ*, with 2 anther-valves. The separation of these orders is now generally recognised. [Marantaceæ; Zingiberaceæ.]

SCOMBERESOX, a genus of Fishes belonging to the family *Esocidæ*. The only British species of this genus is the Gar Pike or Skipper, called also Gowdnook in Scotland. It was first described as a British species by Ray. It is not an abundant fish, but has been taken off Berwick and Yarmouth, and Portland Island, and on some occasions has been even plentiful on the coasts of Scotland. [Esox.]

SCOPELIDÆ, a family of Malacopterygious Abdominal Fishes. This family is closely allied to the *Salmonidæ*. They have the snout short, the mouth deeply cleft, the teeth rather small and sharp; the branchial rays 8 to 15; the first dorsal behind the ventral; the body in some is semitransparent.

The genus *Scopelus* is found in the Mediterranean.

(*Manual of Natural History.*)

SCORESBY, WILLIAM, was born in 1790, and commenced his nautical life only ten years afterwards, accompanying his father, William Scoresby, likewise a distinguished North Polar navigator, in the Dundee, on her voyage of the year 1800. The passion for naval enterprise which the child's examination of the ship had evoked, was confirmed by his first voyage, and in 1803 the father and son sailed together in the ship Resolution of Whitby. This they continued to do for the ensuing eight years, the sedulous junior keeping a regular journal of their voyages. He was promoted in succession, as he became qualified, without being unduly favoured, through all the gradations of the service, until he was appointed chief mate of the ship; which responsible office he held in his sixteenth year. The long intervals during which, from the nature of the whale-fishery, the ships were laid up in winter, were devoted by the young navigator, with the sanction and to the great satisfaction of his father, to regular study, and for a considerable portion of two sessions, at Edinburgh, where he secured the friendship of the late Professor Jameson and other professors of the university, and also of Dr. (now Sir David) Brewster. He thus acquired that definite knowledge of the principles of the various branches of science bearing upon his peculiar profession, which enabled him to extend them, by his own observations, in the voyages to the Arctic regions which alternated with and succeeded these periods of intellectual culture.

While filling the stations respectively of commander and chief-mate of the Resolution in 1806, the Scoresbys sailed to a higher latitude than had been reached before. In May of that year they were successively in 80° 50′ 28″, N. lat., 81° 1′ 53″, and 81° 12′ 42″, and once, by estimation, as far as 81° 30′, the nearest approach to the pole—within about 510 miles—at that period authenticated. It has been exceeded only by the late Admiral Parry [Parry, William Edward, *S.* 2], who, in his celebrated boat expedition, during his fourth voyage, in 1827 reached 82° 45′, the highest point yet attained; but this was accomplished by travelling across the ice, which had to be commenced on gaining the latitude of 79° 55′ 20″, inferior to that attained by the Scoresbys by ordinary sailing, and the honour still remains theirs of having in ordinary sailing navigated the highest northern latitudes. It may be remarked here that the boat expedition had itself been adopted from a suggestion made by the younger Scoresby (in a proposition which had been rejected by the Admiralty), but had not, in his opinion been properly executed. It was always his conviction that by such an expedition, if carried out according to his views, the pole itself might have been arrived at; and at a later period he had the satisfaction of learning that Parry himself had expressed the same conviction. It is proper to note in this place, in order to preclude error, that the surgeon of the Resolution in this voyage, states, in an 'Account of a Voyage to Spitzbergen,' and in a manner taking the achievement to himself, that the highest latitude attained was 81° 50′, but this, as Dr. Scoresby has explained in his 'Memorials of the Sea,' p. 153, is erroneous; the highest latitude observed being 81° 12′ 42″, as already stated. The Resolution was the property of a co-partnery, of which the senior Scoresby was one, and—influenced in a considerable degree by a kindly and parental regard for his son—he formally resigned his command in 1811, on the very day on which the subject of this notice completed his twenty-first year; and on the same day, the earliest at which he could legally hold a command, William Scoresby junior was unanimously elected his father's successor.

In consequence of information communicated by Captain Scoresby to Sir Joseph Banks, the President of the Royal Society, the attention of the council of that learned body and of the government was directed in 1817 to the dormant enterprise of endeavouring to reach the North Pole and discovering the long-sought North-West passage; the latter of which objects has at length been accomplished by Sir Robert MacClure in one of the recent searching expeditions for the ill-fated Franklin. Sir Joseph Banks was very desirous that his young but experienced friend should be employed in the proposed adventure, his father having deferred the fitting out of the ship Fame, which the son was to command, under the idea that she might be taken up for service. Their expectations however were altogether disappointed, and as is well known, Captain (the late Sir John) Ross with the Isabella and Alexander, and Captain Buchan with the Dorothea and Trent, were appointed to make the attempt. It appears to be the policy, not perhaps to be discommended on grounds of national justice however the consequences of it may be regretted in particular instances, of the Board of Admiralty, to reserve these arduous expeditions and others destined for marine scientific research, as the encouragements and rewards of an inevitably laborious and ill-paid service. The history of this subject will be found in a paper by Dr. Scoresby, 'On some circumstances connected with the Original Suggestion of the Modern Arctic Expeditions' published in the Edinburgh New Philosophical Journal, vol. xx. 1835-36.

Having made seventeen voyages to the Spitzbergen or Greenland Whale-fishery, Captain Scoresby published, in 1820, his celebrated work entitled, 'An Account of the Arctic-Regions, with a history and description of the Northern Whale-Fishery,' in 2 volumes consisting of 1217 pages, illustrated by twenty-four engravings. It had been undertaken at the suggestion of Professor Jameson, who did great service to scientific literature by stimulating his pupils or former pupils to make public the results of the observations made by them in their professional or official employments in distant countries. This was the first original work on the physical and natural history of the countries within the Arctic circle and on the nature and practice of the Whale-Fishery, published in this country, with the exception of a tract by Henry Elking on the latter subject. It obtained for the author a more general reputation than he had hitherto enjoyed, and justified the owners of the whaling ships he commanded, in countenancing a degree of enterprise in geographical discovery—not unconnected however with the object of the trade—which had not before been united with the pursuit of whales, except through accidental circumstances. But on Captain Scoresby's return to Liverpool, from a voyage in 1822, in the ship Baffin of that port, undertaken with these views, he received on entering the Mersey the afflicting intelligence of the decease of his (second) wife while he was absent. He now quitted the whale-fishery, but published the geographical results of the voyage, in a 'Journal of a Voyage to the Northern Whale-Fishery; including researches and discoveries on the eastern coast of West-Greenland, made in the summer of 1822, in the ship Baffin of Liverpool,' Edinburgh, 1823, 515 pages, with 8 plates, including a chart, &c. A German translation by Professor F. Kries was published at Hamburg in 1825. Not long after the appearance of this work, on the 17th of June, 1824, he was elected a Fellow of the Royal Society, being already a contributor to the 'Philosophical Transactions,' and having been for some years a Fellow of the Royal Society of Edinburgh. He subsequently received one of the highest honorary rewards of scientific eminence, in being made a corresponding member of the Institute of France, or Academy of Sciences of Paris. As the captain of a whaler he had been a remarkable man. His crews were always distinguished by their discipline and respectability, and the lasting effect of his command upon the characters of some of those who sailed with him was a proof of the soundness of his judgment, temper, and heart. "His success in whaling was remarkable; but he never, under any circumstances, allowed a whale to be pursued upon Sunday, and he succeeded in convincing his men that upon the whole they did not lose by keeping the appointed day of rest. Upon his later voyages he adopted the temperance principle on board his vessel, finding that hot coffee was a very much stronger preservative than spirits against the intense cold of Arctic regions."

Some years after his retirement from the whale-fishing the religious impressions which he had first received from his father and had always entertained, impelled him to desire a more formal and authorised position as a teacher of religion. He entered the University of Cambridge as a student of Queen's College, took his degrees of B.D. in 1834, and Holy Orders in due course, taking the superior degree of D.D. in process of time. The Mariner's Church at Liverpool having been then just established, he accepted the chaplaincy. Private circumstances occasioned his removal to Exeter, but he afterwards became Vicar of Bradford, a very large parish in Yorkshire. After some years however he resigned this office, and retired to Torquay in Devonshire.

As a clergyman, Dr. Scoresby is stated to have "combined what may perhaps be considered extreme evangelical views with the most abounding charity and liberality to those who differed from him. His 'Discourses to Seamen' evince the earnestness with which he laboured for the good of the service in which he had passed his earlier years." He took also enlightened and enlarged views of public education, which while vicar of Bradford he laboured zealously to realise.

But of all the very various subjects to which Dr. Scoresby directed his attention, practical magnetism and its relation to navigation appear to have been most actively pursued by him through his life. The increasing quantity of iron introduced into the equipment and construction of ships, and the recent construction of the entire hull of that metal, were watched by him with unceasing care; and all the resources of his cultivated mind were at length applied to the most important of all subjects of this class—the influence of the iron of ships upon their compasses, and the requisite correction of the indications of the latter. He had published various papers on magnetism in the 'Philosophical Transactions,' the 'Transactions of the Royal Society of Edinburgh,' the 'Reports of the British Association,' the 'Edinburgh Philosophical Journal,' and the two journals which succeeded it. The substance of these, or of many of them, he now made public, in an improved form, in his 'Magnetical Investigations.' Part i. 'Comprising investigations on the principles affecting the capacity and retentiveness of steel for the magnetic condition; with the development of processes for determining the quality and degree of hardness of steel.' London, 1839; 92 pages, 2 plates. Part ii. 'Comprising investigations concerning the laws or principles affecting the power of magnetic steel-plates or bars in combination, as well as singly, under various conditions as to mass, hardness, quality, form, etc., as also concerning the comparative powers of cast-iron.' London, 1843; 280 pages, 2 plates. Vol. ii., part iii., 'Investigations, with illustrative experiments, on the nature and phenomena of magnetic induction, and the mutual influences of magnetical bodies.' London, 1852; 463 pages.

To the section of Mathematics and Physics of the meeting of the British Association at Glasgow in 1855, he communicated a summary of his matured views, and of the evidence in their favour which had occurred since their original promulgation, entitled 'Elucidations, by Facts and Experiments, of the Magnetism of Iron ships and its changes.' In this he recalled attention to his plan of a *compass aloft*, as affording a simple and effective mode of ascertaining the direction of a ship's course, stating that it had not only been extensively adopted by some of our first firms interested in the building and property of iron ships, but had received the particular sanction and commendation of Mr. Airy, the astronomer-royal, and of Lieutenant M. F. Maury, the American hydrographer; "that is, as being recommended by both these gentlemen for adoption for determining safe compass guidance, or the correction of adjusted compasses whenever they might be found to be in error." In the further prosecution of his researches on this subject, and with the view to determine various questions in magnetic science, Dr. Scoresby undertook in his age a voyage to Australia in the Royal Charter. He was received at Melbourne with great distinction, almost with enthusiasm, and was granted the honorary degree of M.A. by the new university of that city. He returned in 1856, but with his constitution much enfeebled by the arduous labours to which he had subjected himself during the voyage; and after a lingering illness he died at Torquay, on the 21st of March 1857, aged sixty-seven, and leaving a widow.

Three principal scientific works of Dr. Scoresby have been described above. The following enumeration will render the account of his separate publications nearly complete. 'Memorial of an Affectionate and Dutiful Son, Frederic R. H. S., who fell asleep in Jesus, December 31, 1834, aged 16 years.'—'Discourses to Seamen: consisting of Fifteen Sermons, preached in the Mariner's Church, Liverpool, treating for the most part generally on subjects of Christian Practice and Doctrine.'—'Jehovah glorified in his Works: a Sermon preached in St. James' Episcopal Chapel, Edinburgh, August 4, 1850, on occasion of the Meeting of the British Association.'—'Memorials of the Sea:' 1, 'Sabbaths in the Arctic Regions;' 2, 'The Mary Russel.' Of both these two editions have appeared. 3, 'My Father: being Records of the Adventurous Life of the late William Scoresby, Esq., of Whitby,' 12mo, Lond., 1851, pp. viii. and 232. 4, 'The Franklin Expedition;' stating his views on its probable course and fate, and on the measures of search for it.

'Zoistic Magnetism.' The contents of this work on a peculiar subject are thus stated by the author himself: "Original Researches in Mesmeric Phenomena, with the view of eliciting the scientific principles of this mysterious agency, and in which experiments are described, eliciting strong electric or magno-electric conditions, with the intercepting of the mesmeric influence by electrics, and the neutralising of the effects of substances having an ungenial influence on the subject, by the same process as was found to neutralise the electricity of sealing-wax, &c., as acting on the electroscope."

Dr. Scoresby had prepared for publication prior to his decease, a work fully detailing the results of his most recent investigations in nautical magnetism. As he contemplated, while commemorating his father, a continuation of the series of 'Memorials of the Sea,' in which the story of his own life should be told, it is not improbable that this also may find a place in the work, which had not appeared in April, 1858.

SCORZONERA, a genus of Plants belonging to the natural order *Asteraceæ*. The pappus is feathery, in several rows. Bracts imbricated. Receptacle naked. Achænia neither stalked nor beaked, with a lateral scar.

S. Hispanica, Viper's-Grass, has a cylindrical succulent root, branches monocephalous; leaves amplexicaul, lanceolate, wavy; involucres smooth; flowers yellow. It is found in Spain and the south of Europe. The root is said to be sudorific. It is delicate and eatable, and is supposed to be a specific against viper bites.

S. glastifolia has roots similar in quality.

S. delicosa is cultivated as an esculent at Palermo, and the gummy root of *S. tuberosa* is eaten by the Kalmucks.

SCOTOPHILUS. [Cheiroptera.]

SCOTT, DAVID, was born in Edinburgh, October 10, 1806. The son of a landscape engraver, he was brought up to his father's profession; but from childhood he had sketched and drawn incessantly, and at length his father yielded to his desire to become a painter. From the first his ambition was to paint in the 'grand style.' His early pictures were of themes such as the 'Hopes of Early Genius dispelled by Death,' 'Fingal and the Spirit of Lodi,' and 'Lot and his Daughters flying from the Cities of the Plain.' Of a melancholy turn of mind, and of somewhat gloomy theological views, his pictures naturally wore a sombre air, and attracted few admirers beyond the circle of his friends. His 'Lot and his Daughters' was returned from the British Institution as too large; his series of outline etchings, 'Monograms of Man,' met with a slow and unremunerative sale; and it was not till 1831 that he sold his first picture. But he loved labour, and he went on painting subjects with which few could sympathise, in a manner that did little to remove the unattractiveness of the theme. Slowly however he made his way, finding ardent if not numerous admirers; and his progress began to be watched with interest by his fellow-citizens. In 1832 he visited Italy, staying awhile at the Louvre on his way. In Italy of course his chief stay was at Rome, but the amenities of Raffaelle seem rather to have repelled him, his chief attention, characteristically enough, being fixed on Carravaggio. Here however he made the acquaintance of the leading resident artists; he worked hard, and painted much; and his power in painting was evidently enlarged. His style however was not materially changed. He continued to paint in the 'grand style' pictures of heroic size; and even when he stooped to the simpler realities of life, or to such matters as 'Love whetting his Darts,' 'Ariel listening to the Mermaid,' 'Beauty wounded by Love,' the 'Triumph of Love,' and the like, it was very much in the spirit of an ancient Covenanter. The themes he entered upon with more congenial feeling were such as his 'Genius of Discord' (a large work, painted at Rome, but repainted on his return); 'Descent from the Cross;' 'Jane Shore found Dead in the Street;' 'Orestes pursued by Furies;' 'Achilles mourning over the Dead Body of Patroclus;' 'Paracelsus, the Alchemist, in his Lecture-Room;' 'Hope passing over the Horizon of Despair;' 'The Dead rising at the Crucifixion;' 'Peter the Hermit addressing the Crusaders,' and several others, which alike attest his remarkable diligence and his soaring ambition; but which, in their want of power to interest the spectator, and their artistic shortcomings, too clearly show that lofty ambition, strong imagination, and unwearied industry, are insufficient to form a great painter, without living genius, a well-directed purpose, and carefully disciplined technical skill. Mr. Scott had built himself a large studio in Edinburgh, and was full of dreams of future glory, despite the warnings of failing health, when the cartoon competition in connection with the new houses of parliament aroused his feelings to a high pitch of excitement. He prepared and sent in a large cartoon of 'The Defeat of the Spanish Armada,' but it was unnoticed by the judges who awarded the prizes, and the blow fell upon the painter with a severity similar in its intensity to that which the like fate inflicted upon Haydon—whom in his ambitious thoughts, and passion for 'grand art' and huge canvasses, Scott greatly resembled. But Scott painted on; devoting now all his energies to his largest and perhaps, on the whole, best work, 'Vasco da Gama encountered by the Spirit of the Storm in passing the Cape,' now in the hall of the Trinity House, Leith. This work occupied him during the last ten years of his life, and he lived only to complete it, dying on the 5th of March, 1849, in his forty-third year. Some of his great works have been purchased for public institutions in Edinburgh. Scott was a vigorous writer both in prose and verse. His 'Essays on the Characteristics of the Great Masters' excited a good deal of attention when first published in 'Blackwood's Magazine,' 1840; and some of his poetry is contained in the 'Memoir of David Scott, R.S.A., containing his Journal in Italy, Notes on Art, and other Papers,' 8vo, 1850. This 'Memoir' is a warm-hearted tribute to his worth and merits by his brother, Mr. William B. Scott, himself an artist of considerable ability.

SCREAMER, [Palamedea.]

SCREW-PINE. [Pandanaceæ.]

SCURVY-GRASS. [Cochlearia, *S.* 1.]

SEA-BREAM. [Pagellas.]

SEA-CRAWFISH. [Palinurus.]

SEA-CUCUMBER. [Pentactæ, *S.* 2.]

SEA-DACE. [Labrax.]

SEA-EARS. [Haliotidæ.]

SEA-HOLLY. [Eryngium, *S.* 1.]

SEA-HORSE. [Hippopotamus.]

SEA-KALE. [Crambe.]

SEA-LAVENDER. [Statice, *S.* 1.]

SEA-NETTLES. [Acalephæ.]

SEA-PEA. [Viciеæ.]

SEA-REED. [Psamma, *S.* 2.]

SEA-ROCKET. [Cakile, *S.* 1.]

SEA-SCORPION. [Cottus.]

SEA-SNAIL. [Disconoli, *S.* 1.]

SEA-SNIPE. [Centriscus.]

SEBACIC ACID. [Chemistry, *S.* 2.]

SÉBASTIANI, HORACE FRANÇOIS, COUNT, was a native of Corsica, having been born at the hamlet of Porta, near Bastia, on Nov. 11, 1776. His uncle, who was a priest, took charge of his education, and was preparing him for his own profession, when the call to arms, in 1792, induced the lad to exchange his cassock for a uniform. He then became secretary to General Casabianca, after which he joined the army of Italy, in 1796, was noticed by Bonaparte, and was made a chef-de-bataillon after the battle of Arcola. In 1799 he distinguished himself greatly at Verona, for which conduct General Moreau appointed him to a regiment on the field of battle. On the 18th Brumaire, being in garrison at Paris, with his regiment of Dragoons, he assisted in the coup d'état by which Bonaparte became master of France. The First Consul promised to reward this proof of devotedness on the part of his compatriot, and henceforth took charge of his fortune.

After the battle of Marengo (June 14th, 1800) Colonel Sébastiani was appointed commissioner along with Marmont to conduct negotiations preparatory to the armistice of Treviso. In 1802, he was sent to Turkey, Egypt, and Syria, on an important diplomatic mission, which he conducted so skilfully as to obtain the rank of General of Brigade for his address.

In 1804 he was despatched to watch the movements of the Austrian army in Germany, when the reports he addressed to the War Office are said to have partly determined the campaign of 1805. General Sébastiani commanded the vanguard of Murat's cavalry when that brilliant corps entered the Austrian capital. At the battle of Austerlitz he displayed his habitual energy, was badly wounded in a desperate charge, and was raised to a division for his conduct. During the next few years he was employed with much distinction in diplomatic missions; in one of which he lost his first wife, who died in giving birth to a girl, afterwards known as the unfortunate Duchesse de Praslin, murdered by her husband in 1847.

General Sébastiani was one of the many French officers sent to Spain to retrieve the fortunes of the Emperor, in 1809. He crossed the Gaudiana, and defeated the Spaniards at Ciudad-Real, at Santa Cruz, and several other places. In the early part of 1810 he took possession of the provinces of Jaen, Granada, and Malaga, and is accused of having greatly mutilated the Alhambra and other monuments of antiquity, and of ransacking the convents for his own private gain. In the following year, not deeming his services sufficiently appreciated, he returned to France. Napoleon I., who considered the chief talents of this general to be diplomatic, rather than military, had determined not to give him a command during the Russian campaign. But the remonstrances of Sébastiani overcame this decision; he was therefore placed in the vanguard of the Grand Army. During the march to Moscow he strongly urged upon the Emperor the prudence of wintering in the province of Lithuania; but this advice was unheeded. General Sébastiani was present at the battles of Smolensko and Moskwa; he was also one of the first to enter the Russian capital, at the head of the 2nd corps. He suffered greatly during the retreat, lost all his artillery, and all his horses perished in the snow.

In 1813, after the battle of Leipzic, at which he was wounded, he contributed to the victory at Hanau, where

Prince Wrede was defeated. Napoleon afterwards gave him the command of the 5th corps, and ordered him to defend the left bank of the Rhine, at Cologne; but he was obliged to fall back into Champagne; where, at the head of three regiments of cavalry of the Imperial Guard, he repeatedly won new honours, particularly at the battles of Arcis-sur-Aube and Saint Dizier.

On the abdication of Napoleon he retired to private life, but during the Hundred Days he became a member of the Chamber of Representatives, and was sent as one of the deputies to wait on the allied sovereigns after the battle of Waterloo. After the return of the Bourbons he spent a few months in England in voluntary exile, though they had not included his name in their list of proscription. In 1819 he was chosen deputy for Corsica, and soon became distinguished as a member of what was termed the liberal opposition in the Chambre des Députés. In 1826 he succeeded General Foy as representative of the department de l'Aisne. After the revolution of 1830, Louis Philippe, in August, appointed him minister of marine, and in the following November, on the retirement of Molé, made him minister for foreign affairs; in which office he continued until 1832. It was during his administration of this office, in September, 1831, that he incurred so much obloquy by his famous announcement from the tribune of the chamber that "order reigns in Warsaw." In 1833 he again filled for a short time the office of minister for foreign affairs, but resigned on the chamber refusing to confirm the treaty he had made with the United States of America, and was appointed ambassador to Naples. In 1835 he was sent ambassador to London, where he was replaced by Guizot in 1840, and on the death of Marshal Maison, he received his bâton de Maréchal after 48 years service. In 1841 he spoke strongly in the chamber in favour of the project for fortifying Paris. Ill health compelled him soon afterwards to retire from public business, and the unfortunate fate of his daughter, the Duchesse de Praslin, darkened the latter years of his life. He died however suddenly while at breakfast, on July 20, 1851. He was buried in the church of the Invalides, and during the funeral some of the hangings caught fire, endangering the whole building, but the fire was fortunately subdued with only the loss of several of the military trophies.

SEBESTEN PLUMS. [Cordia, *S.* 2; Cordiaceæ.]

SECALE, a genus of Grasses, to which the cultivated Rye belongs. The flowers are arranged on a spike; the spikelets are 2-flowered, with a long stalked rudiment of a third floret; the glumes are subulate. In other respects this genus strongly resembles *Triticum*, to which the Common Wheat and Couch-Grass belong. [Triticum.]

S. cereale, Rye, has the glumes 1-nerved and shorter than the spikelet; the rachis is very tough. This plant is extensively cultivated in Europe, and nowhere has been observed in a truly wild state, away from the possibility of escape from cultivation, being sown by the agency of man. [Rye.]

S. montanum has the rachis hairy, brittle; glumes with a short point; the root fibrous. It is found on the gravelly mountains of Sicily.

S. villosum is also a European species, in which the spicules are 4-flowered, and the glumes have 2 or 3 strong ribs. It is found in France.

SECRETIONS OF PLANTS. [Secretions, Vegetable.] Although the term secretion is generally connected with the idea of separating for the purpose of throwing off or getting rid of a product, it is very manifest that such a use of the term would restrict its application to the substances which, amongst animals, are called excretions. It does not appear that any one class of substances can be called excretions more than another in the vegetable kingdom. It is true that a theory of the practice of 'rotation of crops' supposes it to depend on poisonous excretions given off by the roots of one plant which are not poisonous to another. But the facts brought forward to support this theory are doubtful, and other explanations of the necessity of rotation have been given. [Root.]

In plants the organs of secretion are simpler than those of animals, as they have no fixed reservoir from which to draw the materials of secretion, as the blood. This function, however, seems to be performed in both plants and animals on the same general plan. It is in both cases in the interior of the cell that the most remarkable instance of the process takes place. In the plant the compounds changed are simpler, whilst the chemical forces in action during secretion are stronger than in animals. All the important secretions of plants are compounds of the four organic elements: carbon, hydrogen, oxygen, and nitrogen. These enter the plant in the form of carbonic acid and ammonia. Out of these compounds the various substances that give the hardness to the wood of plants, the nutritive value to their seeds, roots, and other parts, the colour and scent of their leaves and flowers, with the medicinal virtues of many special plants, are formed. The substances thus produced are easily distinguishable, and may be divided into two great classes.

First, Nutritive or Assimilable Secretions, that is, substances which having been formed in the plant, are used for forming its tissues, and constructing the mass of which it is composed. The principal substances which are thus employed are cellulose, starch, sugar, oil, and protein. The first four are distinguished by containing the elements carbon, hydrogen, and oxygen, whilst the latter contains in addition nitrogen. [Cellulose; Dextrin, in Tissues, Organic, *S.* 1; Starch; Sugar; Oils; Protein, in Tissues, Organic, *S.* 1.]

These substances are found universally in the vegetable kingdom. No cell can be formed without one of the ternary compounds, and a portion of the quaternary substance in some form. Hence they are called in relation to the plant Nutritive Secretions. These substances are also easily convertible the one into the other; the sugar may be converted into starch or cellulose, and vice versâ, and thus their powers and properties are essentially connected with the assimilative processes of the plant.

The second class of substances are called Non-Assimilable or Special Secretions of Plants. They are substances which are not found in every part of every plant. When once formed also they are not liable to change, and are certainly never converted into the nutritive secretions; hence they are called non-assimilable. Some of these substances are very generally diffused amongst plants, as chlorophyle, which is the substance which gives the peculiar green to the leaves and other parts of plants. [Chlorophyle, in Tissues, Organic, *S.* 1.]

These secretions are very numerous, and may be classed under certain general heads.

1. Colouring Matters. To this head may be referred chlorophyle; the colouring principle of the petals of plants seems also to be a modification of this substance. There are however other colouring matters in plants, such as those used by the dyer, and which do not give any colour to the plants in which they exist, which have nevertheless a very definite chemical composition, and by combining with various other substances produce the colours used by the manufacturers of coloured cotton, linen, silk, and woollen cloths of various kinds. These colouring matters would appear to arise from the decomposition of the assimilable secretions, as many of them bear a close relation to both the ternary and quaternary forms of these secretions.

2. Acids. Substances having an acid reaction, and capable of combining with the oxides of the metals, are very common in the vegetable kingdom. The most familiar forms are those which occur in fruits, as the oxalic, citric, malic, and tartaric acids. Oxalic acid is found in the *Oxalis Acetosella*, hence its name, and other forms of *Oxalidaceæ*. It is also found in the *Cactaceæ* and *Polygonaceæ*. In the latter order it exists in the species of *Rheum* (Rhubarb), used for making pies, and also in the Sorrels (*Rumex*). In all these cases it is combined with the oxide of some metal, either potassium or calcium. In sorrel (*Rumex acetosa*) it exists as a quinoxalate or superoxalate of potass, which, when separated, is called Salts of Sorrel. In the *Cactaceæ* it exists as an insoluble oxalate of lime, in the form of raphides. These bodies, which are merely needle-like crystals of this salt, are very common in the vegetable kingdom. Citric Acid is found in the fruits of the order *Aurantiaceæ*, as the lemon, orange, lime, shaddock, &c. It is easily separated from these fruits in a crystalline form. It is soluble in all its combinations with the oxides of the metals, hence it does not occur as oxalic acid in the form of raphides. Tartaric Acid is found in the juice of the grape. Though closely resembling citric acid, it differs in forming an insoluble compound with potass. This compound is the supertartrate of potass, or cream of tartar of the shops. This salt is deposited whenever grape-juice is allowed to stand. It forms the basis of the tartar of wine procured from the lees. This property of tartaric acid makes the juice of the grape the most efficient compound from which to make wine. The juice of fruits containing citric acid, whose salts are soluble, are much less fitted for wine-making. Malic Acid is the acid found in the apple,

and which gives the sour taste to verjuice, as also to the fermented juices of the apple and pear—cider and perry.

The chemist has described a very large number of organic acids as present in plants, and every day is increasing their number. Many of the colouring matters appear to be acids, which assume their particular colours by combination with metallic oxides, such as the lecanoric, orsellic, erythric, and parellic acids, obtained from lichens, used in making cudbear and archil. The vegetable alkalies, or alkaloids, are also found in combination with acids; thus, aconitine is found in combination with aconitic acid, morphia with meconic acid, and a variety of others.

The acids generally occur in combination, and sometimes supplant each other. Even mineral acids will sometimes take the place of organic acids; thus sulphuric acid is sometimes found combined with morphia in the place of meconic acid. On the other hand, the metallic oxides will sometimes take the place of the alkaloid, and be found in combination with the organic acid. In the instance however of gallic and tannic acids, there appears to be no combination with alkalies or alkaloids. Tannic acid, formerly called tannine, is found very generally present in the woody parts of plants. It is supposed to result from the decomposition of cellulose. Theoretically, it may easily be formed out of carbonic acid and water. Whether it passes through the stage of cellulose is doubtful. It is of great use in the arts, especially in tanning and dyeing, and for these purposes it is obtained from the bark of oak, elm, willow, sumach, and other trees. It exists in the fruits of the *Chrysobalanaceæ*, and the legumes which are called 'divi divi.' The vegetable extracts called catechu, or cutch, and the exudations which are sold by the name of kino consist principally of tannic acid. This acid is converted into gallic acid by oxidation. Such a process takes place during the formation of the galls produced by the puncture of insects in the buds of many of the species of *Quercus*, especially *Q. infectoria*. These excrescences are called gall nuts, and from the presence of this acid in them it has been called gallic acid. [GALLS.]

The alkaloids are substances founds in the leaves, fruits, bark, and other parts of plants. They are some of them peculiar to particular species of plants, whilst others are more generally diffused. Many of them possess extraordinary properties in relation to the animal kingdom, producing poisonous effects: such are strychnia, from the *Strychnos Nux Vomica;* morphia, from the *Papaver somniferum;* conia, from the *Conium maculatum.* These substances are always found in combination with organic or mineral acids. There is however another class of substances closely resembling these in their composition and action, which do not combine with acids. These are called neutral principles: such is theine, the principle found in tea, coffee, and Paraguay tea; and theobromine, the principle of cocoa.

The volatile oils are another group of secretions of great interest. They differ in composition and character from the mixed oils, and do not appear to belong to the assimilable secretions. They are many of them used as perfumes—others as stimulant medicines, and are remarkable for the interesting compounds they can be broken up into by the agency of chemistry. Their investigation is throwing much light on vegetable chemistry. [OILS.]

The resins are a group of substances standing in a similar relation to the fixed oils, as the volatile oils. They do not appear to be assimilable, they are only occasionally formed, and present special properties in particular plants. They are often combined with gum, forming the substances called gum-resins, and from this combination it may be supposed they are directly formed from the ternary assimilable secretions. When occurring with gum, as in the case of the gum-resins of the *Umbelliferæ*, or without gum, as in the resins of the *Coniferæ* and in Myrrh, they are combined with volatile oils, which appears to give them their peculiar odours, flavours, and action. In the *Coniferæ* the volatile oil they are combined with is the same in most species, and is used in the arts under the name of oil or spirits of turpentine. [CONIFERÆ.] Wax is another substance very commonly found in plants, and having relation with the fixed oils. [WAX.] Caoutchouc and Gutta-Percha are also compounds belonging to the non-assimilable group of vegetable secretions, and are remarkable for the absence of both oxygen and nitrogen. [CAOUTCHOUC; ISONANDRA, *S.* 2.]

Although the processes by which these products may be gradually elaborated in the vegetable kingdom may be very numerous and much more complicated than any processes with which we are at present acquainted, we can readily explain their formation from the carbonic acid, water, and ammonia, taken up by plants, and the loss of oxygen.

The following tables illustrate this process, with regard to several of the substances mentioned:—

TABLE OF SUBSTANCES FORMED FROM CARBONIC ACID AND WATER, BY THE LOSS OF OXYGEN.

Substance formed.		Carbonic Acid used in eqs.	Water used in eqs.	Oxygen lost in eqs.
Name.	Formula.			
Oxalic Acid (dry) .	C^2, H, O	2	1	1
Gallic Acid . .	C^7, H^3, O^5	7	3	12
Tartaric Acid . .	C^8, H^6, O^{12}	8	6	10
Malic Acid . .	C^8, H^6, O^{10}	8	6	12
Citric Acid . .	C^{12}, H^8, O^{14}	12	8	18
Meconic Acid . .	C^{14}, H^4, O^{14}	14	4	18
Cellulose . . .	C^{12}, H^8, O^8	12	8	24
Starch . . .	C^{12}, H^{10}, O^{10}	12	10	24
Cane Sugar . .	C^{12}, H^{11}, O^{11}	12	11	24
Glucose (dry) . .	C^{12}, H^{12}, O^{12}	12	12	24
Quassiine . . .	C^{20}, H^{12}, O^6	20	12	46
Salicine . . .	C^{26}, H^{15}, O^{14}	26	18	56
Oil of Turpentine .	C^{10}, H^8	10	8	28
Oil of Lemons . .	C^5, H^4	5	4	14
Oil of Juniper . .	C^{15}, H^{12}	15	12	42

TABLE OF SUBSTANCES FORMED FROM CARBONIC ACID, AMMONIA, AND WATER, BY THE LOSS OF OXYGEN.

Substance formed.		Carbonic Acid used in eqs.	Water used in eqs.	Ammonia used in eqs.	Oxygen lost in eqs.
Name.	Formula.				
Asparagine .	C^8, N^2, H^{10}, O^8	8	4	2	12
Indigo . .	C^{16}, N, H^6, O^2	16	3	1	33
Nicotine .	$C^{10}, N, H^8,$	10	8	1	28
Coniine . .	$C^{16}, N, H^{16},$	16	16	1	48
Morphine .	C^{35}, N, H^{20}, O^6	35	17	1	81
Quinine . .	C^{20}, N, H^{12}, O^6	20	9	1	43
Strychnine .	C^{44}, N^2, H^{22}, O^4	44	16	2	106
Theine . .	C^{16}, N^4, H^{10}, O^4	16	0	6	28
Albumen . .	$C^{216}, N^{27}, H^{169}, O^{68}$	216	88	27	452
Caseine . .	$C^{288}, N^{36}, H^{228}, O^{90}$	288	120	36	612

It should not however be lost sight of that other elements besides the four organic are constantly found present in the secretions of plants. Sulphur and phosphorus are found in fibrine, caseine, and albumen. The alkalies and alkaline earths are found very commonly associated with all these secretions, and it is very certain that plants will not form their secretions unless the inorganic elements are present. [SAP; ROOT.]

SEDGE, SEDGES. [CLADIUM, *S.* 1; CYPERACEÆ.]

SEDGLEY. [STAFFORDSHIRE.]

SEINE-MARITIME, a department in France, recently constituted with HAVRE for its chief town, extends along the coast of the English channel from the Seine to the Bresle. It is formed out of the coast portion of Seine-Inférieure, which bounds it on the south. The Bresle separates it from the department of Somme. It is divided into five arrondissements, Havre, Fecamp, Yvetot, Dieppe, and Tréport. Etretat and Criel, a small coast village, west of Tréport, are made chief towns of cantons. The tribunal of commerce of St.-Valery is suppressed, and that of Yvetot transferred to the more important town of Bolbec.

A change has also been made in the limits of Seine-Inférieure, to which that portion of the territory of the department of Eure that lies east of the Seine to the Epte is added. Seine-Inférieure, by this arrangement, has Seine-et-Oise to the south-east; and out of the new territory two new arrondissements, Elbœuf and Gournay, are chiefly formed. At Gournay, the railways authorised to be made from Amiens to Rouen, and from Beauvais to Tréport, through Aumale, are to meet. In the absence of any official return, it is useless to offer any conjecture as to the area or the population of the new department; though these may be very nearly ascertained by consulting the articles EURE and SEINE-INFÉRIEURE, which have been described as they stood previous to the recent alterations.

SELENALDINE. [CHEMISTRY, *S.* 2.]

SENEGUINE. [Chemistry, *S.* 2.]

SEPARATE PROPERTY. The savings and earnings of a wife may become her separate property *at law;* and she may deal therewith as a *feme sole*, either where an order has been made to that effect under the statute 20 & 21 Vict. c. 85, or a judicial separation has been obtained by the wife. [Divorce, *S.* 2; Justices of the Peace, *S.* 2.]

SEPARATION, JUDICIAL. Until the statute 20 & 21 Vict. c. 85, divorces *a vinculo*, which put an end to the marriage altogether, were only obtainable by a special Act of Parliament, which the legislature would not pass in favour of a husband, until after a sentence of separation *a mensâ et thoro* in the ecclesiastical court, and would not pass at all if his conduct had not been free from reproach. [Divorce.] Either of the spouses could always however obtain on the ground of adultery, cruelty, and certain other causes, a divorce *a mensâ et thoro*.

The remedy now given in such cases by the Court for Divorce and Matrimonial Causes is termed a *judicial separation.* This, like a divorce *a mensâ et thoro*, does not dissolve the marriage; it does not bar the wife of her dower, for instance; it effects only such a separation of the parties as leaves it open to them to come together again. But it relieves the husband from all liability for his wife; and it confers on the wife the right of having and disposing of her own property and earnings, as freely as if she were a *feme sole.*

This kind of separation may be obtained on the ground of adultery or cruelty, or desertion without cause for two years or upwards; but unlike a decree for a divorce, which is absolute and irreversible, a sentence of judicial separation may be reversed at any time afterwards, if obtained in the absence of the defendant, on its appearing that there was reasonable ground for the alleged desertion.

In cases either of divorce or judicial separation, the Court may, if it shall think fit, order that the husband shall secure to the wife such sum as it shall deem reasonable. The allowance which may thus be made to a woman for her support out of the husband's estate, is to be settled at the discretion of the court on consideration of all the circumstances of the case, and to be proportioned to the rank of the parties.

SEPPINGS, SIR ROBERT, F.R.S., the distinguished naval architect, received his education as a shipwright under Sir John Henslow, surveyor of the navy, and continued in connection with the important service of our dock-yards during a period of fifty years. He was the author of many improvements of the first order in our naval architecture, including the system of diagonal bracing and trussing, which he devised while he was master shipwright of Chatham Dockyard. This system formed the subject of two memorable papers in the 'Philosophical Transactions' of the Royal Society, for the years 1814 and 1818, one by Sir R. Seppings in each of those years, and one by the celebrated Dr. T. Young, For. Sec. R. S. [Young, Thomas] in the former, and which attracted an unusual amount of public attention. The great principle of this method was such an arrangement of the principal timbers as would oppose a powerful mechanical action to every change of position of the ribs and other timbers in every part of the ship, thus firmly compacting together the entire fabric, and preventing that perpetual racking of beams and working of joints which in the ancient system of ship-building, produced hogging, creaking, leakage, and rapid decay; and filling up likewise every vacuity between the timbers, which are occasionally the unavoidable receptacles for foul air, filth, vermin, and various other sources of rottenness and disease. These important improvements, though opposed to the inveterate prejudices of the older shipwrights, a body of men who have not sufficiently valued and understood, in this country at least, the just principles of mechanical action, in the practical operation of ship-building, were universally adopted in the navy under the enlightened administration of Mr. Charles York, and the powerful advocacy of Sir John Barrow in the 'Quarterly Review;' and the merit of their author was acknowledged by his appointment as surveyor of the navy, and by the award of the Copley Medal of the Royal Society, of which he became a Fellow on the 10th of November, 1814.

While the claims of Sir R. Seppings to the invention of the system of diagonal bracing in naval architecture is indubitable, it may not be out of place to record here the following point of information. It can be no derogation to the merits of discoverers or inventors to show that their progress is a portion of the general advance of the human mind. Sir John F. W. Herschel has stated in a letter to Mr. C. R. Weld, Assist. Sec., R.S., inserted in the 'History of the Royal Society' by the latter, that he is "disposed to think that the system of triangular arrangement adopted by Sir W. Herschel in the wood-work of his great telescope, being a perfect system of diagonal bracing," or rather that principle to which the "diagonal bracing" system owes its strength, was original with his father at the time of its construction, that is about the year 1786.

Sir Robert Seppings introduced other improvements into our system of naval architecture. The admiralty presented him with 1000*l.* as a reward for his simple yet most useful invention of an improved block for supporting vessels, by which their keels and lower timbers were much more easily and promptly examined and repaired. It was produced while he filled the office of master-shipwright assistant in Plymouth dockyard, and is described in the 'Transactions of the Society of Arts' vol. xxii. p. 275-292, the Society having awarded him their gold medal for it in the year 1804. His plan for lifting masts out of the steps, which superseded the employment of sheer hulks for that purpose, has been the means of saving much expense and labour. His new mode of framing ships has led to a much more extensive use of short and small timbers, which were formerly of little value; but the most valuable of all the reforms of construction for which the navy of England is indebted to him was the substitution of round for flat sterns, which afford increased strength to the framework of the ship, greater protection against pooping in heavy seas, an almost equal power of anchoring by the stern and by the bow, a more secure and effective position for the rudder, and a stout platform for a powerful battery, embracing a sweep of more than 180°. This capital improvement was strenuously opposed by many distinguished naval officers, who regretted the loss of those magnificent cabins, which were better suited for their purposes of state than of service, but the good sense of less prejudiced judges happily prevailed, and secured for our ships of war an additional claim upon the respect of our enemies. The select committee on finance of the House of Commons on several occasions bore testimony to his official merits, and he received the marked approbation of both houses of parliament.

Foreign nations were not tardy in acknowledging the value of the improvements in ship-building originated by Sir R. Seppings, and their author received many substantial proofs of their sense of his merits; the Emperor Alexander of Russia, and the kings of Denmark and Holland, presented him with memorials of their appreciation of what he had effected. We may safely affirm, that in the national record of the great benefactors of their country, there are few names which will deserve more grateful commemoration than that of the object of this notice. In addition to the papers on the diagonal bracing already alluded to, Sir R. Seppings communicated to the Royal Society a paper 'On a new principle of constructing ships in the mercantile navy,' which was inserted in the 'Philosophical Transactions,' for 1820. Dr. Young's paper, also referred to above, though not communicated to the Royal Society till 1814, had been presented in the form of a report to the Board of Admiralty in 1811. It will be found reprinted in Dr. Peacock's edition of the 'Miscellaneous Works' of Young, (vol. i. p. 535-562) together with the official correspondence relative to it between the latter and Sir J. Barrow. Sir R. Seppings was an honorary member of the Cambridge University Philosophical Society, and a corresponding member of the Philosophical Society of Rotterdam. It had been proposed by the University of Oxford to confer upon him the honorary degree of D.C.L., at the commemoration of 1836, but severe indisposition compelled him to decline it. He died at his house at Taunton in Somersetshire, on the 25th of April 1840, aged seventy-two, leaving several children; his wife's decease had taken place a few years before.

SERICA. [Melolonthidæ.]

SERICOSTOMA. [Phryganeidæ.]

SERICULUS. [Merulidæ.]

SERPENTINE. As a mineral Serpentine occurs, although rarely, in right rectangular prisms. It is usually massive and compact in texture, and of a dark-green or blackish-green colour. It also occurs in fibrous and lamellar varieties. Its hardness is 2·5 to 4, and it may be cut with a knife. Its specific gravity is 2·5 to 2·6. It becomes yellowish-gray on exposure, and feels sometimes a little unctuous. The following varieties are recognised:—

Precious Serpentine.—Purer specimens of a rich oil-green colour, and translucent, breaking with a splintery fracture. It is a beautiful stone when polished. It has the following composition:—

Silica	42·3
Magnesia	44·2
Protoxide of Iron	0·2
Carbonic Acid	0·9
Water	12·4
	——100·0

It gives off water when heated; becomes brownish-red before the blow-pipe, but fuses only on the edges.

Common Serpentine.—Opaque, of dark-green shades of colour.

Picrolite, Schiller Asbestus.—A Fibrous Serpentine, of an olive-green colour, constituting seams in Serpentine. The fibres are coarse or fine, and brittle. It resembles some forms of asbestus, but differs in its difficult fusibility. Thomson's *Baltimorite* belongs here.

Marmolite.—A Foliated Serpentine, of greenish-white and light-green shades of colour, and pearly lustre, consisting of thin folia rather easily separable. The folia are brittle, and the variety is thus distinguished from talc and brucite. It has the following composition:—

Silica	40·1
Magnesia	41·4
Protoxide of Iron	2·7
Water	15·7
	——99·9

Kerolite.—Near Marmolite, but folia not separable.

Serpentine is a very handsome stone when polished. Beautiful specimens from Cornwall, and other parts of England and Ireland, may be seen in the Museum of Economic Geology, London. When mixed with limestone it constitutes the Verd-Antique Marble. It does not wear well, although at first it receives a fine polish. Chromic iron is usually found disseminated through it. Dr. Jackson of America has shown that Epsom salts or sulphate of magnesia may be profitably manufactured from Serpentine.

(Dana, *Mineralogy*.)

SERRATULA, a genus of Compositous Plants of the order *Cynaraceæ*, and the section *Serratuleæ*. The heads of flowers are diœcious by abortion; the involucre is imbricated, sharp, and unawned; the scales of the receptacle split longitudinally into linear bristles; fruit compressed, not beaked, basal areola oblique; the pappus persistent. There is but one British species of this genus, *S. tinctoria*, the Saw-Wort. (Babington, *Manual of British Botany*.)

SERVIA or SERBIA, a political division recently formed by decree of the emperor of Austria, consisting of portions of South Hungary and Slavonia. It is styled the Woiwodschaft of Servia and Temesvar Banat, and includes the Banat of Temesvar (comprising the counties of Bacz, Bodrogh, Torontal, Temes, and Krasso, in other words, the territories of the Baczka and the Banat), and the Syrmian districts of Ruma and Illok. The emperor is styled Grand-Woiwode, and the actual governor Vice-Woiwode, who resides in Temesvar, and is assisted by a ministerial commission and a native administrative council. The woiwodeschaft is divided into 5 districts. It has an area of 11,528 square miles, drained by the Maros, the Temes, the Theiss, and the Danube. The population amounts to 1,426,221 Serbs, Wallachs, Germans, and Hungarians. [CROATIA; HUNGARY; TEMESVAR.]

SERVITUDE, PENAL. This punishment has come in place of the former punishment by *transportation*, said to have been first inflicted by stat. 39 Eliz. c. 4. The first Act of Parliament on this subject is the 18 Car. II. c. 3, s. 2, enabling the judge of assize to transport certain offenders to *America*, there to remain and not to return.

The 22 Car. II. c. 5, s. 4, gave the judges power, "at their discretion," to grant a reprieve, and to cause felons to be transported beyond the seas, there to remain for the space of seven years; but if the offender refused to be transported, or returned within the time, then he was to be put to execution upon the judgment. The 22 & 23 Car. II. c. 7, s. 4, directed a judgment of transportation to be entered, when the felon elected to be transported, and it authorised the sheriffs to cause offenders to be embarked. It also made a return before the expiration of the sentence, a capital felony. The next statute on the subject was the Act 4 Geo. I. c. 11, "the foundation of the law of transportation," which enacted that, when the Crown should be pleased to extend mercy, upon condition of transportation to any part of *America*, any court, having proper authority to do so, might direct the offender to be transported. The stat. 6 Geo. I. c. 23, again made a person "*at large* in Great Britain, before the expiration of the term" of transportation, liable, on conviction, to suffer death. The 8 Geo. III. c. 15, extended the powers of the judges to make orders for transportation by enabling them to do so out of court; and by the stat. 30 Geo. III. c. 47, the king was empowered to authorise the governors of convict settlements to remit the sentences of transports.

By the stat. 5 Geo. IV. c. 84 (amended by 11 Geo. IV. and 1 Will. IV. c. 39), consolidating the laws on the subject of transportation, the king in council was empowered to appoint places beyond the seas, to which persons under sentence of transportation should be conveyed, the governor or other person to whom they were delivered, or his assignee, having the property in the service of the convicts. The sovereign was also empowered by warrant to appoint places of confinement at home, either on land or on board vessels in the Thames, or other rivers or harbours, for the confinement of male offenders (recently extended by the stat. 16 & 17 Vict. to females) under sentence of death, but reprieved or respited, or under sentence of transportation, there to remain under order of the secretary of state until entitled to their liberty, or removed, or otherwise dealt with. The capital punishment for offenders found unduly at large before the expiration of their sentence was subsequently abolished by 4 & 5 Will. IV. c. 67, which substituted transportation for life, with previous imprisonment not exceeding four years.

New South Wales, Van Dieman's Land, and Norfolk Island, thus became the principal receptacles for convicts. Although the property in the services of these persons was vested in the colonial governor or his assigns, a practice prevailed of granting them, in certain cases and on certain conditions, permission to employ themselves for their own benefit. These permissions were usually called 'tickets of leave.' By the stat. 6 & 7 Vict. c. 7, the legislature, thinking it just that ticket-of-leave convicts should be protected in their persons, and in the possession of such property as they might acquire by their industry, empowered them to hold personal property, and to maintain actions in respect thereof while such tickets remained unrevoked.

The reception of convicts having, however, become distasteful to the inhabitants of the colonies, the stat. 10 & 11 Vict. c. 67, was passed, permitting offenders under sentence of transportation to be removed to any prison or penitentiary in Great Britain; directors of the principal convict prisons being appointed afterwards under the stat. 13 & 14 Vict. c. 39. The difficulty attending the reception by the colonies of transported convicts having increased, the stat. 16 & 17 Vict. c. 99, finally abolished the punishment of transportation *for less than fourteen years*, and substituted penal servitude at home for certain periods, giving the courts power in all cases to substitute such penal servitude for transportation.

Before this last statute was passed, a system had for some time prevailed with respect to well-conducted convicts (who, although sentenced to transportation, had been kept at home), of granting them free pardons, generally at the expiration of half their sentence of transportation. As the continuance of the same system under the last-mentioned statute seemed likely to cause serious evils, but as it was at the same time desirable to encourage good behaviour in convicts, it was determined to try the experiment of retaining some control over them in cases where they were set at liberty before the expiration of their original sentence. With that view the statute empowers the Crown, by order of one of the secretaries of state, to grant any convict a licence or 'ticket of leave,' to be at large during such portion of his term of transportation or imprisonment, and upon such conditions, as may be thought fit, such licence being also revokable at pleasure.

Finally by the stat. 20 & 21 Vict. c. 3, the sentence of *transportation* is entirely abolished, and the sentence of penal servitude substituted; but the statutes which have reference to transportation are to have reference to penal servitude, so that the name alone is changed.

SEXUAL SYSTEM, in Botany, is the name given to the method by which Linnæus arranged the Vegetable Kingdom. In this system plants are divided into twenty-four classes, each of which is distinguished by the number and relative position of the stamens. The following are the classes:—

I. Flowers with Stamens and Pistils.

Class 1. *Monandria*; flowers with 1 stamen.
2. *Diandria* . . . . 2 stamens.
3. *Triandria* . . . . 3 „
4. *Tetrandria* . . . . 4 „
5. *Pentandria* . . . . 5 „
6. *Hexandria* . . . . 6 „
7. *Heptandria* . . . . 7 „
8. *Octandria* . . . . 8 „
9. *Enneandria* . . . . 9 „
10. *Decandria* . . . . 10 „
11. *Dodecandria* . . . 12-19 „
12. *Icosandria* . . . . 20 or more stamens inserted into the calyx.
13. *Polyandria* . . . . 20 or more stamens inserted on the receptacle.
14. *Didynamia* . . . . 4 stamens; 2 long and 2 short.
15. *Tetradynamia* . . . . 6 stamens; 4 long and 2 short. [Cruciferæ.]
16. *Monadelphia;* flowers with the filaments of the stamens united in one set.
17. *Diadelphia;* flowers with the filaments of the stamens united in 2 sets. (In this class the flowers are papilionaceous.)
18. *Polyadelphia;* flowers with the filaments of the stamens united in 3 or more sets.
19. *Syngenesia;* flowers with the anthers of the stamens united. [Compositæ.]
20. *Gynandria;* flowers with the stamens and pistils combined. [Orchidaceæ.]

II. The Stamens and Pistils on different Flowers.

21. *Monœcia;* flowers with the stamens and pistils on the same individual.
22. *Diœcia;* flowers with the stamens and pistils on different individuals.
23. *Polygamia;* flowers perfect and unisexual, on the same or on different individuals.

III. Fructification concealed.

24. *Cryptogamia.*

It will at once be seen that this system is exceedingly artificial, and that the great object of arrangement and classification in natural history is not attained by it. The effort of the naturalist in all systems should be to bring together those objects which most resemble each other, and to separate those which differ. A classification like the above, which takes only one organ or part of an organised being as a means of arrangement, is therefore certain to frustrate the great aim of the systematist. The only ground on which artificial classification such as the above can be tolerated is that of convenience in finding out the name of any particular object. It was undoubtedly this that led to the general adoption of the sexual system of Linnæus by botanists. It is now however fast falling into disuse; and our catalogues of plants and annuals of indigenous Floras are written on the plan of the Natural System.

Linnæus divided the above classes into orders in the same artificial way. The orders in the first thirteen classes were founded on the number of styles or stigmas in each flower. Thus, flowers having one style were placed in the order *Monogynia*, those with two in the order *Digynia*, with three in *Trygynia*, and so on. Thus the names of the orders are repeated in each of the thirteen classes. In the remaining classes however other points of structure are adopted. In *Didynamia* the orders are two, according as the fruit is 4-lobed or capsular. The first order is called *Gymnospermia*, and the second *Angiospermia*. These names were given by Linnæus under the erroneous supposition that the 4-lobed ovary was a series of naked seeds.

The class *Tetradynamia* was divided into two orders, according to the form of the fruit, *Siliculosa* embracing the species with the fruit a silicle, and *Siliquosa* those with a silique.

In the classes *Monadelphia*, *Diadelphia*, and *Polyadelphia*, the number of the stamens was made the text of the orders, and these were named as the classes. Thus we have the order *Decandria*, class *Monadelphia*, and the order *Decandria*, class *Diadelphia*.

With regard to *Syngenesia* the following plan will afford the best idea of the nature of the orders:—

Order 1. *Polygamia Equalis.*—Florets all hermaphrodites.

Order 2. *Polygamia Superflua.*—Florets of the disc hermaphrodite, those of the ray pistilliferous and fertile.

Order 3. *Polygamia Frustanea.*—Florets of the disc hermaphrodite, those of the ray neuter.

Order 4. *Polygamia Necessaria.*—Florets of the disc staminiferous, those of the ray pistilliferous.

Order 5. *Polygamia Segregata.*—Each floret having a separate involucre.

Order 6. *Monogamia.*—Anthers united, flowers not compound.

This large class thus divided by Linnæus forms the natural order *Compositæ*, and has been recently subdivided in a much less artificial manner than in the orders above given. [Compositæ.]

The class *Gynandria* was divided into orders by the number of the stamens. It includes the natural orders *Orchidaceæ* and *Aristolochiaceæ*.

The classes *Monœcia* and *Diœcia* are also formed into orders according to the number of stamens, and the orders are again named as preceding classes. Thus we have order *Diandria*, class *Diœcia*, &c.

The class *Polyœcia* has the following orders:—

Order 1.—*Monœcia.*—Hermaphrodite, staminiferous, and pistilliferous flowers on the same plant.

Order 2. *Diœcia.*—Flowers on two plants.

Order 3. *Triœcia.*—Flowers on three plants.

The *Cryptogamia* were divided into the orders:—

Filices	Ferns.
Musci	Mosses.
Hepaticæ	Liverworts.
Lichenes	Lichens.
Algæ	Sea-Weeds.
Fungi	Mushrooms.

For the arrangement of the vegetable kingdom, according to the Natural System, see the articles Exogens and Endogens.

SESSIONS. The stat. 12 & 13 Vict., c. 45, has amended the procedure in Courts of Quarter Sessions, by prescribing uniformity of time for giving notices of appeal; by conferring extensive powers of amendment; a large discretion as to costs; and by enabling them to refer matters to arbitration. By the statute 11 & 12 Vict., c. 78, these Courts, in common with the Courts of Oyer and Terminer and Gaol Delivery, are empowered to reserve questions of law for the consideration of the Court of Criminal Appeal; and by the statute 12 & 13 Vict., c. 45, the powers previously given to Judges to order payments by way of reward for the apprehension of certain offenders was extended to these Courts, the compensation to one person in no case to exceed 5*l*. The statute 12 & 13 Vict., c. 18, makes further provision for the holding petty sessions in counties and boroughs, and declares that every sitting and acting of justices, or of a stipendiary magistrate for a city or borough, having a separate commission of the peace, shall be deemed a petty sessions. The fees of justices' clerks in petty sessions are moreover provided for by the 11 & 12 Vict., c. 43, and 14 & 15 Vict., c. 55. See further Juvenile Offenders, *S.* 2; Justices of the Peace, *S.* 2.

SEYBERITE. [Mineralogy, *S.* 1.]

SHAKHOVSKY, PRINCE ALEXANDER ALEXANDROVICH, a prolific and popular Russian dramatic author, was born in 1777, at a village in the government of Smolensk. He entered the army in 1793, but in 1801 obtained the more congenial appointment of one of the directors of the theatre. The war of 1812 recalled him to the army and to the command of a regiment of Cossaks, but after its conclusion he resumed the duties of management. He retired with a pension in 1818, and died in 1846. During his lifetime Prince Shakhovsky was the most conspicuous of Russian dramatic authors, and was sometimes styled the Russian Kotzebue. The number of his plays is loosely said to have approached a hundred; many of them were translations and adaptations chiefly from the French. Among them may be found a refashionment of Shakspere's 'Tempest,' and a drama founded on Walter Scott's 'Black Dwarf.' The original play which is considered his best, bears the title of 'Aristophanes,' and is founded on the history of the great Athenian dramatist; another, a comedy, 'What you don't like don't listen to' ('Ne lyubo ne slushay'), and a third, 'A Lesson to Coquettes,' are also of unusual merit. His vaudevilles and light comedies are considered his most successful efforts.

SHAP. [Westmoreland.]

SHARPE, DANIEL, F.R.S., at the time of his decease president of the Geological Society of London, was born in London in 1806. His mother who died a few weeks after his birth, was sister to Samuel Rogers the poet. He was educated at Walthamstow, and as a boy early showed a taste for the study of natural history, but he did not commence seriously to work at Geology till after he had been admitted a Fellow of the Geological Society in June, 1829. In that year he gave his first memoir to the society, on a new species of *Ichthyosaurus*, *I. grandipes*, which, however, it afterwards appeared had been previously described by Conybeare, under the name of *I. tenuirostris*.

Throughout the greater part of his life, Mr. Sharpe was actively engaged as a merchant, and his business connection with the wine-growing districts of Portugal occasionally leading him there, in 1832, 1839, 1848, and 1849, he gave to the Geological Society a series of memoirs on the rocks of the neighbourhood of Lisbon and Oporto. The first is a mere sketch of the general arrangement of the tertiary and secondary rocks by a young and intelligent geologist; the second, on the same subject, is fuller and more definite, but not sufficiently complete in the determination of fossils to fix the precise age of the strata described. It contains, however, in an appendix, some observations of great value on the comparative effects of the great earthquake of 1755 on the strata on which Lisbon stands. The destructive effects of this shock were chiefly confined to the area occupied by the soft tertiary beds, while the buildings erected on the more solid Hippurite limestone and chalk escaped entirely. The line of division between the shattered and entire buildings Mr. Sharpe found to correspond precisely with the boundaries of the strata. In his third memoir Mr. Sharpe describes the granitic, gneissic, clay-slate, and coal-bearing rocks of Vallongo near Oporto. The clay slate he proved by its fossils to be of Lower Silurian age, and his sections show that the strata bearing anthracitic coal underlie the slate, and rest on gneiss pierced by granite. He thence concluded that the coal is of Lower Silurian age. In the obituary notice of Mr. Sharpe given in the 'Anniversary Proceedings' of the Royal Society for 1856, on which the present article is founded, but with omissions, alterations, and additions, the following just remarks occur on this subject:—"In the present state of knowledge regarding that country, it is impossible to deny that this may be the case, but it must be remembered that the few remains of plants discovered in these strata are considered by palæontologists to present characters indicative of 'carboniferous' age; and even those geologists who most strenuously support the so-called uniformitarian doctrines, incline to attribute the peculiar position of the coal to one of those great inversions of the strata so frequent in highly disturbed districts of all ages, from palæozoic up to tertiary times."

The fourth paper commences with a succinct sketch of the general geology of Portugal, and goes on to define the limits of the secondary rocks north of the Tagus, both by stratigraphical and palæontological evidence. Long before this paper was read, Mr. Sharpe had acquired much critical skill and knowledge as a palæontologist, and on palæontological principles he now established the existence of cretaceous and Jurassic rocks in the country described. The whole formed an excellent sketch of a hitherto undescribed country, and up to this date British geologists are chiefly indebted to these memoirs for the knowledge they possess of a land where the science is almost uncultivated.

Between the years 1842 and 1844 Mr. Sharpe gave four memoirs to the Geological Society, on the Silurian and Old Red-sandstone rocks of Wales and the north of England, territories previously chiefly illustrated by the labours of Professor Sedgwick. The first of these is 'On the Geology of the South of Westmoreland.' Part of this paper describes the range of the Coniston limestone. Mr. Sharpe identified it by its fossils as forming part of the Lower Silurian series, but did not determine its actual horizon. In 1839 Mr. James Garth Marshall, F.G.S., in a paper communicated to the British Association, placed it on the parallel of the Caradoc sandstone, which determination the researches of later geologists have sustained. Mr. Sharpe also pointed out the unconformity of the Upper on the Lower Silurian rocks of the area; and in describing the passage of the Ludlow rocks into the Old Red-sandstone, he correctly infers that the tilestones of South Wales should be withdrawn from the base of the Old Red-sandstone and classified with the Ludlow rocks, to which their fossils unite them. At a later period of the same year he produced a memoir 'On the Bala Limestone, and other portions of the older Palæozoic Rocks of North Wales.' Up to this date it was believed that at Bala and elsewhere there was a great thickness of fossiliferous 'Upper Cambrian rocks' of Sedgwick below the Lower Silurian strata. Mr. Sharpe maintained that this was an error, and that both stratigraphically and by their fossils, the Bala rocks were the equivalents of the Llandeilo flags and Caradoc sandstone. This sagacious determination has since been confirmed by Mr. J. W. Salter, F.G.S., as regards the Caradoc sandstone, the fossils of Bala and the typical Caradoc sandstone of Sir Roderick Murchison in Shropshire being the same.

The more elaborate paper of 1844 is accompanied by a geological map of North Wales, and has been considered less happy. Mr. Sharpe's genius chiefly lay in the palæontological determination of the age of rocks, and, in this case at least, the time he allowed himself to map North Wales was too short for the satisfactory elucidation of the problems he proposed to solve.

Pursuing at intervals these subjects, Mr. Sharpe produced in 1847 an elaborate analysis and comparison of the Silurian fossils of North America, collected by Sir Charles Lyell, with those of Great Britain, and confirmed the views entertained by the American geologist, Mr. Hall, that the American Silurian strata, like the British, consist of two great divisions, namely, upper and lower.

While engaged in these investigations, Mr. Sharpe's attention was drawn to the subject of the slaty cleavage and foliation, which affects the more ancient rocks of Devonshire, Wales, the North of England, the Highlands of Scotland, and Mont Blanc. In 1846, 1848, 1852, and 1854, he produced four memoirs on these subjects, the two first and the last of which are published in the 'Quarterly Journal' of the Geological Society, and the third in the 'Philosophical Transactions' of the Royal Society. These questions had previously been made the subject of special investigation by Professor Sedgwick, Mr. Darwin, and Professor Phillips.

It has been said, that from imperfect data Mr. Sharpe generalised too largely; and though this may be the case, an attentive perusal of the memoir of 1846 proves that in some important points he materially advanced the subject at that date in the direction to which the labours of Mr. H. C. Sorby, F.G.S., have since tended. He attributes the cleavage of rocks, and consequent distortion of fossils, to pressure perpendicular to the planes of cleavage, and asserts that rocks are expanded along the cleavage planes in the direction of the dip of the cleavage. In the communication of 1848, the doctrine that pressure is the cause of cleavage is still more distinctly insisted on, and remarkable instances are given, in which pebbles were observed which appeared to have been compressed and elongated in the planes of cleavage. He also recognises the fact, since so beautifully explained by Mr. Sorby, in the 'New Edinburgh Philosophical Journal,' that the fine particles composing the slaty rocks are arranged lengthwise in the direction of the cleavage planes, and he attributes bends in the cleavage in its passage from one bed to another, to beds of different lithological character offering different degrees of resistance to pressure. The idea that cleavage may be due to crystalline action he altogether repudiates. It must be admitted, however, that no adequate investigation has yet been instituted of the relations of crystallisation to the greater structures of rocks. We are as yet uninformed whether there are or are not jointed structures on the great scale, resulting from the coincidence of crystalline planes over comparatively large areas, as some of the phenomena exhibited by the sub-crystalline limestones and by certain serpentines, tend to indicate. The two last of the series of Mr. Sharpe's papers on these subjects, published in 1852 and 1854, describe respectively the cleaved and foliated rocks of Scotland and Mont Blanc, and are chiefly devoted to the development of his theory of the great 'cylinders' or arches, in which he asserted that the laminæ of cleaved and foliated rocks lie. In these memoirs he made no advance beyond his previous ideas, for he attributed the formation of cleavage and foliation to the same cause; and though he indicated the fact, he gave no explanation of the reason of the occurrence of planes of cleavage and foliation in arched lines, a subject that has since in part been acutely treated of by Mr. Sorby, and of which the full explanation seems not far distant. In the paper on Mont Blanc however Mr. Sharpe explains and corrects for the first time, we believe, the remarkable error of Saussure, in representing the cleavage of slates, wherever they occur in the Alps, almost invariably as stratification; having mistaken the planes of cleavage for those of bedding, and regarded the latter as a series of parallel joints. But while showing that this systematic error runs throughout the whole of Saussure's volumes, he shows also that Saussure's observations, even when his conclusions are erroneous, are always accurate and instructive. He was led into the error from observing the analogy between the foliation of the schists and the cleavage of the slates, an analogy on which Mr. C. Darwin afterwards founded the correct conclusion that the foliation has no reference to stratification; other English geologists however as Mr. Sharpe points out "after correctly distinguishing cleavage planes from stratification, still continued to class the foliation of crystalline rocks with the latter instead of the former; thus proposing to unite two phenomena of totally different origin, while they separated those which are really analogous, and probably due to one and the same cause."

Besides these memoirs Mr. Sharpe contributed to the Geological Society various papers on special subjects, 'On the Quartz Rocks of Macculloch's Map of Scotland,' 'On the Southern Borders of the Highlands of Scotland,' and various palæontological communications; 'On the genus Trematis,' 'On Tylostoma, a new genus of Gasteropods from the Cretaceous beds of Portugal,' 'On the genus Nerinea,' and a note on the fossils of Boulonnais, appended to a paper by Mr. Godwin Austen on that district. He also furnished several parts of a monograph to the splendid publications of the Palæontographical Society, 'On the Fossil Remains of the Mollusca found in the Chalk Formation of England,' and on this important work he was still engaged when he met with the accident that caused his untimely death.

"Such is a brief outline of some of the scientific labours of Daniel Sharpe—a man whose mind alike powerful, active, and well cultivated, urged him successfully to grasp and make his own a wider range of subjects than many geologists dare to attempt. Neither should it be forgotten that all the while he was unceasingly engaged in mercantile pursuits, and it was only during brief intervals of leisure when more imperative labours were over, that he accomplished what many would consider sufficient work for their lives. And it is not in geology alone that he is known and appreciated, philologists and ethnologists equally esteemed him. With marvellous versatility of talent he grappled with the ancient Lycian inscriptions, brought home by Fellows, Forbes, and Spratt, and revealed the secrets of an unknown tongue written in an unknown character. In debate he was clear, keen, severely critical, and at times somewhat sarcastic, occasionally alarming to an opponent unaccustomed to his style; but those who knew him best were well aware that an unvarying fund of kindly good humour lay beneath, and that if he hit his adversary hard, no man than himself more rejoiced in a harder blow in return." His private life is stated to have been full of unostentatious benevolence.

Mr. Sharpe became a Fellow of the Royal Society on June 6th, 1850; he was also a Fellow of the Linnæan, Zoological, and Geological societies. In 1853 he became treasurer of the Geological Society; and on the retirement of Mr. W. J. Hamilton, in official course in 1856, was elected its president, being, as was remarked at the time, the first person actually engaged in commercial pursuits in the city of London, who had been selected for the chair. This honourable position in the world of science however he occupied three months only; for on the 20th of May in the same year, while riding near Norwood, he was thrown from his horse, and sustained a fracture of the skull. In a few days he so far recovered as to be able to recognise the relations who were admitted to his chamber. He had actually recommenced the study of his fossils, and his numerous friends rejoiced in the prospect of his speedy restoration; when a sudden relapse succeeded, and he died May 31, 1856.

(*Proceedings of the Royal Society*, 1856; *Anniversary Address of the President of the Geological Society*, 1857; *Anniversary Proceedings of the Linnæan Society*, 1857.)

SHEE, SIR MARTIN ARCHER, President of the Royal Academy, was born on the 23rd of December, 1770, in Dubin, where his father (the descendant of an old Irish family) was a merchant. His father having, after considerable hesiation, yielded to his desire to adopt painting as his profesion, he was entered, while little more than a child, as a student in the Dublin Society. Here, before he was twelve ears old, he had carried off the three chief prizes for figure, ndscape, and flower drawing. His father's death threw the youthful artist on his own resources, but he had prosecuted his studies to such purpose, that at the age of sixteen he is said to have found ample occupation in Dublin as a portrait-painter, and his lively and polished manners gave him ready access to the best society of the Irish capital.

Anxious however to acquire a wider reputation, he, in 1788, came to London. Here he found in Edmund Burke a kind friend and adviser. Burke introduced him to Sir Joshua Reynolds, who treated him with much cordiality. Mr. Shee now entered as a student at the Royal Academy, and in 1789 became for the first time a contributor to the exhibition, sending a 'Portrait of a Gentleman,' and a 'Head of an Old Man.' Though he did not become a popular portrait-painter, nor, for some years at least, obtain many sitters from among the aristocracy or beauty of the land, Shee made his way steadily into a good and tolerably lucrative practice, towards which his geniality of manners rendered him valuable service. In 1798 he was elected an Associate of the Royal Academy, and he now deemed his position sufficiently secure to venture on taking the house in Cavendish-square, which Romney (whose successor he aspired to become) had built for himself when in the height of his celebrity. In this house Shee continued to reside until failing health compelled him to abandon his profession and remove to Brighton, some half a century later. This change of residence was attended with an improvement in his professional standing. He had painted a good many portraits of the leading actors, and of noted politicians, and other celebrities, which had attracted attention at the exhibition, and sitters readily followed him to his fashionable house. That he was fast making his way was sufficiently shown by his election as Academician in 1800, only two years after his election as Associate: his presentation picture was a 'Belisarius.'

From this time his career was marked by few changes or vicissitudes. Like most of the English painters of the time, during the short lull in the war between France and England he went to Paris to examine the art-treasures which Bonaparte had collected in the Louvre; but besides that, his biographers find little to notice until he appeared before the public in the character of a poet, by the publication, in 1805, of his 'Rhymes on Art, or the Remonstrance of a Painter,' a work which its author described as "a poem on painting, in which, more particularly, the early progress of the student is attempted to be illustrated and encouraged." A second part of it appeared in 1809. Byron praised the poem, and it was a good deal read and quoted at the time; and painters still occasionally garnish their literary essays with a stanza from it; but its vitality has long since departed, though it has an easy flow of rhyme, and is not without more substantial merit, and the notes are occasionally valuable. Again—on the occasion of a collection of the works of Sir Joshua Reynolds being exhibited at the British Institution, and a 'commemoration dinner' in honour of Sir Joshua being given by the directors of the institution in May 1803, at Willis's Rooms, the prince regent presiding—Mr. Shee invoked the muse, and published, in 1814, a small volume of poetry entitled 'The Commemoration of Sir Joshua Reynolds, and other Poems.' His next appearance as an author was under, to himself, more exciting circumstances. He had written a tragedy called 'Alasco,' the principal character of which he deemed to be particularly suited to the histrionic powers of his friend Kemble; who agreed to act it. But it happened to be the first tragedy which fell under the hands of Colman, the new licenser of plays, and he regarding himself as charged with the conservation of the political as well as the moral purity of the play-going public, sternly refused to permit it to be performed so long as it contained certain bits of declamation about liberty, and denunciations of despotism, as well as one or two expletives. To the expurgation of these the author as resolutely refused to submit, and appealed to the Lord Chamberlain himself against the decision of his deputy. But the chamberlain (the Duke of Montrose) declining to examine that on which his deputy had "reported," replied, with some characteristic dislocation of grammar, "I do conclude, that at this time, without considerable omissions, the tragedy should not be acted." Shee however was not to be so silenced, and resolved to shame his censors by printing his tragedy, though it was not allowed to be performed. It accordingly appeared in 1824, with a preface in which the facts were set forth with considerable warmth, while all the prohibited passages were printed in italics. The tragedy itself is forgotten now, but it will be referred to by writers of literary and political history for illustrations of what was prohibited as politically dangerous in London so late as 1824. The censor certainly did his work carefully. Treason is seen to lurk sometimes in single words—often in single lines, such as—

> "Or question the high privilege of oppression."

Even the mention of—

> "Some slanderous tool of state,
> Some taunting, dull, unmanner'd deputy,"

is thought to bode mischief, and is expunged accordingly. This was Shee's latest appearance as a poet, but once later he tried his hand as a novelist.

Literature however was but his amusement. During all these years he had been steadily making his way to a foremost place among the fashionable portrait-painters of his day. The mantle of Reynolds had not fallen on his successor, but Lawrence's easy gracefulness of style concealed his deficiencies from the eyes of his contemporaries, and he reigned in undisputed supremacy. But Lawrence could not alone supply the demands of the titled and wealthy claimants for the immortality of portraiture; and though among the political and literary celebrities Phillips perhaps was most in repute, his gay colour and polished manners undoubtedly rendered Shee second favourite with lords and ladies. On the death of Lawrence in 1830, he naturally aspired therefore to succeed him not only as a fashionable portrait painter, but also as president of the Royal Academy. Wilkie became his opponent, but though of course there could be no comparison between the artistic power of the two men, the academicians felt that Shee's fluency of speech and courtly address were of far more consequence in the academic chair than more eminent artistic abilities with reserved manners and a faltering tongue. Shee was elected president by a large majority, and soon afterwards received the honour of knighthood. He is said to have filled all the duties of his office with zeal and ability, and his official eloquence on those public occasions which called it forth was much admired. He continued to paint till 1845, in which year he exhibited for the last time five pictures; but his powers had been for some years evidently failing. He now, on the ground of inability to discharge its duties, resigned the presidency, but at the unanimous request of the academicians he was induced to withdraw his resignation, and he continued to hold the office till his death, which occurred on the 13th of August 1850, in his eightieth year.

Sir Martin Archer Shee will not rank among the great portrait painters of the English school. He is deficient in depth and force, in intellectual expression and in characterisation. But his colour is often pleasing though too florid, and his figures have an air of ease and refinement; and his pencil has undoubtedly preserved the best portraits of many of the more eminent of his contemporaries. He occasionally painted historical figures and fancy subjects, but none of them won much attention. He was an accomplished gentleman rather than a great painter.

SHEEPSHANKS, REV. RICHARD, M.A., F.R.S., F.R.A.S., was born at Leeds, July 30th, 1794. His father was engaged in the cloth manufacture, and destined his son for the same pursuit. At the age of fifteen however, and after an ordinary school education, the son discovered his own preference for a learned profession, and the father accordingly placed him under the care of the Rev. James Tate, M.A., the master of the Grammar-school of Richmond in Yorkshire, well known as one of the most successful teachers of his day, and subsequently as an editor of Horace. Here he remained until 1812, when he was removed to Trinity College, Cambridge. He took his degree with honours in 1816, obtained a fellowship in the next year, and proceeded to study for the bar, to which he was called about 1822. A weakness of sight, to which he was always subject, is supposed to have been the principal cause of his not practising law; but it must be added that his share of his father's property placed him in easy circumstances, independently of his fellowship, and his taste for science had become very decided. He took orders about 1824, and soon began to devote himself entirely to astronomy. He became a fellow of the Royal Astronomical Society in 1824, and was elected into the Royal Society on the 1st of April 1830. Of the former he was always one of the most active of the executive body. His leisure, and his desire to help the young astronomer so long as he wanted advice and guidance, gave a peculiar value to his services, and a peculiar utility to his career.

Mr. Sheepshanks resided in London till about 1842, when he removed to Reading, where he died of apoplexy, August 4th, 1855. There is much reason to suppose that his life was shortened by his laborious exertions in the restoration of the standard scale of linear measure. "Though an ardent politician of the school of opinion which had to struggle for existence during the first half of his life, but gradually became victorious in the second, he never took any public part in a political question, except that of the Reform Bill. He was one of the Boundary Commissioners appointed in 1831 to fix the boundaries of the boroughs under the new system of representation." His reading in politics and history is stated to have been extensive; and he was especially partial to military matters, with which he was very well acquainted, both ancient and modern tactics having formed a portion, and no inconsiderable portion, of his studies. To this must be added literature and poetry, to which he was much attached. He never abandoned classical reading, and those who knew him best were often surprised at the extent to which he had cultivated modern literature.

But his subject was astronomy, and his especial part of that subject was the 'astronomical instrument.' His reputation among astronomers on this point, and the articles which he contributed to the 'Penny Cyclopædia,' have induced an expression of regret that he did not draw up a full treatise on a matter which he had so completely fathomed.

Mr. Sheepshanks was engaged in active efforts on several special occasions, to which we make brief allusion. In 1828 he joined Mr. Airy, now Astronomer-royal, in the pendulum operations in Cornwall, and suggested some of the most important plans of operation. In 1828 and 1829 he was active in the establishment of the Cambridge Observatory. In 1832 he was consulted on the part of the admiralty with reference to the edition then preparing of Groombridge's Circumpolar Catalogue: the result was the publication of that work in a much more efficient and more creditable form than it would otherwise have appeared in. In 1832 he also interfered in a matter to which, connected as it is with personal differences, we can only here allude, as eliciting much information on the subject of equatorial instruments in general, a result which is entirely due to the part taken by Mr. Sheepshanks. In 1838 he was engaged in the chronometric determination of the longitudes of Antwerp and Brussels; in 1844 in those of Valentia and Kingstown in Ireland, and Liverpool. In 1843 and 1844 the subject of the Liverpool Observatory led him into a controversy, his pamphlets on which will be useful study to those who are interested in astronomical instruments. He was always an active member of the Board of Visitors of the Royal Observatory at Greenwich.

Mr. Sheepshanks was a member of both the commissions (of 1838 and 1843) for the restoration of the standards of measure and weight, destroyed by fire in 1834. The standard of measure was placed in the hands of Francis Baily [BAILY, FRANCIS, *S.* 1], at whose death Mr. Sheepshanks volunteered (November 30th 1844) to continue the restoration. This matter occupied him closely during the last eleven years of his life. It would not be possible to give any detailed account of the operation, a full history of which is expected from Mr. Airy. It need only be said, that after a thorough examination of the process, beginning with the very construction of thermometers,—a point which gave no small trouble,—results were obtained which were embodied in a bill (18 & 19 Vict. cap. lxxii.) which received the royal assent on the 30th of July, 1855, the day following that on which Mr. Sheepshanks was struck by the shock which ended his life. The number of recorded micrometer observations is just five hundred short of ninety thousand. He had given a succinct but very satisfactory account of the operations for the production and verification of the new standard, in the Report of the Commissioners, for March 28, 1854, which was presented to Parliament.

It has been recorded on adequate authority that Mr. Sheepshanks was especially distinguished by the integrity of his mind, and by his utter renunciation of self in all his pursuits. He did not court fame, it was enough for him that there was a useful object which could be advanced by the help of his time, his thoughts, and his purse. His consideration for others was made manifest by his active kindness to those with whom he was engaged, and no less by his ready appreciation of the merits of those against whom he had to contend in defence of truth and justice, as they appeared to his mind.

(*Proceedings of the Royal Society*, 1855; *Report of the Council to the Thirty-sixth Annual Meeting of the Royal Astronomical Society*, 1856.)

SHEFFORD. [BEDFORDSHIRE.]

SHEIL, RICHARD LALOR, the son of Mr. Edward Sheil, a merchant of Cadiz, was born in Dublin in the year 1793. His father was a Roman Catholic, and he was educated in that religion at the Jesuit College of Stonyhurst, Lancashire, whence he was removed at the usual age to Trinity College, Dublin, where he graduated with distinction. He next proceeded to London, and entered himself at Lincoln's Inn to study for the English bar, which had been recently opened to Roman Catholics; but the ruin of his father's means through a disastrous partnership caused a change in his destination, and he returned to Ireland, where he was called to the bar in 1814. He defrayed the expenses of his years of study by the successful tragedy of 'Adelaide' in which Miss O'Neill performed, and by those of the 'Apostate,' 'Bellamira,' 'Evadne,' and 'The Huguenot.' About the same time he also contributed some 'Sketches of the Irish Bar' to the 'New Monthly Magazine,' then edited by Mr. T. Campbell. It appears however that although Mr. Sheil gained credit as a writer and a speaker, he never heartily devoted himself to a deep study of so dry a subject as the law, and that his professional income in consequence was not large. He was not a lawyer but an orator by nature, and he found the platform a more congenial stage for the display of his talents than the law courts of Dublin. As a Roman Catholic too he laboured under the civil disabilities which, though modified from what they had been, still shut the doors of the House of Commons against himself and his co-religionists. It is not surprising therefore that he turned his attention to political and religious agitation. In 1822 he became an active member of the Catholic Association; and three years later was chosen in conjunction with the late Mr. Daniel O'Connell to plead at the bar of the House of Lords against the bill introduced for its suppression. The bill however passed; but it only served to inflame his religious zeal and to rouse his oratorical powers to such a pitch of vehement invective against the government, that a prosecution was commenced against him for seditious language. The illness of Lord Liverpool however transferred the premiership to the hands of Mr. Canning, who wisely ordered the prosecution to be abandoned. In 1828 Mr. Sheil took an active part in procuring the return of Mr. O'Connell to parliament as member for the county of Clare, and also addressed the great meeting held at Penenden Heath for the purpose of resisting the Roman Catholic Emancipation Bill. In 1829, soon after the passing of the Relief Act, Mr. Sheil was returned to parliament for the since disfranchised borough of Milborne Port, by the influence of the late Marquis of Anglesea, who, while holding the lord lieutenancy of Ireland, had noticed his career, and who thus turned the restless agitator into a peaceful citizen and a useful legislator. Here his oratorical powers were appreciated, and he soon became one of the most popular and attractive speakers in the House of Commons, though the matter of his speeches never rose to a level with the brilliancy of illustration and flow of impassioned declamation with which they were adorned. In 1830 he was again returned for Milborne Port, and in 1831 for the county of Louth. After the passing of the Reform Act, which gave much dissatisfaction in Ireland, Mr. O'Connell commenced agitating for repeal, in which Mr. Sheil at first refused to join, but subsequently consented, considering, as his biographer, Mr. T. M'Cullagh asserts, that it "was in point of fact but short-hand for just and equal government in Ireland." In December 1832 for the first reformed parliament he was chosen to represent the county of Tipperary, where he had acquired some extensive landed influence by his second marriage with the widow of Mr. E. Power of Gurteen, on which occasion he adopted that lady's maiden name of Lalor. In 1834 the Grey ministry introduced an Irish Coercion Bill, which was strongly opposed by most of the Irish members, among whom was Mr. Shiel, but a report became current that several of them had expressed a wish that it should be carried, "or there would be no living in Ireland." A great outcry was raised of "Who is the traitor?" and on Lord Althorp being appealed to, he replied that he had no personal knowledge of any such expression, but had heard it, and though he could not give up the names, he would tell any member who asked whether he was one. On Mr. Sheil making the inquiry, he replied he was one who had been mentioned. Mr. Sheil denied it at once: a parliamentary committee was appointed, and Mr. E. Hill, who appeared before the committee to support the allegation, confessed that he believed that he had been misinformed. In the same year Mr. Shiel was a party to the "Lichfield House Compact," a term applied from a phrase of his own, in which he hoped "that no minor differences would mar their compact and cordial alliance." In 1838 he was offered office by the Melbourne administration; at first the clerkship of the ordnance was spoken of, but ultimately he became one of the commissioners of Greenwich Hospital, and never again advocated repeal. In 1839 he was made vice-president of the Board of Trade; and was also sworn a member of the Privy Council, being, we believe, the first Roman Catholic on whom that honour had been conferred since the reign of James II. In June 1841 he was appointed judge-advocate-general, when he resigned the seat for Tipperary for that of the borough of Dungarvan; but he held office only till the following September, when his party were superseded in office by the late Sir Robert Peel. On the advent of Lord John Russell to power in 1846, Mr. Sheil was appointed to the mastership of the Mint, which he filled until November 1850, when he accepted the post of British minister at the court of Tuscany. His health however had been failing for some time, and he had rarely spoken in the House of Commons for the two or three years immediately preceding his retirement from parliamentary life. Although the appointment to Florence could be regarded by himself and his friends as nothing less than expatriation and an extinction of what might have been a growing reputation, yet he submitted not so much with a feeling of philosophic indifference as in a joyous spirit, as though he felt that his diplomatic post would prove a great promotion and a dignified retirement. The melancholy death of his stepson, by his own hand, which happened in the following April, gave a shock to his feeble constitution from which he never entirely recovered, and an attack of gout in the stomach brought his life to a close at Florence on the 23rd of May 1851, in the fifty-ninth year of his age. His younger brother, Sir Justin Sheil, K.C.B., for some time held the post of envoy extraordinary and minister plenipotentiary at the court of Persia. (*Memoirs of the Right. Hon. Richard Lalor Sheil*, by W. T. M'Cullagh.)

SHELBURNE. [NOVA SCOTIA.]

SHELLEY, MARY WOLLSTONECRAFT, daughter of William Godwin and wife of Percy Bysshe Shelley, was born in 1798. In 1816, while in Italy, she wrote her powerful and striking romance of 'Frankenstein,' which commanded an extensive popularity in England, and is still a favourite with the admirers of the wild and wonderful, while the extremely ingenious and consistent development of the character of the monster excites and sustains a human interest amidst all its improbabilities. Though her success was great in this her first effort, it did not induce Mrs. Shelley to resume her pen for some time. She devoted herself to promoting the comfort and guarding the health of her husband with affectionate solicitude, which he gratefully acknowledged and repaid. Just previous to his unfortunate death however she had finished 'Valperga,' a novel, afterwards printed in 3 vols., for which Shelley says in one of his last letters that she had been offered 400*l*., which he designed for the relief of the necessities of his father-in-law, W. Godwin. After her husband's death she published 'Falkland,' 'The Last Man,' and 'The Fortunes of Perkin Warbeck,' each in three volumes. She also wrote 'Rambles in Germany and Italy,' an account of her journeys with her husband. In 1839 she published an edition of his poetical works, with a few biographical notes added, in which the more offensive passages of 'Queen Mab' are omitted; and in 1840 a selection from his letters and a few specimens of his prose writings. In all these she pays a most affectionate tribute to his goodness of heart and the other amiable qualities which she states invariably secured him the love of all who knew him. She died in London, on the 1st of February 1851.

SHEPHARDITE. [MINERALOGY, *S.* 1.]

SHERBROOKE. [CANADA, *S.* 2.]

SHIPPING. [TRADE, SHIPPING, &c., *S.* 2.]

SHIPS. Nearly all the statutes mentioned under this head [SHIPS, v. xxi. p. 397] have been repealed (17 & 18 Vict. c. 120). The law relating to shipping, to the contracts arising from the employment of ships, and to the mutual duties and obligations of owners, masters, passengers, and seamen, remains, nevertheless, almost unaffected; the provisions of the repealed statutes being, in principle, though not always in detail, re-enacted by the statutes about to be mentioned.

The most important of these is the Merchant Shipping Act, 1854, which is amended by stat. 18 & 19 Vict. c. 91; the next in importance, the Passengers' Act, 18 & 19 Vict. c. 119. The Act relating to bills of lading, and that conferring admiralty jurisdiction on the County Courts, have been already referred to. [Lading, Bill of, *S.* 2; County Courts, *S.* 2.] It would be quite impossible in this place to give any detail of the provisions of these Acts, which constitute complete codes in themselves, and which must be referred to by every one who wishes to know anything of the subjects to which they relate.

It is necessary to mention here, however, the statutes which have repealed the Navigation Acts, whereby, it was said, "the constant increase of English shipping and seamen was not only encouraged, but rendered unavoidably necessary."

These Acts were by various statutes maintained down to a recent period; their leading feature being to secure the exclusive trading by which it was thought British shipping and navigation were encouraged. The first step in favour of free trade was effected by the statute 12 & 13 Vict. c. 29, by which the exclusive privileges of British ships were limited in effect to the coasting trade of the United Kingdom, the trade with the Isle of Man and Channel Islands, and the coasting trade of the colonies. But that Act has been almost entirely repealed by the statute 16 & 17 Vict. c. 107, by which the entire trade has been thrown open to vessels of all nations.

The Board of Trade exercises a general superintendence over all matters relating to merchant ships and seamen, and the carrying into execution the statutes in force relating to them. For that purpose it requires various kinds of returns as to trade and navigation, and originates inquiries and considers reports made to it by its inspectors and other officers. It exercises a partial control over local marine boards, and may lay down rules as to the conduct of examinations, and the qualification of applicants for the posts of masters and mates of passenger-ships. It grants licences to persons to engage or supply seamen or apprentices for merchant ships; adjudicates on claims for seamen's wages, investigates cases of alleged incompetency and misconduct in master mariners; and appoints officers to report on the condition and efficiency of steam-vessels and their machinery. These and its other duties, and the mode in which they are exercised, are defined in the Merchant Shipping Act, and other statutes above referred to.

SHIPSTON ON STOUR. [Worcestershire.]

SHIPWRECKS AND LIFE-BOATS. That wrecks are numerous, is a fact well-known to a seafaring nation like ours; that they must necessarily be considerable in number, regard being had to the perils of the deep, will of course be admitted; but that nothing can be done to lessen their frequency, would be a hopeless theory of which we ought to be ashamed. Supposing for the sake of fixing the ideas, that some wrecks are occasioned by a want of scientific knowledge of winds, waves, currents, whirlpools, shoals, reefs, and sunken rocks, on the part of meteorologists and hydrographers; that others are caused by the incompetency of captains and mates; that others again result from the insubordination, carelessness, ignorance, or obstinate fatalism of seamen; that a fourth group are due to the deficiency of lighthouses, beacons, and buoys; and that the remainder arise from want of ready assistance to ships which, though placed in peril on shoals or near rocks, might yet be saved if aid were at hand on the beach or the cliff—who shall say that these evils are incurable? who can put a limit to the improvements which might be wrought?

A dismal story, indeed, does the 'Wreck-chart of the British Islands' tell, as published by the Admiralty, and afterwards in the Life-Boat Journal. It may be designated a truly distressing map. Every wreck on our coasts has its little black mark; and the aggregate of such black marks reveals the number of wrecks in one year. Knowing that a black spot ● indicates a vessel wrecked, and that + indicates a vessel so seriously damaged as to need to discharge cargo, we look eagerly for the relative numbers of these little spots and stars; and it is saddening to see how numerous are the fatal black signs. At some places the wrecks are numerous because the coast is dangerous; at others, because the congregating of ships is very great.

And if it be asked, "What ratio did 1857 bear to previous years, in respect to these calamities?" it is encouraging to know that on the whole it was favourable, fewer lives were lost and more were saved, than usual; yet still our coasts saw no fewer than 1143 wrecks of ships. The lives lost numbered 532 (in 1854 they amounted to 1540), and the number saved was 1668, of which 399 were by life-boats, 512 by luggers, coast-guard boats, &c., 507 by assistance from shore with ropes, mortar-apparatus, &c., 243 by ships' own boats, and steam-vessels, and 8 by individual exertion of a meritorious character. All these wrecks, be it remembered, happened on our own coasts—on the coasts of the most busy maritime islands in the world; where, if there be liability of disaster through the vast congregation of shipping, there ought, on the other hand, to be a supply of invention and good sense sufficient to check, in some degree, such disasters. In examining the details of the chart, it will be seen that, as usual, the line of coast between Dungeness and the Pentland Frith is the most fatal, and that the mouth of the Tyne takes the unenvied precedence of all other places, in the number of black dots and stars opposite to its name; next come the mouth of the Tees and the mouth of the Wear. These three rivers may be taken as the representatives of the district whence three million tons of coal are brought by sea to London yearly, employing the services of several thousand collier ships, which sail to and fro, and add to the otherwise busy commercial trade of the Northumbrian and Durham ports. The mouth of the Humber, the Suffolk coast between Yarmouth and Southwold, the intricate sandy shoals off the mouth of the Thames, the Goodwin Sands, the Scilly Islands, Barnstaple Bay, and Liverpool, are the portions of the English coast which present, in the next degree, the most numerous indications of ship-losses. The Welsh coast is thickly strewn, especially Glamorgan, Pembroke, and Anglesea. Scotland, except in and near the Frith of Forth, presents no large numbers; the western coast is, indeed, remarkably free, due probably to the less exposure to the winds which tend to drive ships ashore on our eastern seaboard. Ireland presents a tolerably equable distribution along the east and south coasts: less on the northern and western.

The annual report states that the year 1857 was a favourable one with respect to shipwrecks, yet 437 vessels were totally lost, and 706 damaged. Of these, 890 were registered British ships; 33 were registered in British colonies; 213 were foreign vessels; and 7 were not known: the total amount of the tonnage of these ships was 218,570, and they were manned by 9819 sailors. Of the total wrecks, 53 were by collision, owing, in many cases, as the report states, to "bad look-out," "neglect to show light," "neglect of the rule of the road," &c.; and cases of collision continue to increase. One prominent cause of collision is stated to be the difficulty of making out the direction in which a ship is standing by the showing of a single light, and a coloured one at the bow is recommended. The total estimated loss occasioned by these wrecks was 519,301*l.*, and the amount insured was 473,135*l.* The Board of Trade institute inquiries into the causes of the wreck in many cases, and during the year the certificates of several of the captains and mates of the wrecked vessels were cancelled or suspended for drunkenness, carelessness, and incapacity.

Many inquiries into the causes of shipwreck have been instituted; and especially one by a Committee of the House of Commons, whence a voluminous report resulted. But public attention was perhaps more fully drawn to the subject by the Duke of Northumberland, who, in 1850, offered a premium for the best model of a life-boat. The examiners by whom the award was made, prepared an interesting Report on the whole subject, which his Grace caused to be printed for distribution in any and all quarters where it might render most service. This Report caused increased attention to be paid to the means for preventing shipwreck, or to assist the sufferers if prevention were impossible. The Duke has caused many life-boats to be placed on the Northumbrian coast, which course of proceeding has acted as an incentive to others. The Report, and the circumstances attending it, also led to the starting of a small periodical [*] by a Society which has laboured since 1824 in the same benevolent cause. This Society, by means of a subscribed fund, has sought to assist in the establishing of life-boats and rocket-mortars at all the dangerous parts of our coast; to induce the formation of Local Committees at the chief ports for a similar purpose; to maintain a correspondence, beneficial to all parties, with these Local Committees; to reward persons who render assistance to distressed ships or mariners; and to encourage the invention of new or improved boats, buoys, belts, rocket apparatus, and other means for saving life. To further this end, as just observed, the Society commenced a little work, in Numbers at twopence each, which, at intervals, gives an epitome of all that is worth knowing on this matter.

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[*] 'The Life-Boat; or, Journal of the Shipwreck Institution.' Published by C. Knight, 90, Fleet-street; and to be had at the office of the Institution, 14, John-street, Adelphi.

A deserved meed of praise was given by a Quarterly reviewer to the Duke of Northumberland, in that he has established, at his own cost, at the principal stations off the coast of his native county, "life-boats of an improved construction, and supplied with all the necessary apparatus and appendages—a piece of munificence which has acted most favourably in stimulating the humanity and activity of the neighbouring peasantry, and from which the tourist, without being unseasonably sentimental, may derive his full share of satisfaction. The grave-yards which surround the striking ruins and picturesque churches 'of mountainous Northumberland,' are full of the mournful records of youth cut off in its bloom, and manhood in its prime, by the tempestuous waves. Each stone has its own sad tale—of brothers found locked in each other's embrace—of a father who perished in a vain attempt to save his son—of whole families, united in industry and affection, and undivided in death, swallowed up in the little craft that constituted the whole of their worldly wealth. He must be 'duller than Lethe's dull weed' whose heart does not swell as he reads the simple tale of their struggles and their fate, and whose eye does not glisten when he hears of the munificence which has done all that on that dangerous coast can be done to avert such catastrophes in future."—'Quarterly Review,' No. 194. It is too much, however, to say that *all* has been done that can be done; this is to put a limit to man's ingenuity and forethought, which we should be sorry to admit until the desired end has been more fully attained.

As an example—not of the means for preventing shipwrecks, or for saving the lives of those who may be endangered by wreck—but for rendering aid to the poor fellows who may have lost all but life by such calamities, the "Shipwrecked Fishermen and Mariners' Royal Benevolent Society" deserves a word of notice. The scheme was formed at Bath in 1839 by Mr. Rye, who was impressed with the importance of affording relief to the widows and orphans of fishermen and mariners who might be drowned, and of assisting with clothes, food, and money, those who might be cast ashore from a wreck—alive, it is true, but deprived at once of all the necessaries of life. Aided by Sir Jahleel Brenton, at that time Governor of Greenwich Hospital, Mr. Rye succeeded in establishing a society, and in collecting a respectable sum as a first subscription. On the 8th of May, in that same year, three fishing-boats were lost in Mount's Bay, involving the death of 20 persons, and the sudden impoverishing of 7 aged persons, 12 widows, and 35 children. A sum of money contributed to the bereaved survivors served to bring the usefulness of the Society into notice. The Society progressed steadily. Between the years 1839 and 1854, it afforded relief to 30,000 shipwrecked persons, and to more than 14,000 widows, children, and dependants of fishermen and mariners, who had been drowned. The aid is not wholly eleemosynary: it partakes in some degree of the character of a provident fund. Primarily, the Society "boards, lodges, and conveys to their homes all destitute shipwrecked persons to whatever country they may belong, through the instrumentality of the agents of the Society;" but aid beyond this limit depends upon membership. All fishermen and mariners may become members by the payment of *2s. 6d.* per annum. The Society affords temporary assistance to the widows, parents, and children of all such members as may have been drowned: and gives a gratuity to such members as, without losing life, lose or damage their apparel or boats by wreck or similar calamity. The longer the period during which a fisherman or mariner has been a member of the Society, the larger is the allowance to his widow and children in the event of his death by wreck or drowning. Every institution which fosters habits of provident forethought is worthy of respect and support; and the Society now under notice does this by the system just described. As to the purely charitable part of the plan, it ranks with a multitude of other praiseworthy modes of helping those who *cannot* help themselves.

It was found, however, in the course of years, that two societies—bearing the titles "National Shipwreck Institution," and "Shipwrecked Fishermen and Mariners' Royal Benevolent Society,"—were liable to be confused in the public mind; and a union or amalgamation became desirable. Accordingly, in the early part of 1855, the latter-named society transferred to the former nine life-boats, eight boat-houses, and five life-boat carriages; in order that one society might have the sole management of the life-boat department of those benevolent schemes; while the other might continue to attend to the wants of shipwrecked mariners, or their widows and children. The "National Shipwreck Institution" at the same time changed its name to the "National Life-Boat Institution," to define more clearly the objects aimed at.

That there is a positive amount of good work rendered by the Life-Boat Institution is made manifest by the simple fact, that in 1857 alone the life-boats belonging to, or in connection with, the Institution, were the means of saving the lives of 399 persons, all of whom would probably have been lost but for such aid. The following is a list of the lives saved, for which rewards were given by the Society:—

	Lives Saved.		Lives Saved.		Lives Saved.
1824	124	1836	225	1848	123
1825	211	1837	272	1849	209
1826	175	1838	456	1850	470
1827	163	1839	279	1851	230
1828	301	1840	353	1852	773
1829	463	1841	128	1853	678
1830	372	1842	276	1854	355
1831	287	1843	236	1855	406
1832	310	1844	193	1856	473
1833	449	1845	235	1857	374
1834	214	1846	134		
1835	364	1847	157	Total .	10,475

It may not be that these lives were all saved by the instrumentality of the Society: indeed such was not the case. In many instances the saving of life by the life-boats or other means did not involve any extraordinary risk, or the exercise of any remarkable skill or bravery, and it is only to such cases, whether performed by persons connected with the Society or strangers, that the rewards are distributed; and the list, therefore, only includes the cases of lives saved from shipwreck on our coast, in which the Society gave honorary or pecuniary rewards.

The life-boats belonging to, or in connection with, the Institution, in March, 1858, were no less than 70 in number, and there are 75 others provided from various sources, and not in connection with the Society. Considering that the boats usually cost from 150*l.* to 200*l.* each, the boat-carriages about an equal sum, and the boat-houses about 100*l.*, it will be seen that the amount of money thus sunk is something considerable. Northumberland, Suffolk, and Anglesea are the three counties most liberally provided. These boats, on an average, appear to be about 30 feet long by 8 feet broad, 3½ feet deep, weight 40 cwt., and are rowed by 8, 10 or 12 oars.

The life-boats above adverted to, are purposely so constructed as to brave the peculiar dangers of a coast where shipwrecks are liable. Seventy years ago the construction of such boats began to attract attention; and in 1789 Mr. Greathead, of South Shields, constructed what may be deemed the original of all the life-boats since made. Cork was largely used in Greathead's boat to render it more buoyant; and since his time air-tight cases, formed of india-rubber cloth, have been a favourite feature in many of the inventions. When the Duke of Northumberland offered the prize in 1850, no fewer than 280 plans and models were sent in, exemplifying numerous modes of combining buoyancy with stability in boats. About 50 of the best of these models were placed in the Hyde-Park Exhibition. The prize was given to Mr. Beeching, of Yarmouth, as the constructor of the boat which seemed to combine the greatest number of good qualities. Since that time a boat, invented by Mr. Peake, of her Majesty's Dockyard at Woolwich, has been more frequently adopted as a model than any other.

A boat being the first requisite for such service, there are numerous fittings necessary to render it workable: there must be a boat-house, in which to keep it sheltered from the weather when out of use; and a carriage whereon to wheel it to the part of the coast most adjacent to the wrecked or stranded ship. Moreover, there must be a crew of trusty men, able and willing to brave a raging sea, strong and resolute to pull the oar under any stress of weather; and there must be a master or coxswain exercising sufficient control to command the men, and direct their energies in a proper channel. It is in this direction, quite as much as in the provision of life-boats and buoys, that the Life-Boat Institution has rendered service. A system of payment, partly in the nature of a salary, partly as a reward, is adopted, such as may induce steady men to render aid; and the local committees assist in collecting the means whereby the outlay is to be defrayed, and in laying down the rules which are to govern the movements of the life-boat corps.

The exact mode in which a life-boat renders its useful service must depend, of course, on many contingencies of winds, waves, shoals, reefs, rocks, &c. The following is an example:—On the 2nd of May, 1855, in early morn, the beachmen at Ramsgate heard alarms given, and saw signal-rockets fired on board the light-vessels moored off the Goodwin Sands, indicating that a vessel was in danger or distress in that perilous region. The Ramsgate life-boat (the property of the Ramsgate Harbour Commissioners) was speedily manned and equipped, and taken in tow by the Samson steam-tug against a rough wind and tide. The hapless ship was seen from the steamer with signals of distress flying, and apparently high and dry on the further edge of the Goodwin; the tide being low at the time, and a heavy sea on the edge of the sand. At a particular point the life-boat left the steam-tug, and steered towards the stranded vessel; but it was speedily found that the depth of water around the vessel was too small to permit a close approach by the boat. The men, therefore, waited until the in-coming tide favoured them a little; they went on; they ran on shore among the breakers; and the master and four of the crew, jumping overboard into the surf, waded to the ship, which they reached in an exhausted state. The ship was the Queen of the Teign, bound from Antwerp to Liverpool with a valuable cargo, of sugar, bark, and seeds. When the crew of the ship saw the exertions of those who had undertaken to aid them, they descended from their vessel into a boat, jumped on the lee-side of the sand, and thence got into the life-boat. As soon as the tide had risen sufficiently to allow the steamer to approach, a line was thrown on board her; and a communication being thus established, she was enabled to lay out an anchor to leeward, and subsequently to get her own large tow-rope fast to the vessel. By these means the vessel was hove off from her dangerous position, and taken, in a leaky state, with four feet water in her hold, into Ramsgate Harbour.

Another example is worth noticing, as showing the recklessness of crews, and the probability that such recklessness frequently occasions loss of ships. On October 7th, 1854, signals of distress were observed in the direction of the Holm Sand, off the Suffolk coast, during a strong easterly gale. The Pakefield life-boat immediately put off, towed by the Lowestoft steam-tug. Finding that it could not reach the vessel to leeward, the boat weathered the sand, and then observed the sea breaking heavily over the ship, a Norwegian brig, of 180 tons. With some difficulty the boatmen succeeded in getting on board, where they found a crew of eight men, *all drunk;* the besotted seamen, though in imminent peril of being drowned, and without the possibility of seeing their vessel got off, obstinately refused to leave. The boatmen, finding persuasion to be useless, and knowing that the life-boat itself was in a perilous position on the verge of the shoal, with the waves constantly breaking over it, returned to Lowestoft Harbour. At daybreak on the next morning, another crew from Pakefield manned the life-boat, and succeeded in reaching the vessel, where the crew, sobered during the night, were glad to avail themselves of this second offer to aid them. They were all brought safely to land.

No part of our maritime system has, in recent years, attracted more attention than that which has just been illustrated—the personal character and conduct of the men employed. Who can tell the amount of misery which one hour of inebriety, one display of incompetency, may produce? The ship may be all that human art can effect, in strength and efficiency; the fittings and stores may be all that could be needed; the provisions may be good in kind, and ample in quantity—and yet one slight manifestation of indiscretion or of unskilfulness, may give room for a catastrophe which will plunge scores or hundreds of human beings into a watery grave. This matter was taken up by the Legislature many years ago; but it is now treated in a more direct way by the system established in virtue of a statute presently to be noticed.

The life-boats of which we have spoken, are not the only means necessary for affording aid to stranded or wrecked ships. There are times when other aid is needed; when a ship is in distress so near the shore as to be within reach of a rope, if means were at hand to throw it—while, perhaps, no boats are near the spot fitted to render the required service. The name of Captain Manby is intimately associated with the history of this part of the subject. Captain Manby's ingenuity was excited by a terribly distressing scene which he witnessed in 1807; when the Snipe, a gun-brig, was lost off Yarmouth; when sixty-seven persons were drowned within sixty yards of the beach, after remaining five or six hours on the wreck, without a possibility of receiving assistance. Long before this, he had thought on the subject. He had, in 1783, thrown a line, by means of a small mortar, over Downham Church, in Norfolk; and it struck him that he might, by the same means, throw a line over a stranded vessel. During many subsequent years he made repeated experiments; his main difficulty consisted in securing the shot to the rope; iron chains were liable to break on the discharge; but at length he found that stout strips of closely-plaited raw hide would answer the purpose. In 1792 the Society of Arts gave a premium of fifty guineas to Lieutenant Bell for "a plan for throwing a rope on shore by means of a shell from a mortar on board a vessel in distress;" but Captain Manby was the first to put in practice a really available plan.

Let us see what is the end to be attained, that we may understand the mode of attaining it. A ship is stranded near the shore, say two or three hundred yards off, where no boat, perhaps, is available. What are the crew to do? Sailors, unfortunately for themselves, are in too few cases swimmers; and even a swimmer has a poor chance for his life in such weather and such a sea as usually accompany these strandings of ships. The men generally cling to their vessel as long as her timbers will hold together, rather than strike out and endeavour to swim to shore. In such case their safety mainly depends on the establishment of some communication with the shore. Such communication was the object of Captain Manby's attention. On February 12th, 1808, a brig ran aground within a hundred and fifty yards of the Yarmouth coast; the crew lashed themselves to the rigging, and bore up against a furious storm as best they might—hoping almost against hope. All attempts to send off a boat to them failed. At length Captain Manby brought his mortar down from his residence to the coast, and succeeded in throwing a line over the ship, by which all the poor fellows were saved. Having thus given practical proof of what could be effected, Manby was instrumental in causing many mortars to be so applied on the coast. He frequently tried to obtain some recognition of his services from the Government; and in this matter he was more fortunate than many useful discoverers. He was unquestionably the means whereby the attention of the Legislature was drawn to the subject of wrecks and life-saving apparatus; and when he died at a venerable age in 1854, he left behind him a name worthy of the gratitude of society.

It is believed that more than one thousand lives have been saved by means of the ropes thrown out to stranded ships, through the agency of mortar-rockets. There are 198 places on the shores of the United Kingdom, where such apparatus is kept, mostly under the charge of the Coast Guard, who, from the peculiar nature of their other duties, are well adapted for this kind of service.

The articles transmitted to the Paris Exhibition of 1855, by the Life-Boat Institution, may be taken as a test of the present state of the arts applied to this kind of construction; for it is to be supposed that the institution would be conversant with the latest practicable improvements. The first was a model life-boat and carriage, as now adopted by the Institution, and stationed on many parts of our coasts; the boat, invented by Mr. Peake, of Woolwich Dockyard, and made by Messrs. Forrestt, of Limehouse, is 30 feet long, 7½ feet wide, and 3¾ feet deep; it is considered to possess, in a high degree, seven qualities required in a life-boat—lateral stability, speed against a heavy sea, facility in launching and beaching, quick self-discharge of water, the power of self-righting if upset, great strength, and stowage-room for a number of passengers. Another specimen, was the life-boat which gained for Mr. Beeching, of Yarmouth, the Northumberland prize; it is a little longer and wider than Mr. Peake's, but not quite so deep. A third was Mr. Palmer's life-boat, employed for many years by the Society, and stationed at many points on the coast of France. A fourth was Mr. Ward Jackson's life-boat, such as is stationed at the West Hartlepool Docks. Besides these boats there were several minor articles, such as travelling life-buoys, to be used with the rocket and mortar apparatus; cork life-belts and life-buoys; and so forth.

We have now to notice the recent law concerning shipwrecks. The year 1854 gave strength to the cause, by bringing the power of the government to bear upon it—not that such strengthening is necessarily a result; for the 'right man' is not always in the 'right place,' nor do the government departments always do the right thing at the right time; but it seems especially fitting that the legislature, and through it the executive, should have a voice in the shipping economy of a maritime nation. Mr. Cardwell brought in and carried a Bill "To Amend and Consolidate the Acts relating to Merchant Shipping;" it constitutes the Act 17 & 18 Vict. cap. 104, and received the royal assent August 10, 1854. The statute is of great length, and relates to eleven different topics, bearing upon the well-being of sailors and their ships,—the relation of the Board of Trade to the Commercial Marine; the ownership, measurement, and register of British merchant ships; the qualifications of masters and seamen; the precautions for safety on ship-board; the arrangements concerning pilots; the management and tolls of lighthouses; the constitution of the Mercantile Marine Fund; the laws relating to wrecks, casualties, and salvage; the liabilities of ship-owners; legal course of procedure in the event of misdemeanor; and miscellaneous details. Inspectors of merchant ships, and investigators in respect to wrecks and accidents, are to be appointed by the Board of Trade; new examinations for masters and mates are to be organised, separating foreign-going ships from home-trade passenger ships; the Board is empowered to suspend certificates to masters and mates, in case of misconduct or inefficiency; naval courts are to be instituted abroad or on the high seas, in correspondence with the Board, to inquire into cases of wreck or abandonment of ships; the number and size of the boats to accompany all trading ships are denoted; every ship carrying more than ten passengers must be provided with a life-boat, or an ordinary boat rendered buoyant, and with two life-buoys—the boat and buoys being always kept ready for use; lights and fog-signals are to be used, such as may be suggested by the Admiralty; iron steamers must have water-tight compartments, and safety-valves beyond the control of the engineer; sea-going ships must be provided with fire-engines and hose, signal-guns, and ammunition for firing signals of distress.

Besides the provision for preventing wreck, the Act contains many clauses, applying to cases in which wreck may unhappily have occurred. As these arrangements are somewhat peculiar, it may be well to notice them a little closely. All matters relating to wreck are placed under the general superintendence of the Board of Trade, by whom 'Receivers of Wreck' are to be appointed. These receivers will have the chief command and authority over all persons present at any wreck, or similar casualty, and power to issue such directions as may seem expedient for the preservation of life and property, or for the prevention of plunder and disorder. Whenever a ship is stranded, or otherwise in distress on British shores, bystanders are to be encouraged to render assistance, by having a pecuniary interest in the preservation of life or property. If services so rendered shall be instrumental towards the object in view, the persons shall have a claim on the owner of the ship for a "reasonable amount of salvage." Numerous directions are given for ascertaining what would be a "reasonable amount" in each case; for enforcing the claim of the salvor against the distrainer; for disposing of an unclaimed wreck; and for adding to the salvor's reward out of the Mercantile Marine Fund, in cases where life has been preserved, and where the wrecked ship is insufficient in value to pay the salvage awarded. The Mercantile Marine Fund here adverted to is made up in a curious way; it consists of certain fees received by the Board of Trade for examinations and registries connected with merchant-ships; lighthouse dues accruing by virtue of certain sections of the Act; rates accruing from lastage and ballastage in the Thames; and fees derived through the Receivers of Wreck. The fund, kept with her Majesty's Paymaster-General, is employed in payment of the salaries of examiners, surveyors, receivers, &c.; expenses in regard to lighthouses, buoys, beacons, lastage, ballastage, life-boats, &c.; and rewards to persons who assist in saving wrecked ships, or crews, or passengers.

In pursuance of the powers conferred by the statute above sketched, the Board of Trade proceeded, early in 1855, to give effect to its provisions. Among other steps, the Board addressed a Circular to all the Life-boat Committees throughout the United Kingdom. Considering that in 1854 no fewer than 1540 persons perished from wrecks on our own coasts, it is not too much to say that a wide field is yet open to the exertions of individual humanity and bravery. Doubtless, many of those persons might have been rescued had there been life-boats and willing aiders at the places where the calamities occurred. The principle intended by the Act, and entrusted to the Board of Trade for realisation, is not to supersede local exertion, but to support it—to "help those who will help themselves." A preparatory Circular was addressed to the several Life-boat Committees in September 1854, and this was followed by another in February 1855. The Circular dwelt strongly on the fact that the Board would insist on evidence of local activity before sanctioning grants out of the Mercantile Marine Fund. "In the wealthier and more populous portions of the kingdom, my Lords anticipate that the public spirit of the neighbourhood will supersede the necessity of recurrence to this Board for aid. In cases where a necessity for such assistance exists, the assistance contemplated by the Board of Trade will be confined to assisting towards the manning and exercise of boats, and towards defraying expenses connected with actual service rendered in saving, or endeavouring to save, life from shipwreck. The construction and maintenance of boats and boat-houses will, my Lords anticipate, be provided for as heretofore by funds voluntarily raised. My Lords have entered into correspondence with the National Life-boat Institution, which offers many advantages to local Committees in correspondence with it, and they propose also to communicate from time to time with any Local Committee which may desire to address their communications directly to this department."

The principal arrangements marked out in the Circular may be condensed as follows. Every Life-boat Committee must have as one of its members an officer of the Coast-guard, or of the Customs, or some official person connected with the Board of Trade. The Local Committee must be provided with a boat and boat-house satisfactory to the Board. The boats, houses, and gear, must be kept in efficient repair, and accessible to the Inspector appointed by the Board. Each boat must have a coxswain, and a crew at least one-half more than is necessary to man the boat; permanent, if possible. The coxswain is to receive a small salary, and he, as well as the crew, are to receive certain specified rewards as payments for each time of exercising (once a quarter at the least), each time of launching to assist a wreck, and each time of undergoing special danger or fatigue. In the event of the death of any of the crew while on service, the Board will contribute towards a fund for the widow. All the payments are in the first instance to be made by the Local Committees, but to be repaid by the Board of Trade when satisfactorily tested. Signal rockets and mortar apparatus on the coast are to remain under the charge of the coast-guard.

The Life-boat Institution, to further the object held in view by the Board of Trade, also issued a Circular to the Local Life-boat Committees, containing advice and suggestions couched in more familiar language than a Government department is accustomed to employ. One extract will suffice to explain in some degree the mode in which men are induced to tender their services in the hazardous duty of manning a life-boat. Speaking of the remuneration promised by the Board of Trade, the Circular says:—"The scale of payment for services in saving life is greater than has ever before been paid, and is calculated to give every encouragement to seamen who engage in such an honourable and humane, yet often perilous, service. They conceive that the chief point in connection with it, which will call for the attention of the Local Committees, will be to exercise a careful and wise discretion in recommending the higher awards for extraordinary services; taking care never to do so but for those of a really distinguished character. The quarterly exercise of the life-boat should never be omitted. If, as may happen in the summer months, rough weather does not occur, the crew may still, with advantage, be exercised in rowing together, and the sound and tight condition of the boat herself, and the perfectness of her gear and fittings ascertained; and if, from any cause, the greater part of her ordinary crew are absent, she had nevertheless better be taken afloat by any other of the seamen of the port who may be obtained, but always, if possible, in charge of the permanent coxswain of the boat. The salary of the coxswain is double that which has previously been paid by this institution. In return, it will be expected that they shall devote the more time and attention to preserving the boats and their appurtenances under their care in a constant state of efficiency, and ready for instant service. With regard to the hire of horses or steam-tugs, and the payment of persons to assist in launching and hauling up life-boats, the attention of the Local Committees will here also be chiefly required to check undue charges and to avoid incurring such expenses, except when necessary. It is thought, also, that they may do much good by endeavouring at all times to encourage public spirit, and other disinterested motives, in those who are called upon to assist on such occasions, and, as far as possible, to divest such services of a mercenary character." Under this Act, in 1857, the Board of Trade paid a total sum of 5020*l.* for rewards, pensions, &c., and for maintaining the Rocket and Mortar Apparatus.

SHIRE. See COUNTY COURTS, *S.* 2, p. 158. Hundred Courts and Courts Leet have long been almost entirely obsolete, and the County Court statutes accordingly contain provisions for the surrender of such courts by the lords thereof to the Crown. It does not appear, however, that any surrenders have yet been made.

SHOVELER. [DUCKS.]

SHRIMP, FRESH-WATER. [GAMMARUS.]

SICILY. The island has been described in vol. xxi., but it is now divided into seven provinces, the area, subdivisions, and population of which, according to the latest returns, are as follows:—

Provinces.	Area in Square Miles.	Districts.	Communes.	Population in 1851.
Palermo	1984	4	72	514,717
Messina	1386	4	116	349,484
Catania	1761	2	81	379,991
Girgenti	1375	3	45	245,974
Noto	1482	3	41	237,814
Trapani	1358	3	21	182,809
Caltanisella	1190	3	31	180,791
Total	10,536	22	407	2,091,580

SILICA. [SILICIUM.]

SILURIAN SYSTEM. The following list of fossils, found in this system, is given by Professor Phillips:—

AMORPHOZOA.

	Species.		Species.
Acanthospongia (?)	1	*Cnemidium*	1
Choria	2		

FORAMINIFERA.

Eudothyra	1

ZOOPHYTA. (*Zoantharia* of Edwards.)

	Species.		Species.
Acervularia	1	*Goniophyllum*	2
Alveolites	4	*Halysites*	1
Arachnophyllum	1	*Heliolites*	10
Aulacophyllum	1	*Petraia*	7
Aulopora	3	*Pyrilonema*	1
Chætites	4	*Protovirgularia*	1
Cladocora	1	*Sarcinula*	1
Clisiophyllum	1	*Stenopora*	1
Cœnites	5	*Strephodes*	5
Cyathaxonia	1	*Stromatopora*	2
Cyathophyllum	5	*Strombodes*	2
Cystiphyllum	4	*Syringopora*	5
Diphyphyllum	1	*Thecia*	2
Favosites	7	*Zaphrentes*	2
Fistulipora	1		

ALCYONARIA.

	Species.		Species.
Didymograpsus	3	*Graptolithus*	12
Diplograpsus	10	*Rasbrites*	1
Gorgonia	4	*Retiolites*	1

HYDROIDIA.

	Species.
Oldhamia	2

ECHINODERMATA.

Crinoidea.

	Species		Species.
Actinocrinus	4	*Marsupiocrinus*	1
Crotalocrinus	1	*Periechocrinus*	2
Cyathocrinus	3	*Sagenocrinus*	2
Eucalyptocrinus	3	*Sasocrinus*	1
Glyptocrinus	1	*Tetramerocrinus*	1
Ichthyocrinus	1	*Tetragonis*	1

CYSTIDOIDEA.

	Species.		Species.
Agelacrinites	1	*Echinosphærites*	4
Apiocystites	1	*Hemicosmites*	2
Caryocystites	5	*Prunocystites*	1
Echinencrinus	2	*Pseudocrinites*	4

ASTROIDEA.

	Species.		Species.
Lepidaster	1	*Uraster*	4
Prolaster	1		

ECHINOIDEA.

	Species.
Palæchinus	1

ARTICULATA.

Annelida.

	Species.		Species.
Aphrodita	1	*Nereites*	3
Cornulites	1	*Serpulites*	4
Cropopodia	2	*Spirorbis*	1
Lumbricaria	2	*Tentaculites*	3
Myrianites	1	*Trachyderma*	3
Murestites	1		

CRUSTACEA.

Entomostraca,—TRILOBITIDÆ.

	Species.		Species.
Acidaspis	10	*Harpes*	2
Æglina	2	*Homalonotus*	5
Agnostus]	4	*Illænus*	8
Amphion	1	*Lichas*	9
Ampyx	5	*Ogygia*	2
Asaphus	7	*Olenus*	4
Bronteus	2	*Paradoxides*	1
Calymene	6	*Phacops*	15
Cheirurus	4	*Proëtus*	3
Conocephalus	1	*Remoplourides*	7
Cybele	2	*Sphærexochus*	1
Cyphaspis	1	*Staurocephalus*	2
Cyphoniscus	1	*Stygina*	2
Deiphon	1	*Tiresias*	1
Eccooptocheile	1	*Trinucleus*	5
Encrinurius	4		

Other *Entomostraca.*

	Species.		Species.
Beyrichia	3	*Eurpyterus*	2
Ceratrocaris	3	*Hymenocaris*	1
Cythere	1	*Leptocheles*	2
Dithyrocaris	1	*Pterygotus*	1

BRYOZOA.

	Species.		Species.
Cellepora	1	*Heteropora*	1
Cercopora	5	*Intricaria*	1
Dicistopora	2	*Oldhamia*	—
Discopora	3	*Polypora*	1
Escharina	1	*Ptilodictya*	8
Fenestella	6	*Retepora*	1
Glauconone	1		

BRACHIOPODA.

	Species.		Species.
Athyris	6	*Chonetes*	1
Atrypa	9	*Crania*	3

Cyxtia	1	*Pentamerus*	8
Discina	12	*Retzia*	3
Leptæna	42	*Rhynconella*	26
Lingula	16	*Siphonotreta*	2
Obolus	2	*Spirifera*	5
Orthis	45	*Trematis*	1
Orthisina	2		

Lamellibranchiata.

Monomyariæ.

	Species.		Species.
Ambonychia	7	*Posidonomya*	1
Avicula	16	*Pterinea*	10
Inoceramus	2		

Dimyaria.

	Species.		Species.
Anodontopsis	7	*Modiola*	6
Aria	12	*Modiolopses*	8
Cardiola	3	*Mytilus*	7
Cleidophorus	7	*Nucula*	13
Conocardium	3	*Orthonota*	3
Cypricardia	3	*Psammobia*	1
Dolabra	2	*Sanguinoletes*	10
Grammysia	4	*Telluria*	1
Leptodomus	2		

Pteropoda.

	Species.		Species.
Cornularia	3	*Pterotheca*	2
Ecculiomphalus	3	*Theca*	3

Gasteropoda.

	Species.		Species.
Capulus	2	*Natica*	1
Euomphalus	16	*Nerita*	1
Helminthochiton	1	*Paletta*	1
Holopla	2	*Pharsanella*	1
Holoppella	9	*Pleurotomaria*	10
Loxonema	2	*Raphistoma*	2
Maclurea	2	*Trochus*	8
Macrochalus	1	*Turbo*	10
Murchisonia	14	*Turritella*	4

Heteropoda.

	Species.
Bellerophon	13

Cephalopoda.

	Species.		Species.
Actinoceras	3	*Orthoceras*	54
Cyrtoceras	3	*Phragmoceras*	10
Litrutes	11		

Fishes.

	Species.		Species.
Onchus	2	*Sphagodus*	1
Plectrodus	3	*Thelodus*	1

Of the above list, 496 were found in the Upper Silurian; 485 in the Lower Silurian; and 19 in the Cambrian.

SILVER. The ores from which the silver of commerce is mostly obtained are the Vitreous Silver, Brittle or Black Silver-Ore, Red Silver-Ore, and Horn Silver, in addition to Native Silver. Besides these, silver is obtained in large quantities from galena (lead-ore), and from different ores of copper; and some galenas are so rich in silver that the lead is neglected for the more precious metal. This metal occurs in rocks of various ages, in gneiss, and allied rocks, in porphyry, trap, sandstone, limestone, and shales; and the sandstone and shales may be as recent as the middle secondary, as is the case in Prussia. The silver-ores are associated often with ores of lead, zinc, copper, cobalt, and antimony, and the usual gangue is calc spar or quartz, with frequently fluor spar, pearl spar, or heavy spar.

The Silver of South America is derived principally from the Horn Silver and Brittle Silver-Ores, including Arseniuretted Silver-Ore, Vitreous Silver-Ore, and Native Silver. Those of Mexico are of nearly the same character. Besides, there are earthy ores called Colorados, and in Peru Pacos, which are mostly earthy oxide of iron, with a little disseminated silver; they are found near the surface, where the rock has undergone partial decomposition. The sulphurets of lead, iron, and copper, of the mining regions, generally contain silver, and are also worked. (Dana.)

The principal mines of silver in Europe are those of Spain, of Kongsberg in Norway, of Saxony, the Hartz, Austria, and Russia.

In England, argentiferous galena is worked for its silver. Forty thousand tons of this ore were reduced in 1837, which contained upon an average about six ounces of silver in a ton of lead.

The annual product of the several countries of Europe is thus estimated by Dana in his 'Manual of Mineralogy:'—

	Pounds Troy.
British Isles	7500
France	4150
Austria	63,000
Sweden and Norway	13,000
Spain	130,000
Saxony, the Hartz, and other parts of Germany	78,500
Belgium	440
Piedmont, Switzerland, and Saxony	1560

making in all 298,150 troy pounds, or about 4,500,000 dollars annually. With the sum from Russia, about 730,000 dollars, it becomes 5,230,000 dollars a year. This is small compared with the amount from America, which at the beginning of the present century equalled 2,100,000 pounds, or 31½ millions of dollars, nearly six times the above sum; and it is probable that these mines will again yield this amount when properly worked. The whole sum from Russia, Europe, and America, makes nearly 2,000,000 pounds avoirdupois.

SIMCOE. [Canada, *S.* 2.]

SIMETHIS, a genus of Plants belonging to the natural order *Liliaceæ*, and the tribe *Anthericeæ*. The parts of the perianth are six, spreading, deciduous; the stamens are attached to the base of the perianth; the filaments bearded; the anthers incumbent; the capsules are 3-celled, and each cell contains two seeds.

S. bicolor is a recent addition to the British Flora. It is a native of the South of Europe, and is found on sandy heaths near the sea-shore. In England it was first found at Bournemouth, in Dorsetshire. It has also been found at Derrynane, Kerry, in Ireland. This plant has linear leaves, flat, or a little keeled upwards. The flowers are panicled, the petals are purple without, and white within. In Hooker and Arnott's 'British Flora' it is suggested that this plant may have been introduced with trees from France.

SIMIADÆ. In the list of the specimens of *Mammalia* published by Dr. J. E. Gray, we find almost a complete representation of this family. They are as follows:—

SIMIADÆ.

The Chimpanzee (*Troglodytes niger*, Geoff.; *Homo Troglodytes*, Linn.). West Africa. [Chimpanzee.]

The Orang-Outan, or Pongo (*Simia Satyrus*, Linn.; *S. Wurmbii*, Kuhl; *S. Agrias*, Schreb.). Borneo. [Orang-Utan.]

The Siamang (*Siamanga Syndactyla; Simia Syndactyla*, Raffles, Horsf.). Java.

The Hoolock (*Hylobates Hoolock*, Martin; *Simia Hoolock*, Harlan). [Hylobates.]

The Oungka (*H. agilis*, F. Cuv.; *Simia Lar.*, Vigors and Horsfield; *Pithecus agilis*, Desm.). Himalaya and Malacca.

The Gibbon (*H. Lar.; Homo Lar*, Linn.; *S. longimana*, Schreb.). Malacca.

The Silvery Gibbon, or Wou-Wou (*H. leuciscus*, Kuhl; *Simia leucisca*, Schreb.). Malacca.

The Kalasie (*Presbytes rubicunda*). Borneo.

The Simpal (*P. melalophos; Simia melalophos*, Raffles). Sumatra.

The Tianac (*P. flavimana; Semnopithecus flavimanus*, I. Geoff.). Sumatra.

The Rufous Presbytis (*P. nobilis*, Gray; *Semnopithecus melalophos*, Desm.). Himalaya.

The Lutung (*P. Pyrrhus*). Java.

The Chingkau (*P. cristata; Simia cristata*, Raffles). Java and Sumatra.

The Dusky Presbytis (*P. obscura*). Singapore.

The Negro Presbytis (*P. maura; Simia maura*, Schreb.). China.

The Hooded Presbytis (*P. Johnii*; *Simia Johnii*, Fischer). India, Madras.

The Hoonuman (*P. entellus*). Bombay and Nepaul.

The Nestor (*P. cephalopterus*; *Cercopithecus cephalopterus*, Zimm.). Ceylon.

Pennant's Colobus (*Colobus Pennantii*, Waterh.). Fernando Po.

The Red and Black Colobus (*C. rufoniger*, Ogilby, Martin). Fernando Po.

Temminck's Colobus (*C. Temminckii*, Desm.). West Africa, Gambia.

The Black Colobus (*C. Satanas*, Waterh.). Fernando Po.

The King Monkey (*C. polycomos*, Geoff.; *Simia polycomos*, Schreb.). Fernando Po.

The Guereza (*C. guereza*, Ruppell). Abyssinia.

The Vervet (*Cercopithecus pygerythrus*, F. Cuv.). Cape of Good Hope.

The Grivet, or Tota (*C. engythithia*; *Simia engythithia*, Herm.). Abyssinia.

The Callithrix (*C. sabæus*. Erxl.; *Simia sabæa*, Linn.). West Africa.

The Talapoin (*C. Talapoin*, Erxl.; *Simia Talapoin*, Schreb.). West Africa.

The Mona (*C. mona*, Erxl.; *Simia mona*, Schreb.). West Africa, Guinea.

Burnett's Mona (*C. Burnettii*, Gray). Fernando Po.

The Red-Eared Monkey (*C. erythrotis*, Waterh.). Fernando Po.

The Hocheur (*C. nictitans*, Erxl.; *Simia nictitans*, Linnæus). Fernando Po.

The Diana (*C. Diana*, Erxl.; *Simia Diana*, Linn.). West Africa.

The Bearded Monkey (*C. Pogonias*, Bennett). Fernando Po.

The Patas (*C. ruber*, Kuhl.; *Simia rubra*, Gmel.). Africa, Senegal.

The White-Collared Mangabey (*Cercocebus collaris*; *Cercopithecus Æthiops*, Kuhl.). Africa.

The White-Crowned Mangabey (*C. Æthiops*; *Simia Æthiops*, Linn.). Africa.

The Sooty Mangabey (*C. fuliginosus*, Geoff.; *Cercopithecus fuliginosus*, Kuhl.). Africa.

The Zati, or Capped Macaque (*Macacus radiatus*, Desm.). India.

The Munga, or Bonnet-Macaque (*M. Sinicus*, Desm.; *Simia Sinica*, Linn.). India.

The Bruh (*M. nemestrinus*, Desm.; *Simia nemestrina*, Linnæus). Sumatra.

The Macaque (*M. cynomolgus*, Desm.; *Simia cynomolgos*, Linn.). India, Sumatra.

The Rhesus (*M. Rhesus*, Desm.; *Simia Rhesus*, Audeb.). India, Bengal.

The Oinops (*M. Oinops*). Nepaul.

The Brilliant Macaque (*M. Speciosus*, F. Cuv.). Japan.

The Magot (*M. Inuus*, F. Cuv.; *Simia Inuus*, *S. vulgaris*, and *S. Sylvanus*, Linn.). Gibraltar Rock, Stora, North Africa.

The Black Macaque (*M. niger*, Bennett; *Cynocephalus niger*, Desm.). Philippines.

The Wanderoo (*S. veter*; *Simia Silenus*, and *S. Veter*, Linnæus). Ceylon, China, India.

The Gelada (*Gelada Ruppellii*). Abyssinia.

The Tartarin (*Cynocephalus Hamadryas*, Latr.; *Simia Hamadryas*, Linn.). Abyssinia.

The Chacma (*C. porcarius*, Desm.; *Simia porcaria*, Bodd). South Africa.

The Baboon (*C. babouin*, Desm.; *Simia cynocephalus*, Fischer). West Africa.

The Papion (*C. Sphinx*, Latr.; *Simia Sphinx*, Linn.). Guinea.

The Mandrill (*Papio Maimon*, Latr.; *Simia Maimon*, and *S. Mormon*, Linn.). Africa.

The Drill (*P. leucophæa*). Africa.

CEBIDÆ.

The Chameck (*Ateles Chameck*; *Simia Chameck*, Humb.). Guiana.

The Black Spider Monkey (*A. ater*, F. Cuv.). Brazils.

The Coaita (*A. Paniscus*, Geoff.; *Simia Paniscus*, Linn.). Brazils.

The Marimonda (*A. Belzebuth*, Geoff.). Brazils.

The Chuva (*A. marginatus*, Kuhl.). Brazils.

The Five-Fingered Miriki (*Brachyteles arachnoides*; *Simia arachnoides*, Humb.). Tropical America.

The Black-Foreheaded Miriki (*B. frontatus*). Tropical America.

The Miriki (*B. hypoxanthus*). Tropical America.

The Caparro, or Negro Monkey (*Lagothrix Humboldtii*, Geoff.). Brazils.

The Araguato, or Brown Howler (*Mycetes ursinus*). Guiana, Brazils.

The Golden Howler (*M. Seniculus*, Kuhl.; *Simia Seniculus*, Linn.). Royal Monkey, Penn. (*Alouate*, Ruff.). Brazils.

The Caraya, or Black Howler (*M. Caraya*; *Simia Caraya*, Humb.). Brazils.

The Guariba, or Yellow-Handed Howler (*M. Beelzebul*; *Simia Beelzebul*, Linn.). Brazils.

The Tufted Capuchin (*Cebus cirrifer*, Geoff.). Brazils.

The Kaite, or Horned Capuchin (*C. Fatuellus*, Erxl.). Brazils.

The Capuchin (*C. Apella*, Erxl.; *Simia Apella*, Linn.). Brazils.

The Hierang, or Yellow-Chested Capuchin (*C. xanthosternon*). Brazils.

The Sai, or Weeper (*C. Capucinus*, Erxl.; *Simia Capucina*, Linn.). Brazils.

The White-Headed Sapajou (*C. hypoleucus*, Geoff.). America.

The Yellow Sapajou (*C. gracilis*, Spix). Brazils.

The Golden-Handed Sapajou (*C. chrysopus*, F. Cuv.). Brazils.

The Tee-Tee (*Callithrix sciureus*, Kuhl.; *Simia sciurea*, Linnæus). Brazils.

The Sahuassu, or Masked Tee-Tee (*C. persondtus*, Kuhl.). Brazils.

The Oiabassu, or White-Handed Tee-Tee (*C. Moloch*, Geoff.). Brazils.

The Collared Tee-Tee (*C. torquatus*, Hoffm.). Guiana. Brazils.

The Cuxio, or Bearded Saki (*Brachyurus Satanas*; *Cebus Satanas*, Hoffm.). Guiana.

The Yarke (*Pithecia irrorata*, Gray). Brazils.

The Black Yarke (*P. leucocephala*, Geoff.). Brazils.

The Whiskered Yarke (*P. pogonias*, Gray). Brazils.

The Douroucouli (*Nyctipithecus trivirgatus*, Gray). Brazils.

The Vitoe (*N. felinus*, Spix). Brazils.

The Marmoset (*Jacchus vulgaris*, Geoff.). Brazils.

The Gnick-Gnick, or Black-Eared Marmoset (*J. penicillatus*, Geoff.). Brazils.

The White-Eared Marmoset (*J. auritus*, Geoff.). Brazils.

The Tamarin (*J. Midas*; *Simia Midas*, Linn.). Brazils.

The Black Tamarin (*J. Tamarin*; *Cebus Tamarin*, Link). Brazils.

The White-Whiskered Tamarin (*J. labiatus*, Desm.). Brazils.

The Marikina (*J. Rosalia*; *Simia Rosalia*, Linn.). Brazils.

The Pinche (*J. Œdipus*, Desm.; *Simia Œdipus*, Linn.). Brazils.

The following forms of *Simiadæ* and *Cebidæ* were existing in the Gardens of the Zoological Society, Regent's Park, between the years 1847 and 1852:—

Simiadæ.

Simia Satyrus, Hylobates Hoolook, Semnopithecus Guletta, Cercopithecus nictitans, C. petamista, C. melanogenys, C. cephus, C. albopilaris, C. Campbellii, C. Pluto, C. Mona, C. Pygerythrus, C. Sabæus, C. cynosurus, C. callithrix, C. Talaponi, C. niger, Cercocebus fuliginosus, C. Æthiops, Macacus sinicus, M. pileatus, M. cynomolgus, M. erythræus, M. nemæstrinus, M. Silenus, M. niger, Inuus sylvanus, Cynocephalus Hamadryas, C. Sphinx, C. Babouin, C. Porcarius, C. leucophæus, C. Mormon.

Cebidæ.

Ateles Chamek, A. paniscus, A. ater, A. Beelzebuth, A. marginatus; Pithecia chiropotes; Lagothrix Humboldtii; Brachyurus Ouakari; Saimiri sciureus; Callithrix torquatus; Nyctipithecus trivirgatus; Cebus apella, C. capucinus, C. cirrifer, C. xanthosternum, C. hypoleucus; Hapale Jacchus, H. aurita, H. penicillata. H. (Midas) Œdipus, H. (Midas) rufimanus, H. (Midas) Tamarin.

SINAPOLINE. [CHEMISTRY, *S.* 2.]

SINNAMINE. [CHEMISTRY, *S.* 2.]

SIPHONOSTOMES. [Suctorial Crustaceans.]

SIPUNCULOIDEA, an order of Echinodermatous Animals, embracing the families *Sipunculidæ*, *Priapulidæ*, and *Thalassemadæ*. This order is thus defined: The cutaneous envelope is coriaceous, and free from calcareous corpuscles; there is no calcareous ring about the œsophagus; the body is cylindrical; the digestive canal usually asymmetrical.

1. The *Sipunculidæ* (Syphon-Worms) have a retractile proboscis, at the base of which is placed the vent, and round the extremity of which there is a circle of tentacles. This family embraces the genera *Syrinx*, *Sipunculus*, and *Phascolosoma*.

Syrinx (Bohadsch) has a cylindrical proboscis shorter than the body, having a circle of short-fingered tentacles around its tip. In his 'History of British Star-Fishes,' Forbes refers three British species of *Sipunculus* of other authors to this genus—*S. nudus*, *S. papillosus*, and *S. Harveii*.

Sipunculus (Linnæus) has a cylindrical proboscis about as long as the body, and a circle of simple linear tentacles around its tip. The following are British species of this genus:—*S. Bernhardus*, *S. Johnstoni*, *S. saccatus*, *S. tenuicinctus*, *S. Forbesii*, *S. granulosus*, *S. punctatissimus*, and *S. Pallasii*.

2. The *Priapulidæ* (Tailed-Worms) have a retractile proboscis with no tentacles, and the vent at the end of a long thread-like tail.

Priapulus (Lamarck) has the body truncated behind, and the tail much branched and pointed.

The only British species is *P. caudatus*, which is only rarely taken.

3. The *Thalassemadæ* (Spoon-Worms) have a body oval or oblong, a proboscis with a long fleshy appendage; vent at posterior extremity, tentacles none.

Thalassema (Cuvier) has a cylindrical body rounded and smooth behind; the proboscis retractile, short, furnished at one side with a long fleshy furrowed simple sheath, which is not retractile. *T. Neptuni* is a British species.

Echiurus (Cuvier) has a cylindrical body, set at its hinder extremity with circles of bony points, and a proboscis as in *Thalassema*. [Echinodermata; Thalassema.] *E. oxyurus* is a British species.

(*Manual of Natural History*; Gosse, *Marine Zoology*; Forbes, *British Star-Fishes*.)

SISMONDINE. [Mineralogy, *S.* 1.]

SISTOVA, a town in Bulgaria, is situated on a height above the right bank of the Danube, 37 miles above Rustschuk, and 25 miles below Nikopoli, and has about 21,000 inhabitants. The town is defended by a citadel, and inclosed by a dry ditch and palisade. The houses are low and ill-built. The mosques, of which there are eight, are the only buildings worth notice. Sistova is a place of considerable commerce, and is looked upon by the Bulgarians as their proper capital. In ordinary times it has a good trade in corn, hides, leather, foreign manufactures, and colonial produce. The Turks and Austrians concluded a peace at Sistova in 1791.

SISYMBRIUM. [Iridaceæ.]

SIVATHERIUM (from Siva, an Indian deity), a genus of extinct animals belonging to the family of *Elephantidæ*. The remains of species of this remarkable genus were found by Dr. Falconer and Colonel Cautley in the valley of Mackanda, in the Sewalik Hills of the Himalaya.

Two species of this genus, *S. giganteum* and *S. Perimense*, have been described. A cranium, lower jaw and teeth, and bones of the extremities of *S. giganteum* are now in the British Museum. The skull of this animal is nearly as long as that of the Elephant, the neck was shorter and stronger than in the Giraffe. The posterior portion of the skull is greatly developed, and formed of cellular cavities, as in the Elephant. "The face is short, and the nasal bones are remarkable for the manner in which they are prolonged into a pointed arch above the external nostrils, indicating a trunk, or proboscis. The very inclined direction of the front of the face in relation to the triturating surface of the teeth, imparts a physiognomy altogether peculiar. Two horns arise from the brow between the orbits, and diverge from each other, and it is probable that the posterior protuberances of the forehead also supported a pair of short massive horns." (Mantell.)

When living, the Sivatherium must have resembled an immense Gnu, or Antelope, with a short thick head surmounted with two pairs of horns. The front pair of these horns were small, whilst those behind were probably palmated. The eyes were small, and it had a nasal proboscis, an organ unknown amongst the *Ruminantia*.

(Mantell, *Petrefactions and their Teachings*; *Journal of the Asiatic Society*.

SKATES. [Raiidæ, *S.* 2; Skate.]

SKENEA, a genus of Gasteropodous *Mollusca*, named after Dr. Skene. The shell is very small, flat, and with few whorls. It is deeply umbilicated; the mouth is entire, circular, not quite connected with the body whorl; operculum rather spiral. The animal is nearly like that of *Rissoa*, and has large eyes. The species are few, and are found generally on the roots of *Corallina officinalis*.

SKIBBEREEN, County Cork, Ireland, a market-town and the seat of a Poor-Law Union, is situated on the river Ilan, in 51° 34′ N. lat., 9° 16′ W. long., distant by road 52 miles S.W. from Cork, and 210 miles S.W. from Dublin. The population in 1851 was 3856. Skibbereen Poor-Law Union comprises 23 electoral divisions, with an area of 115,024 acres, and a population in 1851 of 38,059. The town contains a parish church, chapels for Roman Catholics and Wesleyan Methodists, two National schools, a court-house, market-house, dispensary, bridewell, and Union workhouse. In the town are flour-mills and a brewery. Quarter and petty sessions are held. There are six yearly fairs, at which large quantities of yarns and coarse linens are sold.

SKULLCAP. [Scutellaria, *S.* 1.]

SLATE. *Drawing slate* is a finer and more compact variety than the common slate, of bluish and purplish shades of colour. The best slates come from Spain, Italy, and France. A good quality is quarried in Maine and Vermont, United States.

Novaculite, *Hone-Slate*, or *Whet-Stone*, is a fine grained slate, containing considerable quartz, though the grains of this mineral are not perceptible. It occurs of light and dark shades of colour, and compact texture.

Argillite is a general term given to argillaceous or clay-slate rocks. Many shales or argillites crumble easily, and are unfit for any purpose in the arts, except to furnish a clayey soil.

Alum Shale is any slaty rock which contains decomposing pyrites, and thus will afford alum or sulphate of alumina on lixiviation.

Bituminous Shale is a dark coloured slaty rock containing some bitumen, and giving off a bituminous odour.

Plumbaginous Schist is a clay slate containing plumbago or graphite, and leaving traces like black lead.

The *Pipestone* of the North American Indians was in part a red claystone or compacted clay from the Coteau de Prairies. It has been named *Catlinite*. A similar material, now accumulating, occurs on the north shore of Lake Superior, at Nepigon Bay. Another variety of pipestone is a dark grayish compact argillite; it is used by the Indians of the north-west coast of America. (Dana.)

SLEEMAN, SIR WILLIAM HENRY, K.C.B., the son of Philip Sleeman, Esq., was born at Stratton, Cornwall, in 1788. In 1808, he became a cadet in the East India Company's service at Bengal. He served in the Nepaulese war of 1812 with distinction; and at its conclusion being laid up with an illness which disqualified him for active employment, he spent fifteen months at the College of Fort William, during which time he made himself master of the history and language of the natives, and prepared himself for a career of future usefulness. In 1816 he commended himself to Lord Moira (afterwards Marquis of Hastings), then Governor-General of India, by conducting an inquiry into the claims arising out of the war in Nepaul, and in 1820 was appointed agent in the Saugur and Nerbudda districts. Here he employed his energies in the extinction of the atrocious systems of Thuggee and Dacoity, on which he wrote several able pamphlets; he at the same time produced a larger work, entitled 'Military Discipline in our Indian Army.' In 1842 he was commissioned by Lord Ellenborough to report on the condition of Bundelcund; and in 1849 he was promoted to the Residency at Lucknow, by Lord Dalhousie, who employed him in preparing for the reduction of Oude under British laws. As a proof of the necessity for adopting stringent measures, it should be mentioned that while resident at Lucknow, he intercepted a letter sent from the King of Persia to the King of Oude, in which the former spoke hopefully of a Persian invasion of India, and promised in that event to secure to him his throne, on condition of betraying the English into his hands. He also wrote a 'Treatise on Political Economy,' and a 'Review and Analysis of the Peculiar Doctrines of the System of Political Economy founded by Ricardo.' His most popular works, however, are his 'Diary in Oude' (1852), and his 'Rambles and Recollections of an Indian Officer' (1843), a work which has been pronounced by competent authorities to be the best adapted of all existing treatises on British India, to give an Englishman a faithful picture of the actual state of the religious, moral, and social condition of the natives of that country. He lived to see his measures with regard to Oude carried into effect by his successor, Sir James Outram, and to hear of the proclamation of Lord Dalhousie, announcing the actual annexation of that rich and important district. His health gave way towards the close of 1855, and he died at sea on his return to England, February 10, 1856, a few days after having been created a Knight Commander of the Bath, at the special request of Lord Dalhousie, to mark his distinguished services in the cause of religion and humanity by the suppression of Thuggee.

SLOUGH. [BUCKINGHAMSHIRE.]

SMELT. [SALMONIDÆ.]

SMILACIN. [CHEMISTRY, *S.* 1.]

SMITH, JAMES, the great propagator of the system of deep ploughing and thorough draining, was born at Glasgow on the 3rd of January 1789. His father had been in business at Glasgow, in which he acquired some property, but died when his son was only two months old, leaving him in the charge of his mother, who was a daughter of Mr. Buchanan, of Carston in Stirling. After her husband's death Mrs. Smith resided with her brother, who was the manager of an extensive cotton manufactory at Deanston, a few miles from Stirling. James Smith received his early education at home, completing it at the University of Glasgow. On leaving the university he returned to his uncle, who had by this time removed to the Catrine Works in Ayrshire, where, in order to attain a thorough knowledge of the trade, he worked through the various grades, labouring with persevering industry for twelve hours a day, with such good effect that at eighteen he was entrusted with the entire management of the works at Deanston, into which he subsequently introduced many improvements for promoting the health of the labourers that were noticed with approval by Mr. Chadwick in his 'Report on the Sanitary Condition of the Labouring Population of Great Britain,' published in 1841.

But Mr. Smith's attention had been early given to agricultural processes, and his intimate acquaintance with manufacturing machinery was made available in gratifying his predilection. The Dalkeith Farmers' Club having offered a prize of 500*l.* for a reaping-machine, Mr. Smith produced one, which, though it was not successful in obtaining the prize, was so ingenious that he was encouraged to prepare another in 1813. For this, though an accident prevented his gaining the prize, he received presents from several Scottish agricultural societies, and a gold medal from the Agricultural Society of St. Petersburg. He had the management of his uncle's farm, and many of his experiments were eminently successful; but he could not obtain his uncle's consent to carry out a full development of his theories. In 1823 however he became possessed of the farm of Deanston, about 200 acres of extremely poor land, having a soil not averaging more than four inches in depth, formed chiefly of the débris of the old red sandstone, with a subsoil partly of sandy clay and partly of a compact soil with stones, and the whole interspersed with boulder stones, producing little but rushes in the watery hollows and broom on the dryer portions. The whole of this he intersected with drains, laid at distances of 21 feet and at a depth of 30 inches. This, and a subsoil plough to stir the ground deeply without bringing the subsoil to the surface, produced an effect on the crops that proved the soundness of his theory. In 1831 he published a pamphlet on 'Thorough Draining and Deep Ploughing,' which excited immediate attention among his more immediate neighbours, but it was several years before its merits were generally acknowledged and the practice it recommended was adopted.

In 1846 Mr. Smith was appointed one of a commission to inquire into the health and sanitary condition of our manufacturing towns. One of his recommendations was the removal of the sewage for agricultural purposes; there are many difficulties to be overcome in effecting this, and Mr. Smith gave much attention to plans for overcoming them, propounding several means of singular mechanical ingenuity combined with simplicity. After considerable opposition an act of parliament was passed enabling municipalities to adopt his scheme where circumstances admitted of it. He also suggested several valuable improvements to the Agricultural Society of Ireland, of which he was an esteemed member, as he was also of the Glasgow Philosophical Society, to whose 'Transactions' he was an occasional and valuable contributor. In political economy Mr. Smith was a follower of Adam Smith, and of course opposed to protection, holding that free competition was the great spur to improvement. After a life of almost incessant activity, he died on the 10th of June 1850, somewhat suddenly, having retired to bed on the 9th apparently suffering nothing but an accustomed feebleness, and being found dead in the morning.

SMITH, JAMES and HORACE, were the sons of Robert Smith, of London, an eminent legal practitioner and Solicitor to the Ordnance. James Smith was born Feb. 10, 1775, in London, where also Horace Smith was born in 1780. James Smith, after receiving a good education in the school of the Rev. Mr. Burford, at Chigwell, in Essex, was articled to his father, and in due time was taken into partnership. He eventually succeeded his father in the business and in the appointment of Solicitor to the Ordnance. Horace Smith became by profession a stockbroker.

The first literary productions of the two brothers were gratuitous contributions to 'The Pic-Nic,' a periodical started by Colonel Greville, in 1802. 'The Pic-Nic' was soon merged in 'The Cabinet,' which maintained a struggling existence till July, 1803, when it was discontinued. When the 'London Review' was started by Cumberland, the dramatist, on the principle of each writer affixing his name to his criticism, James Smith wrote one of the articles, but the 'London Review' was unprofitable, and was soon discontinued. James and Horace Smith wrote several of the prefaces to a new edition of 'Bell's British Theatre,' which was published about this time under the sanction of Cumberland's name. They were also contributors from 1807 to 1810 to the 'Monthly Mirror,' in which periodical originally appeared the poetical imitations entitled 'Horace in London,' which were subsequently published in a small volume. Horace Smith wrote several of these parodies, but the larger number was written by James Smith.

The celebrity, however, which the two brothers enjoyed arose chiefly from the 'Rejected Addresses,' a small volume which was published on the opening of the new Drury Lane Theatre, in October 1812. The committee of management had issued an advertisement requesting that addresses, one of which should be spoken on the first night, might be sent in by way of competition. As all the addresses sent in, except one, were to be rejected, Mr. Ward, secretary to the theatre, casually started the idea of publishing a series of supposed 'Rejected Addresses.' This was just six weeks before the opening of the theatre. The brothers eagerly adopted the suggestion, and having immediately settled what authors each should imitate, Horace left London on a visit to Cheltenham, and James remained at home. Horace having executed his portion of the task returned to London a few days before the opening of the theatre. Each then submitted his productions to the other; a few verbal alterations were made, a few lines were added, and the little book was immediately printed and published. It was received by the public with enthusiastic delight. As the 'Rejected Addresses' are humorous imitations mostly of authors well known, and as the work is still in circulation, it is perhaps worth while to mention that the imitations of Wordsworth ('Baby's Debut'), Cobbett ('Hampshire Farmer's Address'), Southey ('The Rebuilding'), Coleridge ('Playhouse Musings'), and Crabbe ('The Theatre'), are by James Smith, as well as the song styled 'Drury Lane Hustings,' the 'Theatrical Alarm Bell' (an imitation of the editor of the 'Morning Post'), and the travesties 'Macbeth,' 'George Barnwell,' and 'The Stranger.' The rest of the imitations are by Horace Smith. The copyright, which was originally offered to Mr. Murray for 20*l.*, was purchased by him in 1819, after the sixteenth edition, for 131*l*.

Besides a great number of amusing trifles which James Smith contributed to the periodical literature of the day, he was a gratuitous contributor to the earlier series of theatrical entertainments entitled 'At Home,' in which the elder Charles Mathews displayed his extraordinary powers of humorous imitation. Subsequently, for the 'Country Cousins,' the 'Trips to Paris,' 'Air-Ballooning,' and the 'Trip to America,' he received from Mr. Mathews altogether 1000*l.* "You are the only man in London," said Mathews to James Smith, "who can write what I want, good nonsense."

The brothers were both admired for their conversational powers. James Smith especially had a large circle of acquaintance, and went much into society. Though he was always a man of temperate habits, he became in middle life subject to attacks of gout, which increased in frequency and severity till he gradually lost the use of his limbs, and could only move himself by the aid of crutches. He died in London, December 24, 1839. In early and middle life he was distinguished for manly beauty both of figure and face. He was never married.

Horace Smith contributed numerous pieces of poetry, half playful, half sentimental, to the 'New Monthly Magazine,' while it was under the editorship of Thomas Campbell, the poet. He was also the author of about twenty novels, of about three volumes each, the greater part of which seem to have been little known except to the regular novel readers of the circulating libraries. 'Gaieties and Gravities,' published in 1825, was one of the earliest of his novels. 'Love and Mesmerism,' 1845, was the latest. In the intermediate twenty years he gave to the public 'Brambletye House,' 'Tor Hill,' 'Reuben Apsley,' 'Zillah,' 'New Forest,' 'Walter Colyton,' 'Jane Lomax,' 'The Mooeyed Man,' 'Adam Brown,' 'Arthur Arundel,' and others. Horace Smith died July 12, 1849, at Tunbridge Wells. He was a widower, and left two daughters.

(*Memoirs, Letters, and Comic Miscellanies in Prose and Verse*, by the late James Smith, Esq., one of the authors of the 'Rejected Addresses,' edited by his brother, Horace Smith, Esq., 2 vols., cr. 8vo, 1840.)

SMITH, JOHN PYE, D.D., LL.D., one of the most learned ministers and theological tutors of the Independent or Congregationalist denomination, was born at Sheffield, May 25, 1774. In his early years he was employed in the shop of his father, who carried on a respectable bookselling establishment in Sheffield; but always a diligent student, and becoming strongly impressed with religious feelings, he became desirous of engaging in the Christian ministry. He accordingly left business, and in his twenty-second year entered the Independent Academy at Rotherham. Here he devoted himself zealously to the studies of the place, and such was the character he attained for ability and learning that, on a vacancy taking place in Homerton Theological Academy, Mr. Smith was chosen in 1800 to occupy the post of classical tutor in that seminary. At Homerton he subsequently formed a church, of which he became pastor, and which increased so largely in numbers as to require a separate chapel. In 1807 he received the diploma of D.D. from Yale College, Newhaven, Connecticut. In 1813 Dr. Pye Smith gave up the situation of resident classical tutor, retaining at the request of the directors the post of divinity tutor. In 1835 he received the diploma of LL.D. from Marischal College, Aberdeen. Dr. Smith became again in 1843 the resident tutor at Homerton, which office he filled till the breaking up of the establishment in 1850, when New College, St. John's Wood, was formed from the junction of Homerton, Highbury, and Coward Colleges. Dr. Pye Smith, who had been for many years afflicted with deafness, then retired from active duty, and his friends and admirers testified their regard for his character by raising a sum of 3000*l.*, to provide an annuity for him while he lived, the interest to be afterwards devoted to the foundation of a Smith scholarship in New College. Dr. Pye Smith died on February 5, 1851, in his seventy-seventh year. Dr. Pye Smith was held in unusual regard by all who knew him, as much for the singular simplicity, zeal, and benevolence of his character, as for his earnestness and devotion in his official duties, and his extensive erudition. He had been twice married.

Dr. Smith was a man of untiring industry, as well as of very unusual acquirements. He published numerous works on theology and on science, especially the science of geology. His great work was 'The Scripture Testimony to the Messiah,' 2 vols., 1818 and 1821. The remarkable range of reading which this work displayed, and particularly its familiarity with recent German theological literature, then a rare attainment with English divines, and especially with those of the Nonconformist body, attracted great attention to the work, and though some of the positions of the author were regarded as questionable by many theologians who agreed with him in his general theological views, it at once took a high place, and eventually came to be pretty generally regarded as a standard work on the subject of the divinity of Christ, and as perhaps the most important work of the kind on the orthodox side of the question. In subsequent editions the work was in parts considerably enlarged, and in some respects modified; and in its final shape it may be regarded as embodying almost the whole of the erudition on the important subject of which it treats. The fourth edition was published in 1847. Among his other works, several of which were of a controversial character, may be enumerated—'The Adoration of our Lord Jesus Christ vindicated from the Charge of Idolatry, a Sermon,' 1811. 'Four Discourses on the Sacrifice and Priesthood of Jesus Christ,' third edition, 1827. 'On the Personality and Divinity of the Holy Spirit, a Sermon,' 1831. 'The Mosaic account of the Creation and the Deluge, illustrated by the Discoveries of Modern Science,' 1837. 'On the Relation between the Holy Scriptures and some parts of Geological Science,' fourth edition, 1848. Dr. Pye Smith was a Fellow of the Royal Society and of the Geological Society, and took a deep interest in the philanthropic and religious movements of the day.

SMITH, JOSEPH, founder of the religious body commonly known as Mormons, but called by their founder and by themselves 'The Church of Jesus Christ of Latter Day Saints.'

Whether regarded as a religious, political, social, or intellectual phenomenon, the rise and progress of Mormonism is one of the most remarkable movements of modern times; and a calm survey of its origin and development, made with a view to arrive at a true knowledge of the facts, and, as far as practicable, a clear understanding of its inner spirit—to comprehend, that is, alike the system and its effects, the character of its founders, and its influence on its disciples—could not but be serviceable as well as interesting. Such a survey we cannot of course attempt here. What will be attempted in the present article will be to give a brief notice of the founder of Mormonism, and of the system as he left it. Its subsequent development and present state will be noticed under Utah, *S.* 2.

Joseph Smith left behind him an autobiography; and a strange book purporting to be written by his mother has been published, under the title of 'Biographical Sketches of Joseph Smith, the Prophet, and his Progenitors for many Generations, by Lucy Smith, Mother of the Prophet.' Of these, as well as the notices of him by his adherents and opponents who profess to have obtained their information respecting him at first hand, we have made use; but we prefer to let the Prophet in a measure tell his own story as we find it in a short sketch of himself and his system, which he supplied a few months before his death to Mr. Daniel Rupp for that gentleman's 'Original History of the Religious Denominations at present existing in the United States,' 8vo, Philadelphia, 1844, and which may consequently be taken as an authentic representation, as far as it goes, of what Smith himself wished to be believed. He says:—

"I was born in the town of Sharon, Windsor County, Vermont, on the 23rd of December, 1805. When ten years old, my parents removed to Palmyra, New York, where we resided about four years, and from thence we removed to the town (township) of Manchester, a distance of six miles. My father was a farmer, and taught me the art of husbandry. When about fourteen years of age, I began to reflect upon the importance of being prepared for a future state; and upon inquiring the plan of salvation, I found that there was a great clash in religious sentiment. . . . . Considering that all could not be right, and that God could not be the author of so much confusion, I determined to investigate the subject more fully. . . . . Believing the word of God, I had confidence in the declaration of James, 'If any man lack wisdom let him ask of God, who giveth to all men liberally and upbraideth not, and it shall be given him.'

"I retired to a secret place in a grove, and began to call upon the Lord. While fervently engaged in supplication my mind was taken away from the objects with which I was surrounded, and I was enrapt in a heavenly vision, and saw two glorious personages, who exactly resembled each other in feature and likeness, surrounded with a brilliant light which eclipsed the sun at noonday. They told me that all the religious sects were believing in incorrect doctrines, and that none of them was acknowledged of God as his Church and Kingdom. And I was expressly commanded to 'go not after them,' at the same time receiving a promise that the fulness of the Gospel should at some future time be made known to me."

This "fulness of the Gospel," was that revealed in the Book of Mormon; and as his account of the discovery of the book and its contents is really the point on which our estimate both of the man and the doctrine must to a great extent turn, it will be best given in his own words and without abridgment. He says:—"On the evening of the 21st of September, A.D. 1823, while I was praying unto God and endeavouring to exercise faith in the precious promises of Scripture, on a sudden a light like that of day, only of a far purer and more glorious appearance and brightness, burst into the room; indeed, the first sight was as though the house was filled with consuming fire. The appearance produced a shock that affected the whole body. In a moment a personage stood before me surrounded with a glory yet greater than that with which I was already surrounded. The messenger proclaimed himself to be an angel of God, sent to bring the joyful tidings, that the covenant which God made with ancient Israel was at hand to be fulfilled; that the preparatory work for the second coming of the Messiah was speedily to commence; that the time was at hand for the Gospel in all its fulness to be preached in power unto all nations, that a people might be prepared for the Millenial reign.

"I was informed also concerning the aboriginal inhabitants of this country (America) and shown who they were, and from whence they came;—a brief sketch of their origin, progress, civilisation, laws, governments, of their righteousness and iniquity, and the blessings of God being finally withdrawn from them as a people, was made known unto me. I also was told where there were deposited some plates, on which was engraven an abridgment of the records of the ancient prophets that had existed on this continent. The angel appeared to me three times the same night, and unfolded the same things. After having received many visits from the angels of God, unfolding the majesty and glory of the events that should transpire in the last days, on the morning of the 22nd of September, 1827, the angel of the Lord delivered the records into my hands.

"These records were engraven on plates which had the appearance of gold; each plate was six inches wide and eight inches long, and not quite so thick as common tin. They were filled with engravings in Egyptian characters, and bound together in a volume, as the leaves of a book, with three rings running through the whole. The volume was something near six inches in thickness, a part of which was sealed. The characters on the unsealed part were small and beautifully engraved. The whole book exhibited many marks of antiquity in its construction, and much skill in the art of engraving. With the records was found a curious instrument which the ancients called 'Urim and Thummim,' which consisted of two transparent stones set in the rim on a bow fastened to a breastplate. Through the medium of the Urim and Thummim I translated the record by the gift and power of God.

"In this important and interesting book the history of ancient America is unfolded from its first settlement by a colony that came from the tower of Babel, at the confusion of languages, to the beginning of the 5th century of the Christian era.

"We are informed by these records, that America, in ancient times, has been inhabited by two distinct races of people. The first were called Jaredites, and came directly from the tower of Babel. The second race came directly from the city of Jerusalem, about 600 years before Christ. They were principally Israelites of the descendants of Joseph. The Jaredites were destroyed about the time that the Israelites came from Jerusalem, who succeeded them in the inheritance of the country. The principal nation of the second race fell in battle towards the close of the 4th century. This book also tells us that our Saviour made his appearance upon this continent after his resurrection; that they had apostles, prophets, pastors, teachers, and evangelists; the same order, the same priesthood, the same ordinances, gifts, powers, and blessing as was enjoyed on the eastern continent; that the people were cut off in consequence of their transgressions; that the last of the prophets who existed among them was commanded to write an abridgment of their prophecies, history, &c., and to hide it up in the earth, and that it should come forth and be united with the Bible, for the accomplishment of the purposes of God in the last days. For a more particular account I would refer to the Book of Mormon."

We must here for a while interrupt the Prophet's narrative. It will have been noticed that the account of his early life, and of his proceedings between the first appearance of the angel and the discovery of the plates, is remarkably vague. His education had evidently been of the rudest kind. From various accounts, including those of his mother, it would seem that he used to assist his father in his business, but that he was of an unsettled disposition, and probably spent a good deal of time in wandering about the country. It is stated also, that he for some time got a living by trying for mineral veins by a divining-rod, and some affirm that, like Sidrophel, he used "the devil's looking-glass—a stone," and was consulted as to the discovery of hidden treasures, whence he had come to be commonly known as the "money-digger;" and on one occasion he had been, at the instigation of a disappointed client, imprisoned as a vagabond. He is also stated to have carried off and married a Miss Hales, during the interval between the first angelic visitation and the discovery of the plates of Nephi.

As to the Book of Mormon itself, the authorship has been claimed for one Solomon Spalding, a presbyterian preacher, who having fallen into poverty composed a religious romance, entitled 'The Manuscript Found,' which professed to be a narrative of the migration of the Lost Tribes of Israel from Jerusalem to America, and their subsequent adventures on that continent, in the hope of obtaining enough from its publication to release him from his difficulties. The work was written, but he could not find a publisher for it, and some ten years after his death, the manuscript was carried by his widow into New York, where it was stolen by or somehow got into the hands of Smith, or Rigdon (an early associate in his proceedings). The statement is supported by affidavits made by Spalding's daughter, his brother, one Henry Lake, and some other persons, who declare that they had heard him read portions of the work which were substantially the same as parts of the Book of Mormon. The story is incoherent in its details and the authenticity of the affidavits does not seem clear; but the work itself appears to agree pretty well with such an origin, supposing, that is, that the presbyterian preacher, as might well have been the case, was a rude-minded uneducated man, sufficiently familiar with the Old Testament to find no difficulty in clothing his story in its language, and making use of the easily-obtained information respecting the ruins of ancient "towns and temples," which have been discovered in various parts of America, as a ground-work for his narrative. The book itself is (even now that its grosser grammatical errors are said to have been expunged) a singularly ill-written one, and how any decently-educated man could have written it as a book to be read for amusement would be inconceivable, were it not that experience teaches us that authors are by no means unfrequently mistaken in that respect. At the same time there is certainly nothing in the book to contradict the supposition that it is the work of Smith himself—for as to its being a divine revelation, the most cursory examination of the book will be enough to convince an educated man of the utter improbability of that, if its possibility were otherwise conceivable. Be the author who he may, Smith having obtained the book—whether from Solomon Spalding's travelling chest, his own brain, or the stone-box which the angel discovered to him—thought it behoved him to make his treasure known. At first he told the members of his own and his father's household, and, more fortunate than Mahomet, found little difficulty in persuading them of the truth of his mission and the reality of the gift. But he says:—"As soon as the news of this discovery was made known, false reports, misrepresentation, and slander flew, as on the wings of the wind, in every direction. My house was frequently beset by mobs and evil-designing persons; several times I was shot at, and very narrowly escaped; and every device was made use of to get the plates away from me; but the power and blessing of God attended me, and several began to believe my testimony."

Among those whom he told of the discovery was a farmer named Martin Harris, whom he persuaded to convert his stock into money in order to assist in printing the book. But Harris wanted to consult some scholar, and Smith was induced to entrust him with a copy of a portion of one of the golden plates to carry to New York. Harris took the copy to Dr. Anthon, who according to the triumphant declaration of the Mormonites, was unable to make out the characters, which he described to be "reformed Egyptian"—and this is one of "the proofs" cited by Mormonite teachers of the authenticity of the book. But Dr. Anthon's own account is very different. He says that he at first supposed the paper to be a hoax, and gave little heed to it; but on hearing the man's story, he assured him that the work was an imposture, and strongly advised him not to have anything to do with it. The paper itself he thus describes (and it is the only description of the 'Book of Mormon' which has been published):—"The paper was, in fact, a singular scrawl. It consisted of all kinds of crooked characters, disposed in columns, and had evidently been prepared by some person who had before him, at the time, a book containing various alphabets. Greek and Hebrew letters, crosses and flourishes, Roman letters inverted or placed sideways, were arranged in perpendicular columns, and the whole ended in a rude delineation of a circle divided into various compartments, decked with various strange marks, and evidently copied after the Mexican calendar, given by Humboldt, but copied in such a way as not to betray the source whence it was derived." ('Letter to Mr. Howe,' February 17, 1834.)

Mrs. Lucy Smith (the Prophet's mother) tells an odd rambling story about the first translation made from the plates having been entrusted to this Harris, and stolen from him by his wife. Smith, she says, was, after long repentance, assured by the angel of forgiveness for his negligence, but at the same time informed that Satan would cause the stolen work to be interpolated and altered; and in order to avoid the mischief that would else arise from these machinations, he was directed to make another translation—not as the first was to have been—from the original book, but from an abridgment of it. Harris, though despite of Dr. Anthon's advice he did sell his goods as a contribution towards Smith's outlay, afterwards apostatised, and one might fancy from Mrs. Smith's story that he had in his possession some version of the revelation differing from that eventually published, but it is possible that she might have written with some reference to the Spalding story.

No sooner was the discovery published, than great curiosity was manifested by the faithful as well as by unbelievers, to obtain a sight of the marvellous plates, and the Prophet and his mother gave a minute account of the shifts to which he was driven to conceal them. At length it was revealed to him that the desired sight should be vouchsafed to three witnesses—whose 'testimony' is prefixed to every printed copy of the 'Book of Mormon.' These witnesses aver in their strange language—"that an angel of God came down from Heaven, and he brought and lay before our eyes, that we beheld and saw the plates, and the engravings thereon." This is sufficiently vague, and it is noteworthy that the more detailed account of this transaction by the Prophet's mother, has just the same vagueness as to what manner of vision this was. But a more specific testimony was given by eight other witnesses, to whom Smith was permitted to show the plates. Mrs. Smith says that these eight men went with Joseph into a secret place "where the family were in the habit of offering up their secret devotions to God. They went to this place because it had been revealed to Joseph that the plates would be carried by one of the ancient Nephites. Here it was that these eight witnesses, whose names are recorded in the Book of Mormon, looked upon them and handled them." The witnesses themselves say—"We have seen and hefted, and know of a surety that the said Smith has got the plates of which we have spoken." Of these eight witnesses three were members of Smith's own family. After these witnesses had seen the plates, Mrs. Smith tells us, "The angel again made his appearance to Joseph, at which time Joseph delivered up the plates into the angel's hands;" and Joseph himself says, "He (the angel) has them in his charge to this day." It is needless to remark that this disposes of any demand on the part of the sceptic to see the original plates, and gets rid of many awkward inquiries; nor need we add that it is a story quite satisfactory to Mormon 'saints'—but how far it is likely to satisfy the outside world the reader will judge for himself. We have, at the risk of being tedious, related these particulars, because they concern the very foundations of the system. To satisfy the curious we may mention that Smith carried on the process of translating the plates by retiring behind a screen where he read the plates through the "curious instrument called the Urim and Thummim," and was thus enabled to translate them, while a 'scribe' outside the screen wrote as he dictated.

The 'Book of Mormon' was published in 1830. In the previous year Smith and Oliver Cowdery, the scribe, had been baptised by an angel, and power given them to baptise others. Smith himself may now carry on the narrative:—'On the 6th April 1830, 'The Church of Jesus Christ of Latter Day Saints' was first organised, in the town of Manchester, Ontario county, state of New York. Some few were called and ordained by the spirit of revelation and prophecy, and began to preach as the spirit gave them utterance, and though weak, yet were they strengthened by the power of God; and many were brought to repentance, were immersed in the water, and were filled with the Holy Ghost by the laying on of hands. They saw visions and prophesied, devils were cast out, and the sick healed by the laying on of hands. From that time the work rolled forth with astonishing rapidity, and churches were soon formed in the states of New York, Pennsylvania, Ohio, Indiana, Illinois, and Missouri. In the last-named state a considerable settlement was formed in Jackson county; numbers joined the church, and we were increasing rapidly; we made large purchases of land, our farms teemed with plenty, and peace and happiness were enjoyed in our domestic circle and throughout our neighbourhood; but as we could not associate with our neighbours—who were many of them of the basest of men, and had fled from the face of civilised society to the frontier country to escape the hands of justice—in their midnight revels, their sabbath-breaking, horse-racing, they commenced at first to ridicule, then to persecute, and finally an organised mob assembled and burned our houses, tarred and feathered and whipped many of our brethren [Smith himself was tarred and feathered], and finally drove them from their habitations; these, houseless and homeless, contrary to law, justice, and humanity, had to wander on the bleak prairies till the children left their blood on the prairie. This took place in the month of November (1833)." The government, he says, winked at these proceedings, and "the result was, that a great many of them died; many children were left orphans; wives, widows; and husbands, widowers. Our farms were taken possession of by the mob, many thousands of cattle, sheep, horses, and hogs were taken, and our household goods, store goods, and printing-presses were broken, taken, or otherwise destroyed." These outrageous proceedings were the result of the reports which had spread abroad of the scandalous practices of the Mormonites—practices almost perfectly analogous to those formerly charged upon the Anabaptists and other new sects, and in all probability with no more foundation in truth. Driven from Jackson, the Mormonites settled in Clay county, where they remained three years, when being again threatened with violence, they removed to Caldwell and Davies counties. Here their numbers rapidly increased. They formed three extensive settlements, established a bank, and appeared to be in a most flourishing condition. But again various troubles fell upon them. The bank failed, and Smith was obliged to conceal himself. Their old persecutors roused the popular feeling against them, and finally, by "an extraordinary order," issued by the governor of Missouri, in the summer of 1838, they were violently ejected from their homes, plundered of their goods, and subjected, the women especially, to the most frightful atrocities.

Being thus expelled from Missouri, they settled in Illinois, where they were at first treated with great kindness. An admirable site having been purchased by them on the Mississippi, at the head of the Des Moines Rapids, they "in the fall of 1839" laid the foundation of their famous city of Nauvoo, or 'the Beautiful,' for which the state legislature granted them in December 1840 a charter of incorporation with unusual privileges. Smith dwells with great delight on this city, which he had seen rise up under his presidency from a wild tract to be a place of "1500 well-built houses, and more than 15,000 inhabitants," all looking to him for temporal as well as spiritual guidance. Among the chief things which he describes as provided for, was "the University of Nauvoo, where all the arts and sciences will grow with the growth, and strengthen with the strength of this beloved city of the saints of the last days." But the grand feature of the city was the great temple, which Smith thus describes:—"The temple of God, now in the course of erection, being already raised one story, and which is 120 feet by 80 feet, of stone with polished pilasters, of an entire new order of architecture, will be a splendid house for the worship of God, as well as unique wonder of the world, it being built by the direct revelation of Jesus Christ for the salvation of the living and the dead."

The progress of Nauvoo was even more rapid than that of any of the preceding places. Converts flocked in from foreign countries as well as from different parts of America; the people were peaceful and industrious, the land was fertile, and the settlement was eminently prosperous. Dangers of various kinds beset Smith, but he escaped from them all. He had in 1841 been arrested on a charge of sedition, &c., but being carried before the authorities of Nauvoo, he was set at liberty. Again, he was charged with shooting at the ex-governor of Missouri, and he deemed it prudent to conceal himself for a time, but eventually surrendered, and being able to prove that he was "some hundreds of miles distant" from the scene of the attack, he was acquitted. Among his followers too there were occasional symptoms of disaffection, but they never extended widely, and were easily suppressed. With the 'gentiles' settled in Nauvoo, and whom he could not keep out, he had more trouble; and, as might have been anticipated, the reports which had led to the expulsion of the Mormons from their former cities followed them here, and suspicion and hatred gathered about them. But Smith from the foundation of Nauvoo had been making provision against this danger. He had procured the insertion of a provision in the city charter empowering the formation of an independent civic militia, which he at once organised, and of which he constituted himself 'lieutenant-general.' He also set about consolidating his spiritual as well as civic government, and he made careful provision for an ample succession of hardy and zealous missionaries. The Book of Mormon was an historical revelation: the doctrine and discipline of the church were to be enunciated in subsequent revelations as circumstances called them forth. The first point was his own acceptance as "prophet, seer, and revelator." In other words, this "church of the latter days" was to be a theocracy, with himself as its head and inspired legislator—at once the Moses and Aaron of this new house of Israel. Nor in this capacity was he ever found wanting. He was always ready in the moment of difficulty with the needful revelation. In this manner he successively defined his own position, provided for his requirements, established his 'orders' of apostles, elders, priests, &c., in the church, and regulated all ceremonies, as well as defined its creed. These later revelations will all be found in the 'Doctrines and Covenants of the Church of Jesus Christ of Latter-Day Saints, selected from the Revelations of God, by Joseph Smith, President,' of which there have been numerous editions published. But, whatever was Smith's power over his followers, he was sadly deficient in wariness in his dealings with the outer world. Again and again he suffered himself to come into contact with the civil authority of the state; and his impunity led him, notwithstanding the terrible lessons he had already received, to defy the storm that was plainly gathering around him. So little did he heed the danger, that in prospect of the presidential election of 1844 he published his own 'Views of Government,' a sort of social scheme, in which "honesty and love," so that all might form a brotherhood, were declared to be the motive forces of just government: and he was actually put in nomination for the presidency.

But he did not live to the day of election. The storm that had been so long gathering, burst before then and swept him away in its fury. The 'gentile' residents in Nauvoo, supported as it would appear by some of the dissatisfied among the saints, had established an opposition newspaper, 'The Expositor,' which, growing more and more bold, ventured at length to denounce the morals of the prophet as well as his system of government. The city council now interfered and condemned the newspaper to silence; upon which a mob assembled, broke into the office and destroyed the presses. The proprietors charged some of the Mormon leaders with inciting the mob to this act, and they were formally arrested, but immediately set at liberty by the public prosecutor entering a *nolle prosequi*, a practice said to have become usual when a 'saint' was charged with any offence. The injured parties now carried their complaints before the governor of Illinois, who, having been long waiting, as is said, for a legal opportunity to crush the power of Smith, readily granted a warrant for his apprehension, June 24, 1844, on a charge of treason and sedition. Smith's first impulse was to put Nauvoo into a state of defence, and his militia was drawn out. But on the approach of the state troops, he offered, in order to avoid bloodshed, to surrender on condition that Governor Ford would guarantee his safety till his trial could take place. This was agreed to, and Joseph Smith, his brother Hyram, and some other of the leading members of the council were carried prisoners to Carthage jail. A guard small in number and purposely chosen, as is affirmed, from among Smith's declared enemie was set over them; but, on the 27th of June, a mob of about 200 armed ruffians broke into the jail, and firing in at the door of the room in which the brothers were confined, shot Hyram dead at once. Joseph Smith attempted to escape by the window, but was knocked down, carried out, and shot. His dying exclamation is said to have been "O Lord my God." His body was given up to his friends, and buried with great solemnity.

Perhaps the death of Smith at that time did more than any other event could have done, to confirm and consolidate the Mormon church. Smith himself, it is evident, was becoming intoxicated with power and prosperity. He is said to have given way to lust and intemperance, and though the statement is warmly denied, there appears to be truth in the report, though the extent has been no doubt greatly magnified. There is every reason to believe that he was beginning to disgust even his followers, when his murder banished all feelings but those of pity and reverence. Thenceforth, he was thought of only as the glorified prophet and martyr; and his followers braced their nerves to endurance by the remembrance of their master's fate and example. In Nauvoo itself the impression produced by the event was most profound. At first the popular cry was only for revenge, but their leaders exhorted them to forbearance, and succeeded in their exhortations. They then proceeded to elect a successor to Smith. Three candidates put forward their claims to the prophet's place. The choice of the council fell on Brigham Young, who, as soon as he was installed, took measures to remove his people far beyond the farthest settlements of his countrymen, convinced now that only in a country far distant from societies living under the established forms, could the vision of the Prophet stand a chance of realisation. The only stipulation made with their enemies was that they should be unmolested till they could finish and dedicate their beautiful temple; and as soon as that was accomplished, September 1846, the last band of the brethren departed from the land of their hopes to seek a new land of promise.

Shortly before Smith's death he estimated his followers at upwards of 150,000, and declared that they were to be found among almost every civilised people on the face of the earth. Probably he exaggerated alike the number and the diffusion of his disciples, but that their number was very great, and that they were very widely spread, there can be little doubt. To what extent, if any, they have since increased, we need not now stay to inquire. Their present condition will be more properly noticed in another article [UTAH, *S.* 2]. It only remains now to state their doctrines as enunciated by Smith, and this will be best done in the creed which he forwarded a few months before his death for publication in Rupp's work, quoted above:—

"We believe in God the Eternal Father, and his Son Jesus Christ, and in the Holy Ghost.

"We believe that men will be punished for their own sins, and not for Adam's transgression.

"We believe that through the atonement of Christ all men may be saved, by obedience to the laws and ordinances of the Gospel.

"We believe that these ordinances are—1st, Faith in the Lord Jesus Christ; 2nd, Repentance; 3rd, Baptism by immersion for the remission of sins; 4th, Laying on of hands for the gift of the Holy Spirit.

"We believe that a man must be called of God by 'prophecy, and by laying on of hands' by those who are in authority, to preach the Gospel and administer the ordinances thereof.

"We believe in the same organisation that existed in the primitive church, namely, apostles, prophets, pastors, teachers, evangelists, &c.

"We believe in the gift of tongues, prophecy, revelation, visions, healing, interpretation of tongues, &c.

"We believe the Bible to be the Word of God, so far as it is translated correctly; we also believe the Book of Mormon to be the Word of God.

"We believe all that God has revealed, all that he does now reveal; and we believe that he will yet reveal many great and important things pertaining to the kingdom of God.

"We believe in the literal gathering of Israel, and in the restoration of the Ten Tribes; that Zion will be established upon this (the Western) continent. That Christ will reign personally upon the earth; and that the earth will be renewed and receive its paradisal glory.

"We claim the privilege of worshipping Almighty God according to the dictates of our conscience, unmolested, and allow all men the same privilege, let them worship how, where, or what they may.

"We believe in being subject to kings, presidents, rulers, and magistrates; in obeying, honouring, and sustaining the law.

"We believe in being honest, true, chaste, benevolent, virtuous, and in doing good to all men: indeed we may say that we follow the admonition of Paul, 'We believe all things,' we 'hope all things,' we have endured very many things, and hope to be able to endure all things. If there is anything virtuous, lovely, or of good report, or praiseworthy, we seek thereafter."

In this creed it will be seen that there is no reference to what is now commonly regarded as the characteristic feature of the Mormon system—polygamy, nor has it been mentioned in connection with Smith himself. There is no doubt that during the last year of Smith's life this was one of the charges brought against the Mormonites, but the doctrine of a plurality of wives was never openly taught until after his death, and if he proclaimed it at all, he confined the revelation to the initiated. He is said however to have "sealed" to himself "plural wives," as the Mormons express it, about two years before his death; and the privilege may have been accorded to some of the chief of his followers. But the doctrine in its present form is one of the 'developments' of the system.

SMITH, ADMIRAL SIR SIDNEY, was born at Westminster in 1765, and in his twelfth year was sent as a midshipman on board the Sandwich, Lord Rodney. At the age of sixteen he was made lieutenant, and at nineteen post-captain. War having broken out between Russia and Sweden, he obtained permission to offer himself as a volunteer to the latter power, in whose service he showed so much courage and skill as to lead to his investment with the order of the sword. On the surrender of Toulon to Lord Hood, August 1793, Captain Smith, being in the south of Europe unemployed, hastened thither, and offered his services, which were accepted; and on the evacuation of the city in the following December, the destruction of the French ships of war, which could not be removed, and that of the powder magazines, arsenal, and stores, was entrusted to him. On his return to England he was appointed to the command of the Diamond, with a small flotilla, charged to cruize in the Channel. He succeeded in considerably annoying the enemy, but in attempting to cut out a ship at Havre he was made prisoner.

After a confinement of over two years, Captain Smith, by the assistance of a French officer named Philippeaux, made his escape and reached England in safety. Appointed to the command of the Tigre, 80 guns, and a small squadron, Sir Sidney proceeded to Constantinople, and thence to Acre, which, as the key of Syria, was then closely invested by Bonaparte at the head of 10,000 men. Sir Sidney, with admirable decision and promptitude, brought two of his largest ships close in shore and landed a party of sailors and marines, at the same time sending his friend Colonel Philippeaux, who was a skilful engineer, to assist in directing the fortifications; Bonaparte made several desperate assaults upon the place, but was on each occasion repulsed with heavy loss, and ultimately was compelled to raise the siege and retreat in disorder. This successful resistance was attributed in no small degree to the gallantry and energy of Sir Sidney Smith. In the events which followed Bonaparte's departure from Egypt, Sir Sidney took an active part, and when General Kleber on whom the command of the French army had devolved, offered to evacuate Egypt, Sir Sidney, though without instructions, confirmed the treaty which he made with the Turkish commander to that effect at El-Arish, January 24, 1800. The English ministry however disavowed his procedure, and Sir Sidney continued to participate in the measures adopted for the expulsion of the French. In the battle of Alexandria, in which Abercrombie was killed, Smith received a severe wound. On his return to England, the 'Hero of Acre,' as he was popularly designated, was received with great enthusiasm, and among other marks of public approval, had the freedom of the city of London voted him along with the present of a valuable sword.

In 1802 he was elected M.P. for Rochester, and during the brief peace took part in the debates; but on the renewal of war he was appointed to the Antelope, 50 guns, with command of a flying squadron, at the head of which he displayed his wonted activity. In 1804 he was made colonel of marines; in 1805 rear-admiral of the blue; and in 1806 he proceeded to the Mediterranean in the Pompey, 80 guns, with a small squadron to harass the French in Naples. He took Capri, succeeded in twice throwing succours into Gaeta, landed his sailors, and battered the fortresses of the French, and renewed, on a smaller scale, his Acre tactics, inflicting at various parts of the coast severe losses upon the troops of Massena. He was not able however to save Gaeta. As long as he was there the garrison was firm, but soon after his departure for Palermo the governor surrendered. In the following year Admiral Smith was ordered, under Admiral Duckworth, to the Dardanelles, and there he destroyed a Turkish squadron of one line-of-battle ship, four frigates, four corvettes, two brigs, and two gun-boats. In 1810 he was made vice-admiral: in 1812 he was appointed second in command of the Mediterranean fleet, and remained stationed in comparative inactivity off Toulon to the end of the war, when he was created K.C.B., and received a pension of 1000*l.* for his distinguished services. In 1821 he rose to the rank of full admiral, and in 1830 succeeded King William IV. as lieutenant-general of marines. He died May 26, 1841, at Paris, where, in consequence of pecuniary difficulties arising out of unsuccessful trading speculations, he had been for some years a resident.

SMYTH, WILLIAM, was born at Liverpool in 1766, and was educated at Peterhouse, Cambridge, where he graduated B.A., and 8th Wrangler in 1797, and M.A. in 1790. His father, who was a banker, having become embarrassed in consequence of the war between England and France in 1793, he was compelled to look around for means of maintaining himself, and accepted the office of tutor to Thomas, the eldest son of R. B. Sheridan. Of his connection with these two celebrated characters Mr. Smyth has left an interesting little 'Memoir,' printed not for sale in 1840. Mr. Smyth had accompanied his pupil to Cambridge, and from that time it became his settled residence. In 1806 he published a small volume of poetry, 'English Lyrics,' of which a fifth edition was issued in 1850. In 1809 he was appointed Professor of Modern History, which secured him a moderate competence, as the salary is 400*l.* a year. He commenced his lectures the same year, of which the first series comprised the period from the irruption of the northern nations into the dominions of the empire, to the English revolution of 1688; the second series extended from that period to the close of the American war; the third series commenced in 1810, comprised a history of the French revolution from the accession of Louis XVI. to the close of the Constituent Assembly; and the fourth continued it down to the fall of Robespierre. To these he added in 1832, 1835, and 1837, Supplementary Lectures, containing reflections and observations on the events of that revolution, and in 1836 two others on America. The whole were published in 1840, and have been since reprinted in Bohn's Historical Library in 1854-5. These lectures were popular during their delivery, and are well adapted for the purpose intended, namely, that of exciting attention to the study of history, rather than as satisfying all the requirements of the student; nevertheless they contain a useful commentary on the events: the first two series, though the briefest, being perhaps the best. In 1840 was also printed, for private circulation, what is called an 'Occasional Lecture.' It is a pleasant little pamphlet, occasioned by the desire of a lady to hear a lecture, of which it takes the form. It is an eulogium on woman, displaying considerable humour, with much varied reading, and is dated 1814. In 1845 he published his last work, 'Evidences of Christianity,' and on June 24th, 1849, he died at Norwich, after having worthily occupied his professorial chair for forty years. In 1851 a painted window by Warrington, representing the 'Adoration of the Magi,' was erected by some of his friends to his memory in the north aisle of Norwich Cathedral.

SNAKE-FISH. [Cepola.]

SNETTISHAM. [Norfolk.]

SNOW-BERRY. [Chiococca, *S.* 2.]

SNOW-BUNTING. [Emberizidæ, *S.* 2.]

SNOWDROP. [Galanthus.]

SODA-ALUM. [Mineralogy, *S.* 1.]

SOLANINA. [Chemistry, *S.* 1.]

SOLASTERIÆ, or SOLASTERINÆ, a sub-family of *Asteriadæ*, including those forms of Star-Fishes which have two ranges of suckers in each avenue. There are two British genera, *Cribella* and *Solaster*.

Cribella has only a few rays covered with spine-bearing warts; the intermediate spaces porous; the avenues bordered by two sets of spines.

There are two species which are not uncommon on the shores of the British Islands, *C. oculata* and *C. rosea*.

Solaster (Forbes) has many rays studded over with bundles of spines; the avenues bordered by three sets of spines.

S. papposa, the Rosy Sun-Star, is common on the eastern coasts of Great Britain, where, on account of the number of its rays, it is called Ten-Fingers. It is of a deep red or orange colour. Another British species is *S. endeca*.

SOLDANELLA, a genus of plants belonging to the natural order ***Primulaceæ***. Some of the species are slightly purgative.

SOLIHULL. [Warwickshire.]

SOLITARY BIRD. [Dodo.]

SOLOMON'S SEAL, the common name of the species of ***Polygonatum***, a genus of Plants belonging to the natural order ***Liliaceæ***, and the sub-order ***Asparageæ***.

Polygonatum has the perianth tubular, 6-toothed, tardily deciduous; the ovary 3-celled: cells 2-ovuled; the stigma blunt, trigonous; berry with 1-seeded cells; the flowers not jointed to pedicel. There are three British species.

P. verticillatum has linear-lanceolate whorled leaves, with an erect angular stem. It is a rare plant in Great Britain.

P. officinale, Solomon's Seal, has leaves ovate-oblong, half-clasping, glabrous, stem angular: peduncles 1-2-flowered; filaments glabrous. It is the ***Convallaria Polygonatum*** of Linnæus, and has been confounded with the following. It is only found in Scotland.

P. multiflorum has leaves ovate-oblong, half-clasping, glabrous, alternate; stem round; peduncles one- or many-flowered; filaments downy. This plant is the common species known by the name of Solomon's Seal.

SOMERVILLITE. [Mineralogy, *S.* 1.]

SOMMITE. [Nepheline.]

SOPHIA, a city in Bulgaria in European Turkey, situated on the route from Constantinople to Belgrade, about midway between Nissa and Philippopoli, near the point indicated by 42° 37′ N. lat., 22° 27′ E. long., in a wide plain bounded by high ramifications of the Balkan, and traversed by the Isca, a feeder of the Danube, and has about 10,000 inhabitants, the greater part of whom are Christians. It is a large place, and has a beautiful appearance from a distance, but the streets are narrow, tortuous, dirty, and lined by high mud walls, which here and there inclose good houses, but in general the houses are poorly built. It has a great number of mosques and Christian churches, which are the principal buildings in the city; there are also a large and well-frequented bazaar, public baths (which are supplied from a hot-spring), and khans. The chief industrial products are—knitted-stockings, for which Sophia is celebrated, broad-cloth, some silk-stuffs, leather, and tobacco. Sophia was formerly the residence of a pasha and capital of an eyalet of the same name, but the eyalet is now named from its capital, Nissa, called by the Turks Nish. It gives title to a Greek archbishop and to a Catholic bishop. There are hot-springs in the environs. Sophia is a place of considerable commerce. It was founded by the emperor Justinian on the site of the ancient *Sardica*. The only remains of antiquity are the ruins of the church founded by Justinian. Sardica is famous for the council held in it A.D. 347, which confirmed the decree of the Pope acquitting St. Athanasius of the charges brought against him at the council of Antioch. The council of Sardica also passed twenty canons, one of which permits a bishop condemned by a provincial council to appeal to the Pope. The Arian bishops, to the number of about eighty, withdrew from the council of Sardica to the town of Philippopolis, and held what they called the council of Sardica, in which they pronounced sentence of excommunication against Osius, St. Athanasius, and the Pope. (***Frontier Lands of the Christian and Turk; L'Art de Vérifier les Dates.***)

SORDAWALITE. [Mineralogy, *S.* 1.]

SOREL. [Canada, *S.* 2.]

SORREL, WOOD. [Oxalis.]

SOULIÉ, MELCHIOR-FRÉDÉRIC, one of the most fertile writers of the French Romantic school, was the son of a teacher of philosophy at Toulouse, and was born at Foix, in the department of the Ariège, December 23, 1800. In 1808, his father having obtained employment at Nantes, Frédéric Soulié commenced his studies at the Lycée of that city; and afterwards completed them at Poitiers, Paris, and Rennes, so migratory was his early life. In 1820 he accompanied his father to Laval, where the elder Soulié had received an appointment in a public office, and in this office the future novelist laboured also assiduously for several years. The object of his father had been to prepare him for the bar, and young Soulié having spent several years in the study of law, was admitted an avocat, and waited for his briefs like other barristers. But his inclinations were for literature; he wrote pretty verses for his amusement, his letters already displayed an elegant style, and a vein of exquisite pathos, if not of deep reflection, pervaded all he produced. About the year 1825 his father's desultory life brought the family once more to Paris; when the young poet published a volume of fugitive pieces under the title of 'Amours Françaises.' The book did not sell; but several of the poems it contained have since been well spoken of. Frédéric Soulié at once took his resolution, and unwilling to trust for his maintenance to literature alone, sought for and accepted a situation as foreman to an upholsterer. In this laborious employment he passed ten hours a day, and at night he devoted one or two more to the production of his first drama, 'Romeo et Juliette.' This play, though founded on the tragedy of Shakspere, which consequently afforded its adapter nearly all his materials, took him three years to prepare. Nearly another year was spent in vain endeavours to obtain from the managers permission to read it; at last he was fortunate enough to secure the intervention of Jules Janin, who had read and admired some of his poems, and Soulié's drama was represented with some éclat at the theatre in 1828. From that day he took his place as a man of letters. In 1829 he produced at the Odéon his 'Christine à Fontainebleau,' but it failed; and in 1830 he began to write critical articles for the 'Mercure,' the 'Figaro,' and the 'Voleur,' in all of which his genial spirit sought consolation for his own failure, by his cordial panegyrics of other dramatists. His 'Lusigny,' which was produced at the Théâtre Français in 1831 with better success, was followed in 1832 by his 'Clotilde,' the triumph of which, both on the stage and in the drawing-room, was absolute.

Shortly after his 'Clotilde,' which established his reputation as a dramatic writer, Frédéric Soulié began to contribute a series of romances in the shape of feuilletons to the newspapers. In this new and lucrative class of literature, he became and continued for twelve years, 1833-45, the most popular of French romancists. The 'Deux Cadavres' was published in this form in 1833; the 'Vicomte de Beziers' in 1834; the 'Comte de Toulouse' in 1835; the 'Comte de Foix' in 1836; 'Un Été à Mendon' and 'Deux Séjours Provence et Paris' in 1837; 'L'homme de Lettres,' in 1838. In this manner upwards of thirty fictions, some of them of considerable length, were produced. In 1842 appeared his 'Mémoires du Diable,' the sale of which was immense. It was the universal popularity of this novel which stimulated Eugène Sue to undertake his 'Mystères de Paris.' Soon after this the success of Sue and Dumas in the same class of writing somewhat obscured the fame of Frédéric Soulié, who witnessed their sudden popularity without jealousy. But he never gave up his connection with the newspapers, whose proprietors to the last paid him liberally for his works. In 1846 he bought an estate at Bièvre, where he died September 22, 1847.

SOULT, NICOLAS JEAN-DE-DIEU, MARÉCHAL DUC DE DALMATIE, was born at Saint Amand-du-Tarn, on the 29th of March 1769, or, according to some biographers, in 1765. He was the son of a notary, but not being inclined to follow his father's calling, and having made, it is said, but little progress at college, it was considered best to devote him to a military life, for which he manifested more inclination. Consequently he was allowed to enlist as a private in the regiment of the Royale-Infanterie, on the 15th of April 1785. So slow was his early advancement, that six years after, in 1791, he had reached no higher grade than that of sergeant. In that year he was noticed by old Marshal Luckner, who appointed him to discipline a regiment of volunteers of the Upper Rhine, giving him a commission of sub-lieutenant for that service. The great war shortly after opened new paths to talent, and men of true capacity and courage were no longer prevented by court favour to high birth and family interest, from ascending by degrees to the highest ranks for which nature had fitted them.

On the 29th of March 1793, Lieutenant Soult obtained credit for his conduct at the combat of Oberfelsheim, under General Custine. In November 1793, Hoche placed him on the staff of the army of La Moselle, when, as captain, Soult led the attack of the left at the battle of Weissenberg, and repulsed a body of Austrians. His next service was in the Palatinate under General Lefebvre, who entrusted him with the post of chief of the staff in the vanguard of his army. In 1794 Soult was created colonel, and was one of the most distinguished officers present at the great battle of Fleurus, June 26. He displayed great skill by his dispositions in this action, and in the very crisis of it, when General Marceau, deserted by his troops, had resigned himself to despair, Soult arrested the panic, and restored the battle. For this feat of arms he was promoted to a brigade, October 11, 1794, in the division of General Harty, and assisted at the blockade of Luxemburg. At the battle of Altenkirchen, in 1796, he commanded the attack of the left against the Austrians, who were entirely defeated. Shortly after this victory, being detached with 500 horse to cover the left of the army at Herborn, he was suddenly hemmed in by the enemy's cavalry, amounting, it is said, to 4000; he repulsed seven charges without his ranks being broken; and at length drew off his troop without the loss of a single soldier. This brilliant retreat covered him with honour, and has always been cited among the most memorable actions of the war. His excellent manœuvres at the battle of Friedberg, in 1796, contributed most effectually to its success. At this epoch, and during the whole period of the Revolution, Soult was a constant frequenter of the clubs, a flatterer of the men then in power, and no voice more loudly denounced the 'ancien régime;' conduct which was not forgotten in after days.

In 1799 he joined the army on the Upper Rhine, under Jourdan, and at the head of the vanguard of the left wing was present and acted with distinguished bravery and ability at the battle of Stockach, March 25. Though the battle was eventually won, after a fierce struggle, by the Archduke Charles and the Austrians, such was the opinion entertained of Soult's skilful conduct, that the Directory promoted him to a division on April 21st, whilst Jourdan, the commander-in-chief, lost credit and command by the same action. Soon after, he found himself under the orders of Massena, who, besides his own army in the Alps, had lately succeeded to the command of that on the Rhine, after Jourdan's disgrace. Under that able general he took part in the battle of Zurich, June 4, 1799, when the Austrians were defeated, and France preserved from invasion. In 1800, when Massena shut himself up in the walls of Genoa, General Soult was one of the most active of its defenders during the siege, distinguishing himself highly in the numerous skirmishes which took place beneath its walls. He was wounded and taken prisoner in one of these sorties, but recovered his liberty after Napoleon's victory of Marengo.

After the battle of Marengo, June 14, 1800, the military command of Piedmont was conferred upon General Soult; who was next despatched with a corps of 15,000 men to occupy the peninsula of Otranto; but after the peace of Amiens, he was superseded in this government by General Saint-Cyr. Soult returned to France during the suspension of hostilities, and though, for some unexplained cause, he was not personally a favourite with Bonaparte, on the recommendation of Massena he became one of the four colonels of the Consular Guard. The rupture between England and France soon followed, and it was General Soult who organised the vast armament collected on the heights of Boulogne, known as the Army of England. Meanwhile, the French Empire had been formed, and so assiduous had been the court paid by Soult to the First Consul during the short period of transition, that although he had served neither in the first campaigns in Italy, 1796-97, nor in that of Egypt, 1798-99, nor even yet fought under Napoleon, nor commanded an army in the field, his name was included in the list of French marshals created at the coronation.

In the campaign of 1805 Marshal Soult obtained still greater distinction; his services at the battle of Austerlitz, December 2, being so efficient, that Napoleon thanked him on the battle-ground, before his whole staff, calling him one of the first of living strategists. Thenceforward, and until the end of the war, he ranked as one of the leading generals of France, to whom the greatest undertakings might be committed when Napoleon himself was elsewhere. With the same success, he took part in the campaigns of 1806 and 1807. After the battle of Jena, October 14, 1806, he defeated Marshal Kalkreuth, captured Magdeburg, and put to flight the Prussian General Blücher, and the Russian General Lestocq. Again he signalised himself at the battle of Eylau, February 8, 1807, and captured Königsberg the same year. He had now been fifteen years in constant service in the field, and had fought under the ablest and most experienced commanders, with all of whom he had enjoyed the same confidence. He had now fully acquired the confidence of Napoleon himself, who for the rest of his career treated Soult as his lieutenant, by honouring him with the chief command he had to bestow after the one he filled in his own person.

When the ambition of the French Emperor had turned towards Spain, Marshal Soult was appointed to command the 2nd corps, with which he was despatched, in November 1808, to attack Belveder's corps of 20,000 men, at Burgos. In this battle, fought on the 10th of November, the Spanish army was defeated, although one of Soult's divisions alone (Maison's) was engaged. Madrid having surrendered to the French, after its fall Napoleon marched against the British army under Sir John Moore, then on its way from Portugal. Marshal Soult was at first directed upon Sahagun; but Sir John Moore, seeing the risk to which he was exposed of being intercepted and hemmed in, lost no time in commencing his retreat upon Corunna. Napoleon was averse to dilatory war, and was moreover unwilling to fatigue the troops under his command unnecessarily; he therefore recalled the marshal, with injunctions to pursue Sir John, and "drive the English into the sea." At the same time Marshal Ney was commanded to support the operation with the 6th corps. Some French generals, and other military historians, with the anxiety so common with them to explain away any failure of the French arms, have, on this occasion severely censured Marshal Soult for inactivity and negligence, "in halting at every defile to collect the sick and loiterers, by which the almost total destruction of the British army," according to them, was prevented. On the other hand, the marshal always expressed his astonishment at the skilful retreat of his enemies. At length, on the 16th of January, 1809, the British army, having approached Corunna, the place intended for their embarcation, made a stand, and a bloody engagement ensued. In this action Sir John Moore was mortally wounded, but the French met with a decisive repulse. [Moore, Sir John.] The British troops effected their passage to their ships unmolested by the French, and it was not until the 20th that the Spanish governor capitulated.

Soon after, Marshal Soult entered the Portuguese territory with the 2nd and the 8th corps; and having defeated the Portuguese troops under Romana, he appeared before Oporto, which was carried by storm on the 29th of March, 1809. Instead of marching at once upon Lisbon, the marshal lingered at Oporto, where he is said to have conceived the plan of making himself king of Portugal, and to have postponed the interests of his imperial master, whilst indulging this intrigue.

Meanwhile, Wellington had landed, collected his forces, and made his preparations; on the 8th of May he reached Coimbra with the English army, whilst Beresford at the head of the Portuguese troops was advancing towards Chaves and Amarante to turn the French army. After passing the Douro with his usual boldness and promptitude, Wellington fell upon the marshal, drove him from his position, and captured his sick, his baggage, and almost all his guns. Soult then retreated upon Galicia, with a loss upon his route of 2000 men; whence, after leaving Ney, with his single corps, to defend that province, he continued his retreat to Zamora. The retreat was conducted in a manner creditable to his military talent, but he suffered his troops to commit atrocities on the helpless peasantry which have left an ineffaceable stain on his memory.

After the battle of Talavera, July 28, 1809, Soult was appointed to replace Marshal Jourdan as Major-general of the army in Spain, the chief command being nominally left in the hands of King Joseph, a man without any capacity for war, but faithful and devoted to his brother's plans. On the 19th of November, 1809, he won the battle of Ocana, and soon after resolved upon an expedition into Andalusia, one of the richest provinces in Spain. Accordingly, in January 1810, he collected a strong army, consisting of four corps, and taking his way through Andujar and Seville, appeared before Cadiz on the 5th of February; but was disappointed of taking the place. Soon after this check, King Joseph returned to Madrid, leaving the marshal in command of the Army of the South, consisting of the 1st, 4th, and 5th corps. The year 1810 was almost entirely occupied by the marshal in establishing his position in Andalusia; but the wide cantonments over which his troops were dispersed, constantly exposed them to loss in petty skirmishes with the enemy, who, supported by the strong fortress of Badajoz to fall back upon, had a great advantage over him. In the beginning of 1811, Napoleon, who felt the urgent necessity of supporting Massena in Portugal, ordered Soult to besiege Badajoz. The marshal obeyed; but although he captured the place on the 11th of March, 1811, the Prince of Essling, unable to penetrate the strong lines of Torres Vedras, had found it necessary to abandon Portugal.

The departure of Massena having relieved the English army from one of their most formidable opponents, Lord Wellington determined to recapture Badajoz, for which purpose he despatched Beresford to invest it. The siege was opened on the 7th of May, 1811; Soult came to its relief, and on the 16th had to fight the battle of Albuera, in which —though by means of his great superiority in numbers he inflicted great loss upon Beresford's army—he was thoroughly defeated. The fall of Badajoz now appeared inevitable, when Napoleon, apprised of Soult's recent defeat, ordered Marshal Marmont, who had superseded Massena in the command of the army of Portugal, to push forward to his support. This movement rendered it necessary for Wellington to raise the siege on the 16th of June. However, in the following spring, encouraged by the capture of Ciudad Rodrigo, Wellington laid siege a second time to the fort of Badajoz, and—though not without terrible loss—the place was carried on the 6th of April, 1812. Soult was in consequence compelled to retreat from Seville, his rear-guard being severely cut up at Villa Garcia.

The subsequent defeat of Marmont at the battle of Salamanca (July 22, 1812), and the surrender of Madrid to the British general, compelled Joseph Bonaparte to withdraw behind the Tagus with his army, and Marshal Soult received orders to join him. Accordingly, to his deep regret, he marched out of Andalusia, and on the 10th of November took the command of the three combined French armies stationed on the Tormes. This junction of forces was too powerful to be attacked; Lord Wellington therefore fell back upon Ciudad Rodrigo, with a heavy loss of troops on his route, and went into winter quarters. After his departure from the rich province of Andalusia, which he had occupied for nearly three years, the strongest charges were brought against Marshal Soult for the cruel extortions levied on the people by himself and his agents, and his shameless and unbridled robbery of pictures and articles of value. The reports of military men of every army engaged in the Peninsular war have fully corroborated the charges; while the enormous wealth which he ostentatiously displayed after the peace seemed to indicate that he did not feel the disgrace his atrocious conduct had drawn down upon his name. For a few months during the year 1813 Soult was employed in the German campaign, having been summoned by Napoleon to take the command of his guard, after the death of Marshal Bessières at Weissenfels.

But the disastrous defeat of Marshal Jourdan at Vitoria, on the 21st of June, 1813, having threatened, not only the loss of Spain, after an occupation of five years, but the security of the French soil, Napoleon was once more compelled to employ Soult in the Peninsula, though it was not without some sense of shame that he sent him there. Accordingly, in July, Soult returned to Spain as commander-in-chief of the French armies. Then followed the most arduous period in his career; and although—overmatched by the genius of Wellington—nearly every enterprise was a failure, and every battle a defeat, we cannot refuse to Soult the credit due to resolute perseverance and dauntless bravery. The fall of Pampeluna, the battles of San Marcial and Sorauren, succeeded, in all of which the marshal was worsted; then he took up a strong position on the banks of the Bidassoa, but was driven from it by the leader before whom so many marshals had succumbed. The losses of Napoleon in Champagne required some relief, and thousands of Soult's veterans were drafted off; his German troops deserted him. Still, wherever the ground enabled him to defend himself the marshal formed a new position. First, he fortified himself on the Nivelle; driven from that river, he took up a new position on the Nive, whence his impetuous enemy dislodged him; but, without being depressed, he offered the English battle at St. Pierre, and was again defeated. Wellington had at last entered the French territory in the south, whilst in the north Napoleon was falling back before the allied armies. But even then he did not despair. A truce of a few weeks was forced upon the opposing armies after November, when both sought winter quarters. But early in February 1814 the war was renewed. The battle on the Adour, the battle of Orthes, the battle of Tarbes, succeeded each other, and were lost by the marshal. To complete his embarrassment, he had been informed of the surrender of Bordeaux to the Bourbons, and the subsequent capitulation of Paris. Yet, even when the three allied armies were in possession of the capital, when Lyon had submitted, when so many marshals and generals were deserting Napoleon at Fontainebleau, he fell back upon Toulouse, and formed that admirable position which not even the impetuous valour of British troops could force without a carnage so fearful as almost to balance their own victory. The loss of the French was however more than commensurate, and their defeat was complete. This was Soult's last and the greatest of his battles; it was fought with consummate skill, April 10, 1814, eleven days after the fall of Paris: Soult evacuated Toulouse on the 11th.

On the escape of Napoleon from Elba, Soult, who had attached himself to the restored king, and who was then in office as minister of war, published an order of the day, March 8, 1815, calling on the army "to rally round their legitimate and well-beloved sovereign, and resist the adventurer, who wanted to seize again that usurped power of which he had made so pernicious a use." But on the 25th of March he saw the emperor at the Tuileries, was easily reconciled to him, and accepted the post of quarter-master-general to the army preparing to open the campaign. In this quality he was present at the battle of Waterloo, on the 18th of June 1815. Soult was banished from France in July; but in 1819 he was once more permitted to return, and his baton was restored to him. Charles X. showed him great favour throughout his reign: he created him a peer on the 5th of November 1827. During the reign of Louis-Philippe he was made Minister of War, Ambassador Extraordinary to Queen Victoria's court at her coronation, and on two occasions President of the Council, or prime minister. Whilst filling this office for the second time, in September 1847, he wrote to the king requesting leave to resign. His request was granted; but in order to mark his appreciation of the services of the marshal, Louis-Philippe re-established in his favour the ancient but disused dignity of Marshal-General of France, which had not been borne by any subject since the death of Marshal Turenne. From that time the marshal went to live in retirement, to which he confined himself more closely still after the revolution of February 1848. His health and strength had long been severely shaken; the marshal grew worse during the year 1851, and breathed his last at the castle of Soult-Berg, on the 26th of November in that year. After his death his splendid gallery of Spanish pictures *collected* by him during his Spanish campaigns was sold by auction, and realised a very large sum: several of the best of these pictures are now in the Imperial Galleries of France. The 'Mémoires du Maréchal General Soult, duc de Dalmatie, publiés par son fils. 1ère partie. Histoire des Guerres de la Révolution,' appeared in three vols. 8vo, with an Atlas, Paris, 1854.

SOUR-SOP. [ANONACEÆ.]

SOUTH AUSTRALIA. Under this head, in Supplement 1, an account of the geographical features of the colony was given. It has risen since into greater importance, and is better known. We therefore add the following particulars:—

The climate of South Australia is one of the finest in the world, resembling that of the south of Italy. The atmosphere is generally clear and elastic, and the sky remarkable for the variety and brilliancy of its colours. There are no prevalent diseases. On entering the country some are attacked with dysentery, which with a little care may be avoided. Adelaide has been occasionally visited with influenza; and at particular seasons there are some cases of ophthalmia, which is rather a swelling of the eyelids, caused by a small insect. The seasons are divided into dry and wet. The dry season begins at the end of August and continues to the end of March. In December and January, corresponding in temperature to our June and July, the heat is very great, and the ground so arid that the least breeze raises clouds of dust. Occasionally in summer a hot wind from the north blows over the plains, and compels all to seek shelter from the close and dusty atmosphere; but it seldom lasts many hours before it is succeeded by a cooling breeze from the south-west. The thermometer ranges as high as 115° Fahr. Its highest range in 1852 was 105°; its lowest, 44°; the average was 67°. The temperature is subject to sudden and very extraordinary changes; but these do not in general affect the health injuriously, neither do they occasion much inconvenience. During the wet season, from the end of March to August, it rains frequently and sometimes very heavily. During this period the earth is covered with the richest verdure, and the weather is so genial that the approach of summer is scarcely perceptible. In summer the grass is speedily parched, and frequently becomes so dry as to break when trampled on; but the ground is as rapidly clothed with fresh pasture by the showers which fall at no great intervals. The long droughts, with which New South Wales is periodically visited, are not known in the settled parts of South Australia. During the rainy season the wind blows from the west or south-west, and frequently in hard gales. In the dry season northern and north-eastern winds prevail. No fall of snow has been experienced, and in the Mount Barker district, the coldest part of the colony, the frost has only in rare instances been of such force as to form a thin crust of ice. The lowest temperature for the year is about 37°.

During the rainy or cold season a great number of whales visit the coasts of the colony, and are chased by British, American, and French vessels. The black whale is most frequent, but the sperm-whale also occurs. The native animals are—the kangaroo, the wallobi, a smaller species of the same genus, the wombat, the opossum, and the dingo, or Australian dog. Porcupines, although unknown on the mainland, are found in considerable numbers on Kangaroo Island. For several years locusts have appeared in great numbers, and caused much damage to gardens and young crops in the district around Adelaide. Birds are numerous, and distinguished by their beauty. The emu, several kinds of parrakeets and cockatoos, partridges, and quails are common. The most common sea-fowl are—pelicans, black-swans, wild-ducks, divers, waders, cormorants, and Cape pigeons. Several kinds of fish are taken in the sea, as salmon, snappers, porpoises, and large and small sharks. There are several kinds of snakes and lizards: among the latter the iguana, which is eaten; among shell-fish, oysters and periwinkles are plentiful.

The colonists have imported horses from Tasmania and New South Wales, and ponies from the island of Timor in the Indian Archipelago; cattle and sheep from the Cape, Tasmania, New South Wales, and Victoria; hogs from New Zealand. Fowls are common, both the common species and the larger one from the countries of the Malays. The kangaroo-dog is a valuable cross-breed of the bull-dog and greyhound, and is used for chasing the emus and kangaroos.

The woods of South Australia contain many large trees, of which the stringy bark, the blue, white and peppermint gum-trees, different species of the Encalyptus, are the most useful, their timber serving for building and fencing, for the construction of carts and ploughs, and the manufacture of agricultural implements; but timber for finer purposes is imported from New South Wales and New Zealand. All kinds of grain are successfully cultivated: maize grows well, and also potatoes. Melons, water-melons, pumpkins, and cucumbers attain an uncommon size, as do also cauliflowers. Onions are cultivated to a great extent in Kangaroo Island. No edible fruit is indigenous, except some berries, which are eaten by the natives. Fruit-trees have been extensively introduced. At Adelaide a prize was awarded in 1851 for a collection of sixty varieties of apples grown about ten miles from the city. The peach grows luxuriantly. Oranges and lemons, olives and mulberries, are cultivated to some extent. Every approved variety of grape is grown.

South Australia is rich in minerals. Iron-ore is found in many places, especially in the deserts. Copper-ore is very widely distributed in great abundance, and of the richest quality. Lead also exists in considerable quantity, and some gold has been found. Salt occurs in many places. Twelve copper-mines were in operation in 1851. These are—the Burra-Burra mine, 90 miles N. by E. from Adelaide; the Kapunda and North Kapunda mines, 50 miles N.N.E.; Karkulto mines, 76 miles N. by W.; Worthing mine, 14 miles S.S.W.; Perseverance mine, 12 miles N.E. by E., where parties were engaged digging for gold on licences; Tungkillo, or Reedy Creek mine, 35 miles E.N.E.; the Consolidated mines in Barossa and Lynedoch Valley, 38 miles E. by N.; the Kanmantoo, Bremer, Wheal Mary, Wheal Maria, and Wheal Friendship mines, all in a group about 25 miles E.S.E. from Adelaide. The ore of the Burra-Burra mine is peculiarly rich. It contains 75 per cent. of metal, in the form of a pure oxide requiring no flux to smelt it, the heat of a blacksmith's forge sufficing to run the metal. The lode is 17 feet wide, of great extent, and is quarried like stone, in masses. The mine yields annually about 20,000 tons of copper ore, valued at 20*l.* per ton. The lead-mines are Glen Osmond and Wheal Watkins mines, about six miles south from Adelaide, and the Wheal Gawler and Yattagolinga mines, the first two yielding 75 per cent. of metal.

The natives of South Australia, like those of New South Wales, belong to that race which is called Negro Australian. They have not yet attained an equal degree of civilisation with the native population of the eastern coast, but measures have been adopted for their improvement with some degree of success. There are schools at Adelaide and Port Lincoln for the education of the children. Connected with the latter is a training institution under the superintendence of Archdeacon Hale, in which the youths, after leaving school, are kept separate from the tribe, and instructed in the Christian religion and in some industrial pursuit. A number of youths are employed on stockholders' stations along the Murray. Though it appears certain that all the natives of the southern and eastern coast of Australia speak the same language, a marked difference exists in the dialects spoken in different parts. Various dialects are used within the territories of South Australia: one is spoken by the few isolated families which live in the districts west of 136° E. long.; another by the tribes inhabiting the vicinity of Adelaide; and the tribes along the banks of the Murray below the junction of the Darling, have been found to use four different dialects, three of which were unintelligible to natives from the neighbourhood of Lake Victoria. The tribes within the settled parts of the colony are generally peaceable and inoffensive.

The settled parts of the colony have been distributed into the counties of Frome, Burra, Stanley, Gawler, Light, Eyre, Adelaide, Sturt, Hindmarsh, Grey, Robe, Russell, all lying to the eastward of the gulfs of Spencer and St. Vincent; and the county of Flinders on the south-west shore of Spencer Gulf. A township has been laid out at Port Wakefield, at the head of the gulf of St. Vincent, where a considerable quantity of copper from the Burra-Burra mines has been shipped for Swansea. Roads and bridges have been liberally provided for as settlements have been formed.

The population of South Australia in 1854 was 97,387. The government of the colony is vested in a lieutenant-governor, an executive council, and a legislative council. The executive council consists of the governor, the colonial secretary, the advocate-general, and the surveyor-general. The legislative council, which was instituted in 1851, in terms of an Act of the Imperial Parliament, passed in August, 1850, consists of 24 members, 8 of whom are nominated by the crown, and 16 are elected by 10*l.* householders and the possessors of freehold property of the value of 100*l.* sterling, in the 16 districts into which the colony is divided for the purposes of the Act. The main source of revenue is the customs, the greater part of which is derived from the duties of 1*s.* per gallon on wines, and 10*s.* per gallon on spirits. There are no differential duties between British and foreign goods; but an 'ad valorem' duty of five per cent., or an equivalent rated duty, is charged on all imports except wines and spirits. The general colonial revenue in 1852 was 102,325*l.*, the expenditure was 88,238*l.*; for 1855 the revenue had risen to 504,250*l.*, and the expenditure to 810,327*l.*, no less than 173,376*l.* having been expended during the year on streets, roads, and harbours. The land fund revenue realised 233,745*l.* for 171,610 acres of land. The total exports in 1852, exclusive of bullion and coin, amounted to 736,267*l.*; the imports were 538,973*l.* In 1854 the imports amounted to 2,054,453*l.*, but decreased considerably in 1855; while the exports had increased from 823,104*l.* in 1854 to 839,915*l.* in 1855, exclusive of gold, which in 1854 amounted to nearly half a million. The staples of the exports are wool and copper.

For the promotion of education in the colony, an inspector of schools has been appointed. Schoolmasters obtain an annual grant of 20*l.* for the first 20 scholars, and 1*l.* for each additional scholar, the aid however in no case rising above 40*l.* per annum. The number of day schools receiving government aid in January, 1853, was 69, with about 3300 scholars. The amount paid to teachers during the year was about 3100*l.*

In 1850 there were about 150 places of worship in the colony. The ministers of religion were 17 of the Church of England, under the superintendence of the Bishop of Adelaide; 11 of the Roman Catholic Church, under the Roman Catholic Bishop of Adelaide; 2 of the Church of Scotland; 2 of the Free Church of Scotland (which in 1857 had increased to 7); 1 of the Scotch United Presbyterians; 6 Wesleyan Methodist ministers, besides many local preachers; 2 Primitive Methodist missionaries, and several local preachers; 15 Independent, 8 Baptist, 6 German Lutheran, 1 German Independent, 3 Christian, and 2 Bible Christian ministers. The New Church, the Quakers, and Jews, have each a place of worship in Adelaide.

Adelaide, now an episcopal city, and the seat of Government and the capital of the colony, is situated chiefly on the left bank of the river Torrens, in 34° 56′ S. lat., 128° 30′ E. long. That part of the city which stands on the left bank of the river is called South Adelaide, is the seat of Government and of the commerce of the town; North Adelaide, on the right bank, is much smaller, but more pleasantly situated. The two divisions are connected by four neat wooden bridges; and a public demesne, averaging half a mile in width, surrounds the whole city. This, known as the Park-lands, is to be converted into a series of public gardens. Adelaide was founded in 1836, and it has made remarkable progress in the 21 years which have elapsed since that time. North Adelaide stands on a gentle slope; in 1852 it contained one public square, 27 streets, and occupied an area of 350 acres; while South Adelaide occupied an area of 750 acres, contained 5 large public squares, and 30 principal streets, which intersect each other at right angles. The streets are wide, but ill paved or unpaved, and are only lighted by lamps in front of the public-houses, every keeper of which, by the terms of his licence, is bound to keep one burning from sunset to sunrise. The site of South Adelaide is flat, and in 1852 was without drainage. The public improvements and sanitary arrangements are under the management of a Board of Commissioners, who, between January, 1850, and September, 1851, expended upwards of 20,000*l.* in forming and repairing streets, erecting public buildings, and otherwise improving the city. Among the public buildings are the Supreme Court-House, a large stone building, the Resident Magistrate's Court, Police Court and offices, the Bishop's palace, a lunatic asylum, an hospital, military barracks, police barracks, and a large jail erected at a cost of 36,000*l.* The post-office is a large and handsome building. An Assay-office was established at Adelaide in 1852 for receiving and assaying gold, chiefly from the Mount Alexander diggings. The total amount of gold deposited in it from February 12 to September 10 was 292,243 ounces, of the value, at the assay price of 3*l.* 11*s.* per ounce, of upwards of 1,000,000*l.* Trinity Church is the temporary cathedral of the diocese of Adelaide. The Roman Catholics have a cathedral dedicated to St. Francis Xavier. A very fine chapel in the Gothic style has been erected by the Wesleyan Methodists, at a cost of about 6000*l.* Besides these, the places of worship in Adelaide are, four for the Church of England; one each for the Church of Scotland, the Free Church, and the United Presbyterian Church; five for Baptists; three each for the Wesleyan Methodists, Primitive Methodists, and Independents; two for Roman Catholics; two for German Evangelical Lutherans; and one each for German Evangelical Independents, Christians, Bible Christians, Quakers, Swedenborgians, and Jews. No burial-ground is permitted to be attached to any church or chapel in the city, but a large cemetery is provided to the west of it. Among the educational institutes of the city are, the Church of England College of St. Peter, a spacious and very handsome edifice, and a training institute for native aborigines. There are three banks, for one of which, the Bank of Australasia, a handsome stone building was erected in 1851, at an expense of 9081*l.*: the amount of money in the Adelaide Savings Bank in 1850 was 11,772*l.* 1*s.* 11*d.* The South Australian Agricultural and Horticultural Society holds an annual show of fruits, garden and field produce, and colonial manufactures. A Chamber of Commerce was established in July, 1850. The South Australian Library and Mechanics' Institute is open daily from noon till ten o'clock, P.M. There are several building societies and various benevolent associations. The cattle-market is outside the city, and the cattle sold there are only permitted to be slaughtered in the city slaughter-house, a spacious and convenient building on the left bank of the Torrens, half a mile below the city.

Port Adelaide, at the mouth of the river Torrens, and on the shore of the Gulf of St. Vincent, about eight miles from Adelaide city, is a capacious harbour, well situated in respect to the prevailing winds; but the great expense and delay in the transport of merchandise between the city and the port are considerable drawbacks to the prosperity of the place. The usual mode of conveying goods is by bullocks and horses. In 1850 an Act was passed by the local council for the construction of a railway from the city to Port Adelaide Creek, which has been completed. A steam-tug is employed to assist vessels in entering the harbour. By an Act passed in 1845, the port was made free to the ships of all nations. Port Adelaide contains extensive and substantial warehouses, built of stone, wharfs alongside which ships can lie to load and unload, a custom-house, a patent slip on which vessels of 1000 tons burden can be raised, a wet dock, a church, a Presbyterian chapel, a theatre, and numerous shops.

The population of Adelaide, Port Adelaide, and Albert Town, which together form one municipality, was 14,577 at the end of the year 1850; since that time it has considerably increased. *Albert Town* is a small straggling village, about a mile from the port, and is chiefly occupied by persons connected with the shipping. Between Albert Town and Adelaide are several other villages, the principal of which is *Hindmarsh*, where there is a steam-flour-mill, the largest brewery in the colony, and many good shops. Within a range of about 5 miles from the city are 11 villages, which may be considered as suburbs of Adelaide: some of them contain excellent residences. In Adelaide county there are about 40 more villages, some of which are inhabited solely by German immigrants, who have erected their houses in their own country fashion. The diocese of Adelaide, to which Bishop Short was appointed in 1847, extends over the two colonies of South Australia and Western Australia; the chapter comprises a dean, two archdeacons, two canons, and twelve clergymen.

The Burra-Burra and other copper mines in South Australia, and the export trade in wool, have rendered Adelaide and its port very flourishing. In August, 1852, gold was discovered at Echunga, 23 miles S.E., and subsequently on Field river, about the same distance S. from Adelaide. A considerable number of diggers were attracted to the spot, and a large amount of gold has been obtained, but not in quantities at all equal to the other Australian gold fields.

SOUTH MOLTON. [DEVONSHIRE.]

SOUTHERNWOOD. [ARTEMISIA.]

SOUTHEY, CAROLINE ANNE, (better known as *Caroline Bowles*), the second wife of Robert Southey, was the only child of Captain Charles Bowles, of Buckland, near Lymington, Hampshire, where she was born December 6, 1787, and where she spent the whole of her days, with the exception of the four years of her married life. Her early days spent in the comparative solitude of a retired village of the New Forest, and a feeble state of health, induced a morbid shrinking from society, which she never in later life endeavoured to shake off, even when her poems had made her name widely known, and her friendship eagerly sought after. Miss Bowles first appeared before the public as an authoress in 1820, when her poem 'Ellen Fitz-Arthur' was published, but without her name. Indeed it was not till many years later that any of her works were issued with her name, though their authorship was no secret in literary circles. In 1822 she published 'The Widow's Tale, and other Poems;' in 1826 'Solitary Hours' (prose and verse); and in 1829, in two volumes, 'Chapters on Churchyards,' which had already appeared in 'Blackwood's Magazine,' where they had excited much interest. In June 1839, as already mentioned, Miss Bowles was married at Boldre Church, in the New Forest, to Robert Southey. Some twenty years before, and whilst they were quite unknown to each other, a literary correspondence had commenced between them, and it was continued with little interruption, their mutual respect gradually strengthening into warm friendship. Their marriage was a melancholy one, at least for the lady. Southey's mental faculties were already beginning to fail, and they soon gave way altogether. But she never permitted a murmur to escape her at her heavy lot. During his few remaining years she ministered to him with unwearying devotion, and her devotedness deserved a somewhat different notice than the ungenerous reference made to it in Mr. Cuthbert Southey's life of his father. She survived her husband somewhat over ten years, but her health had entirely broken down under her affliction, and her last years were years of constant suffering. She found at first occupation in completing a poem on Robin Hood, commenced by Southey, which she published in 1847, and afterwards in collecting her husband's letters, which have since been edited by Mr. Warter. The poetry of Caroline Bowles is of a kind that will always give pleasure to persons of a reflective turn of mind, but is scarcely fitted for continuous popularity. It is tender, graceful, and, though somewhat melancholy, pervaded by a fine moral tone; but it is diffuse, and wanting in strength of thought and passion.

SOUVESTRE, EMILE, one of the most able writers of the modern French school, was born at Morlaix, in Brittany, on the 15th of April 1806. His father was an engineer officer employed in repairing the roads and bridges of his district. Educated at the college of Pontivy until he had reached the age of seventeen, he began to evince a decided taste for literature. But his father's death in 1823 induced him to select the bar as his profession. He therefore studied the law, and in 1827 was formally received as an advocate at Rennes. He soon however grew weary of waiting for practice, and proceeded to Paris, with a strong determination of setting up as an author. His first efforts in this way were not encouraging. Having written a drama, the 'Siege of Missolonghi,' it remained unnoticed at the theatres until M. Alexandre Duval, a Breton like himself, and already known as a successful dramatist, supported him with his interest. After this his tragedy was read, accepted at the Théatre Français, and put into the prompter's hands. But then came the 'censure' with its pruning knife, and such was the mutilation of his piece, as to scare the very managers who had before applauded it. Thus disappointed of his hopes, he returned to his family, and being left without resources, accepted a situation as shopman with M. Mellinet, a bookseller at Nantes. In this situation he was living when the July revolution of 1830, and the fall of Charles X., gave so much stimulus to the young generation.

He began in 1830 to write for the provincial press, and in 1832 was appointed managing editor to a liberal journal published at Brest. Whilst living with M. Mellinet, Emile Souvestre was frequently noticed by the customers who frequented the library, for his unobtrusive good sense, and one of these, the deputy Luminais, a gentleman devoted to the reform of national education, conceived a friendship for him. The deputy soon perceived that Emile Souvestre felt an unusual interest in the same object, and having founded a school at Nantes, for the illustration of his new plan, he entrusted the management of it to young Souvestre, and another youthful reformer, M. Papot, under whom its success was from the first decided. In 1835 M. Souvestre was made régent de rhétorique at the college of Malhouse, in Alsace; he did not however continue many months in this situation.

For several years he had been quietly collecting materials to produce a work on his own province, to which he was extremely attached. This he did in 1836, under the title of 'Les Derniers Bretons,' a book which at once established his name. It is one of the best descriptions of Brittany, full of vivid yet unexaggerated painting, and affords a just idea of the customs, manners, and literature of the 'Wales of France.' His 'Echelle des Femmes' appeared at the same time, and was likewise successful. Encouraged by this change of fortune, Emile Souvestre returned to Paris to fix himself there. He was then thirty, and his future lot was decided.

For the next twelve years, 1836-48, he took a prominent part in the 'rédaction' of the 'Révue de Paris,' and the 'Révue des Deux Mondes;' he also contributed many notices and feuilletons to the 'Temps,' the 'National,' the 'Siècle,' and the 'Journal du Commerce.' His style is very pleasing; his matter thoughtful and instructive. His articles, tales, and books have none of the levity, or persiflage, so lamentably common in too many of his countrymen in the present day; they may be taken up with full reliance on their taste and tendency. Among his numerous writings may be cited: his 'Voyage dans le Finistère,' 'La Maison Rouge,' 'Le Mat de Cocagne,' 'Pierre et Jean,' and 'Les Confessions d'un Ouvrier.' This last especially is a work of incontestable value, full of maxims of the soundest character, especially as relates to the industrious classes. He has also produced several successful dramatic pieces, amongst others: 'Le Filleul de tout le Monde,' 'Le Riche et le Pauvre,' 'Henri Hamelin,' 'Ainée et Cadette,' 'L'Oncle Baptiste,' 'Maitresse et Fiancée;' and 'Un Enfant de Paris.' He is also the author of a good history of the Revolution of 1848.

In 1848, Emile Souvestre, who never lost sight of the principle of educational reform, was appointed by M. Carnot, then minister of public instruction, a lecturer in one of the schools established for the civil service. He likewise gave gratuitous lectures in the evenings to large audiences, consisting of working men and their families. These lectures were well calculated to produce a beneficial effect, and were always crowded.

In 1853 he spent the summer months in lecturing in the principal towns in Switzerland. These lectures were also very successful. He seemed to have found a new vocation, and had begun to diffuse new and more rational ideas among a class, who do not always think for themselves, when his health gave way, and death put an end to his useful labours, on the 5th of July 1854. Having married a second time, he left behind him a widow and three daughters.

SOWERBY, GEORGE BRETTINGHAM, second son of James Sowerby, one of a numerous family distinguished as naturalists, or natural history artists, was born at Lambeth on the 12th of August 1788, and died on the 26th of July 1854. He studied natural history with more success than his elder brother, perhaps on account of his not being so good an artist. In early life he was attached to the study of Entomology, and assisted his father in those departments of his labours where a knowledge of insects was required. On marrying however he gave up his Entomology, and commenced business as a dealer in natural history objects, and visited the Continent of Europe for the purpose of obtaining specimens. He bought the celebrated Tankerville collection of shells, for which he gave six thousand pounds. He also bought several other large collections. His knowledge of the forms of shells was very extensive, and he projected and published a great work entitled 'The Genera of recent and Fossil Shells.' This was published from 1820 to 1824. His father and brother executed the drawings and engravings, and he drew up the descriptions. His papers on various species of Mollusca are very numerous, and were published in the 'Zoological Journal,' the 'Proceedings of the Zoological Society,' the 'Magazine of Natural History,' and the 'Reports of the British Association.' A list of these papers, upwards of forty in number, is given in Agassiz's and Strickland's 'Bibliography of Zoology,' published by the Ray Society. Besides these papers and the work on the genera of shells he published several other independent works; amongst these should be mentioned the Catalogue of the collection of the late Earl of Tankerville, 'Species Conchyliorum, or concise original Descriptions and Observations of all the Species of recent Shells with their Varieties,' London, 1830. 'Conchological Illustrations, or coloured figures of all the hitherto unfigured recent Shells, with their Varieties,' London, 1832-45. 'Thesaurus Conchyliorum, or Figures and Descriptions of Shells,' London, 1842. He was a Fellow of the Linnæan Society.

SOWERBY, CHARLES EDWARD, third son of James Sowerby, was born on Feb. 1st, 1795, and died in June 1842. He assisted first his father and afterwards his brother James de Carle in their natural history publications till 1831, when the copyright of 'English Botany' falling to his share, he commenced the publication of a second edition on small paper, with large additions. This work has been reprinted by his son, John Edward Sowerby.

SPAIN. Since our previous account very material alterations have taken place, which we shall briefly indicate. The first is the sub-division of the old provinces for administrative purposes, which we subjoin, with the population in 1849, the latest return available; but by a return not yet published, the total population it seems amounts to about 17,000,000.

AREA AND POPULATION OF POLITICAL DIVISIONS.

Old Provinces.	Modern Provinces.	Area in Sq. Miles.	Population in 1849.
Aragon	Zaragoza	5,254	350,000
	Huesca	5,052	247,105
	Teruel	4,404	250,000
		14,710	847,105
Asturias	Oviedo	3,686	510,000
Basque Provinces	Bilbao (Vizcaya)	7,621	150,000
	San Sebastian (Guipuzcoa)	622	141,752
	Vitoria (Alava)	1,082	81,397
		9,325	373,149

Old Provinces.	Modern Provinces.	Area in Sq. Miles.	Population in 1849.
Castilla la Vieja .	Burgos .	7,674	432,022
	Logroño .		185,519
	Santander .		190,000
	Soria .	4,076	140,000
	Segovia .	3,466	155,000
	Avila .	2,570	132,936
		17,786	1,235,477
Castilla la Nueva.	Madrid .	1,315	405,737
	Toledo .	8,773	330,000
	Guadalajara .	1,946	199,746
	Cuença .	11,295	252,723
	Ciudad Real (La Mancha) .	7,543	302,594
		30,872	1,490,800
ataluña .	Barcelona .	12,180	533,695
	Tarragona .		290,000
	Lerida .		197,445
	Gerona .		262,594
		12,180	1,283,734
Cordova .	Cordova .	4,160	348,956
Estremadura .	Badajos .	14,330	336,136
	Caceres .		264,988
		14,330	601,124
Galicia .	Coruña.	15,897	511,492
	Lugo .		419,437
	Orense .		380,000
	Pontevedra .		420,000
		15,897	1,730,929
Granada .	Granada .	9,622	427,250
	Almeria .		292,334
	Malaga .		438,000
		9,622	1,157,584
Jaen .	Jaen.	4,446	307,410
Leon .	Leon .	5,894	288,833
	Salamanca .	5,630	240,000
	Valladolid .	3,239	210,000
	Zamora .	3,563	180,000
	Paleneia .	1,733	180,000
		20,059	1,098,833
Murcia .	Murcia .	7,877	400,000
	Albacete .		195,531
		7,877	595,531
Navarra .	Navarra .	2,450	280,000
Sevilla .	Sevilla .	8,989	420,000
	Cadiz .		358,446
	Huelva .		153,462
		8,989	931,908
Valencia .	Valencia .	7,683	500,000
	Alicante .		364,219
	Castellon .		247,741
		7,683	1,110,960
Total .	. . . . . .	184,072	13,903,500
	Balearic Islands .	1,757	253,000
	Canary Islands .	3,340	257,719

Commerce and Manufactures.—Spain, from the extent of its coast-line, its large ports of Cadiz, Cartagena, and Ferrol, the number of its smaller harbours, its geographical position, and its abundance of natural productions, possesses very great commercial advantages, but those advantages have been diminished, and in a great measure destroyed, by the restrictive laws of the government. Smuggling to an enormous extent is carried on almost everywhere along the coast, especially at and near Gibraltar, and also from France, across the Pyrenees, and from Portugal across the frontier. The articles smuggled through Gibraltar consist of cottons, linens, muslins, thread, stockings, and the like, and tobacco to a large amount. The total imports into Spain during the year 1849 amounted to 587,171,795 reals (about 6,160,000*l.*). Of course these are the registered imports. The amount of goods smuggled into the country cannot be estimated. The exports during the same year amounted to 478,162,822 reals (about 5,000,000*l.*). The imports consist of colonial produce, dried fish and salted provisions, cotton and woollen goods, cutlery, glass, butter, and cheese. The exports consist of wool, wine, brandy, oil, fruits, chestnuts and nuts, cork, quicksilver, iron, silver, lead, and salt, with a small quantity of silk and manufactured goods. Of late years a large amount of wheat and flour has been exported from the northern provinces, chiefly to Cuba and Brazil. The manufacturing industry, formerly considerable, has greatly declined; and the grape-vine disease (*oidium*) has very materially lessened their manufacture and exportation of wine. The government has still manufactures of tobacco, saltpetre, gunpowder, cannon, fire-arms, and porcelain, but they are all in a decayed state except the manufactory of cigars at Sevilla. Other manufactures are silks, coarse cottons and woollens, and leather. Cutlery and iron-ware are made to some amount in the Basque Provinces and Asturias.

Roads, Canals, and Railways.—The public roads in Spain, except those around the capital and the royal road from Madrid through Leon to Oviedo and the coast, are amongst the worst in Europe. The only canal of importance is the Imperial Canal, commenced by Charles V., extending along the southern bank of the Ebro. There are three or four small canals in the Castillas and in Murcia. The railways completed in January 1858, are—from Barcelona to Arenis del Mar, 23 miles; from Barcelona to Granollers, 19 miles; from Barcelona to Martorell, about 20 miles; from Barcelona to Tarrasa, 22 miles; from Valencia to Alcudia, 39 miles; from Valencia to Grao, 3 miles; from Madrid to Albacete, 173 miles; Reinosa to Alar del Rey, 32 miles.

Revenue.—The budget proposed for 1857 amounted to 20,030,000*l.*; the ordinary receipts were estimated at 17,400,000*l.*, leaving a deficiency to be supplied of 2,630,000*l.* The amount of the public debt in November 1856 was 141,200,000*l.*, on which the interest payable was 2,277,000*l.*, in addition to a loan for 3,330,000*l.* recently contracted for. The army and navy are given under MILITARY AND NAVAL FORCES, *S.* 2.

Religion and Education.—The established religion is the Roman Catholic, and no other is allowed in the Spanish dominions. The crown presents the archbishops and bishops, who are confirmed by the Pope. The wealth of the church was at one time immense. After the revolution of 1836-7, the monastic orders were suppressed, and the convents and the lands belonging to them were sold; but the convents of nuns were suffered to remain till the death of the then occupants. A law was passed in 1855 for the sale of the whole of the church-property, and its conversion to secular uses; which law was revoked, at least so far as the property unsold, in 1857; and an indemnity to the clergy of upwards of 2,500,000*l.* has been introduced to the Cortes, but has not yet (May, 1858) been adopted.

Education is very little diffused. The lower classes receive little or no instruction, except in the principal cities, where infant-schools have of late years been established. The children of the upper classes are mostly educated in France and other countries. The universities, formerly numerous and of great reputation, are now reduced to about 14, and those are attended by only a comparatively small number of students in theology, law, and medicine. There are, however, several academies and literary societies in Madrid, Cadiz, Sevilla, and other large cities.

History.—After the queen-mother, Christina, had been appointed queen-regent (Reina Gobernadora), Don Carlos, the brother of Fernando VII., laid claim to the throne on the ground that by the Salic law females were declared ineligible. A civil war ensued, which lasted till September, 1840, when the partisans of Don Carlos were finally defeated, and the sovereignty of Isabella established. Early in 1854, in consequence of the arbitrary and unconstitutional measures of the Spanish government, insurrectionary movements occurred in Barcelona and other places. On the 22nd of February the whole kingdom was declared in a state of siege. On the 15th of July the city and garrison of Barcelona issued a 'pronunciamento' (a public declaration) against the government. This was followed, July 17, by an insurrection in Madrid. The streets were barricaded, and the people fought against the soldiers till July 19, when the ministry fled, the soldiers gave up the contest, and a National Junta was established. Espartero was reinstated in power; the constitutional government was re-established; and the queen-mother was banished from the kingdom, August 28, 1854. In June, 1856, a revolution took place, and General O'Donnell became dictator, suppressing all opposition by force of arms. He was succeeded by Marshal Narvaez in October. Narvaez was dismissed in the following year, and was succeeded by M. Isturitz, as prime minister, but the government is yet in a very unsettled state.

SPANIOLITMINE. [CHEMISTRY, *S.* 2.]

SPANISH FLIES. [CANTHARIDÆ.]

SPARROW-HAWK (*Accipiter*). [FALCONIDÆ.]

SPARUS. [DENTEX, *S.* 2.]

SPECIES OF PLANTS. All the individual forms of plants, as well as animals, that occur on the globe, may be collected into groups resembling each other, and these groups are called species. A species has been defined to be "a combination of individuals alike in all their parts;" "a systematic combination of homogeneous individuals;" "a collection of individuals which will breed together and produce fertile offspring." De Candolle says, a species is "a collection of all the individuals which resemble each other more than they resemble anything else, which can by mutual fecundation produce fertile individuals; and which reproduce themselves, by generation, in such a manner that we may from analogy suppose them all sprung from one single individual." However clear such a definition may be, it would assist a botanist only in a very limited degree in determining whether a new plant should be looked upon as a new species. If there were perfect structural identity between two individuals of the same species, or if we could ascertain, on the physiological ground, that the individuals after fecundation reproduced similar individuals, it would then be a more easy task. But perfect structural identity does not exist, and the physiological test cannot be always applied, and hence the difficulty of determining what is really a species. From this some have gone so far as to deny the existence of species altogether, and assert that the supposed distinctions between plants are altogether arbitrary and imaginary. This notion is however altogether upset by the well-known fact of plants maintaining for centuries the same structural characters.

However much it may be regretted, on account of the vexatious multiplication of species, that some fixed rules cannot be laid down for their formation, it does not appear at present that anything more than general rules can be given, and that much must depend on the judgment and experience of the observer.

As a general rule species are not distinguished by differences in the internal organisation, such differences being left for the higher divisions into genera, orders, and classes; but by those superficial and external differences which are independent of internal structure. Of these may be named duration, dimension, surface, form, division, numerical proportion, and colour. The value of each of these points varies according to circumstances, and in proportion to the knowledge of the observer will be the skill with which he selects them for distinguishing species. The duration of a plant is a point of great importance, as in no instance do we find, unless from change of climate, plants of the same species differing in being annual, biennial, &c. Dimension is rarely of any importance, and should only be taken into consideration in extreme cases. Differences of surfaces, depending on structural peculiarities, are of importance; smoothness, roughness from tubercles, and the existence of stinging hairs and prickles, are points of value. The presence or absence of lymphatic hairs on the surface of leaves is a point that may mostly be disregarded; they are of more importance on other parts. The form of parts is only of importance when it is the consequence of anatomical differences, that is to say, the arrangement of the veins, &c. The division of organs is not of much importance where it depends on the degree of the laceration of the parenchyma. The union or non-union of contiguous organs, as the parts of the calyx, corolla, &c., is of the greatest value, being mostly uniform in all the individuals of the same species. The numerical proportion of the parts of a plant is of value in proportion to the small number of parts or organs; the greater the number, the more subject it is to variation. Differences in colour, odour, or taste, are little to be relied on.

Those departures from identity of structure, which are considered insufficient to constitute a species, are called Varieties, and the points of structure that should constitute a species or variety is frequently a matter of difference, and it is no unfrequent thing for one author to reduce the species of another to mere varieties. Thus, Borrer has made 71 species of *Salix*, but Koch has reduced them to 29, and numerous examples could be cited. A careful attention to the influence of climate, soil, elevation, &c., on species, would save much trouble and vexation on this point. De Candolle has elegantly summed up the influence of these agents on plants:—"Let us suppose," he says, "what really happens, that the seeds of plants are scattered at hazard over the surface of the earth; or, to speak more correctly, by causes that have no necessary connection with the existence of those plants; such seeds will find themselves in an infinite variety of situations; some which have fallen in soil that is too tenacious or too loose, too dry or too wet, too hot or too cold, do not grow, and are soon destroyed. But between these extremes some will succeed, although it may be under very different circumstances. Thus, for instance, if the place has not light enough, the plant will be half blanched, which will be indicated by its paleness and feebleness, or by being spotted, or by the diminution or even loss of its hairs; if the light is too bright, the plant will be stronger, smaller, more deeply coloured, harder, and more velvety than usual. Temperature also exercises some influence, though in a less degree; in a cold climate the same plants are smaller and weaker than ordinary, the colour of the flowers and fruit is paler, the wood worse ripened, their leaves more deciduous, their fruit often abortive, and the sap destined to nourish it throwing itself into the neighbouring parts, sometimes changes their appearance. In a hot climate plants become larger, produce more wood, and their leaves have brighter colours and a higher flavour. In the same climate humidity causes the appearance of differences without end; plants that grow in water lose all their hairs, their leaves become divided into capillary segments so as to look like hairy roots, their stems and flower-stalks lengthen to reach the surface of the water, and these different effects are further variable as the water is still or agitated, clear or turbid, pure or mixed with heterogeneous substances; the varieties of *Ranunculus aquatilis* offer a remarkable example of this. If, on the other hand, a plant accustomed to water is found to live in a drier soil, it becomes covered with hairs, remains smaller than usual, and acquires greater hardness. In air rarified like that of mountains, plants are generally found smaller and more stunted than usual, while their flowers are larger than upon the plains. The influence of soil is not less manifest: if it is tenacious, the roots, which penetrate it with difficulty, are small, hard, and clustered; if it is very sandy, the roots become large, fleshy, and fully formed; if it contains a great quantity of carbon, the colours of the flower are often altered, as those of the *Hydrangia* into blue, and of the Pink into violet; if it is charged with salt, or if the plant is within the reach of salt, even brought through the atmosphere, we usually find the leaves more fleshy and more glaucous, as in *Lotus corniculatus*. All these different circumstances, combined with each other in nature, are fertile causes of varieties, which are still further multiplied by cultivation."

SPEEDWELL. [VERONICA.]

SPHENOPS. [SCINCOIDEANS.]

SPHEROSTILBITE. [MINERALOGY, *S.* 1.]

SPIDERS. [ARACHNIDA; ARANEIDÆ, *S.* 2.]

SPONTINI, GASPARD, a celebrated Italian dramatic composer, was born at Jesi, in the Roman States, in the year 1778. After studying the principles of music under Padre Martini at Bologna, he entered, at the age of thirteen, the Conservatory of La Pietà at Naples, then a music school of great renown. At seventeen he composed his first opera, 'I Puntigli delle Donne,' which spread his name over Italy, and led to the favourable reception of a long series of dramatic productions. He visited Paris in 1804, and from that time became much connected with the music of the French opera; his principal works, 'La Vestale,' 'Olympia,' and 'Fernand Cortez,' having been composed for and produced at the Académie Royale de Musique. Of these works 'La Vestale' acquired the greatest celebrity. Having been adapted both to the Italian and the German stage, it was performed in every great musical theatre in Europe, and for a time had almost as much popularity as the works of Rossini himself. Spontini passed many years of the latter period of his life at Berlin, as director of music at the Prussian court, and held this office at the time of his death, January 21, 1851.

SPURGE LAUREL. [Daphne.]

STAG-BEETLES. [Lucanidæ, S. 1.]

STAINDROP. [Durham.]

STALEYBRIDGE, Lancashire, a market-town in the parish of Ashton-under-Line, is situated chiefly on the right bank of the river Tame, in 53° 30′ N. lat., 2° 4′ W. long., distant 8 miles E. by N. from Manchester, 185 miles N.W. by N. from London by road, and 192 miles by the London and North-Western railway viâ Trent Valley. The population of the town in 1851 was 20,760. The living is a perpetual curacy in the archdeaconry and diocese of Manchester. Staleybridge owes its importance chiefly to the cotton manufacture. Woollen-cloth is manufactured to some extent; there are also brass and iron foundries, machine-making factories, brickfields, collieries, stone-quarries, and corn-mills. The parochial chapel is an octagonal structure occupying an elevated site, and there are three district churches, chapels for Wesleyan, Primitive, New Connexion and Association Methodists, and for Independents, Baptists, and Roman Catholics; National, British, and Roman Catholic Schools; a mechanics institute, and a savings bank. Saturday is the market-day; fairs are held on Easter Monday and November 5th.

STAMP ACTS. See 17 & 18 Vict., c. 83; 18 & 19 Vict., c. 36; 18 & 19 Vict., c. 82; 18 & 19 Vict. c. 27; 18 & 19 Vict., c. 78; and 19 & 20 Vict., c. 81.

STAMP-DUTIES. That the relaxing of a heavy tax, while it confers great advantages on the public, does not always involve a loss of revenue, has been strikingly shown in the example of the postage rates, as well as in many others, of which the Stamp Duties form one. In 1850 and 1854 great alterations and reductions were made by the 13 & 14 Vict., cap. 97, the 16 & 17 Vict., caps. 59 & 60, and the 17 & 18 Vict., cap. 83. That the acts were altogether a great boon to professional men and to the public is a point upon which there are not two opinions. The effect upon the revenue will be seen from the following figures:—

In the year ending Jan. 5, 1850, the sum produced by the Stamp Duties was .	£6,867,548
In the year ending March 31, 1858 . .	7,372,209

It must, however, be taken into account that the Succession Duty on real estates was passed in 1853. But in 1852 the stamp duties amounted to 6,761,634*l.*; and the penny receipt duty has come into operation since.

In pointing out the difference between the former and the new duties, the *ad valorem* duties first claim attention.

Conveyance Duties upon the Sale of Property.—These duties show a considerable reduction in all purchases for sums not exceeding 200,000*l.* The highest *ad valorem* duty under the late law was 1000*l.*, there being no increase on sums exceeding 100,000*l.*; the duty is now one uniform rate of 10*s.* per cent., without limit; which, speaking in general terms, may be said to be about half the amount of the former duty on sums from 500*l.* to 100,000*l.* That duty was not a uniform per centage, as at present, but a fixed amount on all sums between those specified in the scale, being somewhat more or less than 1*l.* per cent. as the purchase money approximated to the higher or lower amount in each step; on the mean sum it was precisely that rate. But on sums under 500*l.* the rate was, for the most part, much higher, being as much as 5*l.* per cent. on the mean sum under 20*l.*; 3*l.* per cent. on that under 50*l.*, and 1*l.* 10*s.* under 150*l.* On purchases of small properties, therefore, the advantage is very great; and, referring to these, the justice and propriety of the new scale of duties will be more apparent. In giving a comparative statement of the two duties a difficulty arises from the difference in the language of the two acts imposing them, in expressing the turning point; in the new act the words "exceeding" and "not exceeding" being substituted for "amounting to" and "not amounting to."

The omission to charge the *ad valorem* duty on conveyances where the consideration was stock, whether in the funds, or of any company, is supplied.

The following comparative table will exhibit at a glance the difference between the old and the new duties in all cases of sales for sums not exceeding 1000*l.*

			New Duties.			Old Duties.		
	£	£	£	s.	d.	£	s.	d.
	Not amounting to .	20 ...	0	2	6	0	10	0
Amounting to	20 and not exceeding	25 ..	0	2	6	1	0	0
Exceeding .	25 and not amounting to	50 ...	0	5	0	1	0	0
Amounting to	50 and not exceeding	50 ...	0	5	0	1	0	0
Exceeding .	50 „ „	75 ...	0	7	6	1	10	0
„	75 „ „	100 ...	0	10	0	1	10	0
„	100 „ „	125 ...	0	12	6	1	10	0
„	125 and not amounting to	150 ...	0	15	0	1	10	0
Amounting to	150 and not exceeding	150 ..	0	15	0	2	0	0
Exceeding .	150 „ „	175 ...	0	17	6	2	0	0
„	175 „ „	200 ...	1	0	0	2	0	0
„	200 „ „	225 ...	1	2	6	2	0	0
„	225 „ „	250 ...	1	5	0	2	0	0
„	250 „ „	275 ...	1	7	6	2	0	0
„	275 and not amounting to	300 ...	1	10	0	2	0	0
Amounting to	300 and not exceeding	300 ...	1	10	0	3	0	0
Exceeding .	300 „ „	350 ...	1	15	0	3	0	0
„	350 „ „	400 ...	2	0	0	3	0	0
„	400 „ „	450 ...	2	5	0	3	0	0
„	450 and not amounting to	500 ...	2	10	0	3	0	0
Amounting to	500 and not exceeding	500 ...	2	10	0	6	0	0
Exceeding .	500 „ „	550 ...	2	15	0	6	0	0
„	550 „ „	600 ...	3	0	0	6	0	0
„	600 „ „	700 ...	3	10	0	6	0	0
„	700 and not amounting to	750 ...	4	0	0	6	0	0
Amounting to	750 and not exceeding	800 ...	4	0	0	9	0	0
Exceeding .	800 „ „	900 ...	4	10	0	9	0	0
„	900 and not amounting to	1000 ...	5	0	0	9	0	0
Amounting to	1000	...	5	0	0	12	0	0

Bonds and Mortgages.—These duties are also charged at one uniform rate throughout, viz., 2*s.* 6*d.* for every 100*l.*, and any portion of 100*l.*, except that on sums not exceeding 300*l.* the duty is imposed by fifties, so as to charge only 1*s.* 3*d.* on the fraction over 50*l.*; thus favouring minor transactions, instead of the more important ones as under the old system. The repealed duty was unjust and wholly indefensible upon principle; as will be perceived when it is stated that the duty on the mean sums in the scale, from not exceeding 50*l.* to not exceeding 20,000*l.* gradually diminished from 4*l.* per cent. to 2*s.* 3*d.*; that the highest duty being 25*l.*, the rate on 40,000*l.* was 1*s.* 3*d.* per cent., and that this rate proportionately diminished with the increase in the amount of money secured.

The following is a comparison of old and new duties on bonds and mortgages for sums not exceeding 20,000*l.*:—

			New Duties.			Old Duties.		
	£	£	£	s.	d.	£	s.	d.
	Not exceeding .	50 ...	0	1	3	1	0	0
Exceeding .	50 and not exceeding	100 ...	0	2	6	1	10	0
„	100 „ „	150 ...	0	3	9	2	0	0
„	150 „ „	200 ...	0	5	0	2	0	0
„	200 „ „	250 ...	0	6	3	3	0	0
„	250 „ „	300 ...	0	7	6	3	0	0
„	300 „ „	400 ...	0	10	0	4	0	0
„	400 „ „	500 ...	0	12	6	4	0	0
„	500 „ „	600 ...	0	15	0	5	0	0
„	600 „ „	700 ...	0	17	6	5	0	0
„	700 „ „	800 ...	1	0	0	5	0	0
„	800 „ „	900 ...	1	2	6	5	0	0
„	900 „ „	1000 ...	1	5	0	5	0	0

And proceeding upwards to £20,000 by thousands, dropping the intermediate hundreds, the comparison will be as follows, viz.:—

		New Duties.			Old Duties.					New Duties.			Old Duties.		
	£	£	s.	d.	£	s.	d.		£	£	s.	d.	£	s.	d.
On	2,000 ...	2	10	0	6	0	0	On	12,000 ...	15	0	0	15	0	0
„	3,000 ..	3	15	0	7	0	0	„	13,000 ...	16	5	0	15	0	0
„	4,000 ...	5	0	0	8	0	0	„	14,000 ...	17	10	0	15	0	0
„	5,000 ...	6	5	0	9	0	0	„	15,000 ...	18	15	0	15	0	0
„	6,000 ...	7	10	0	12	0	0	„	16,000 ...	20	0	0	20	0	0
„	7,000 ...	8	15	0	12	0	0	„	17,000 ...	21	5	0	20	0	0
„	8,000 ...	10	0	0	12	0	0	„	18,000 ...	22	10	0	20	0	0
„	9,000 ...	11	5	0	12	0	0	„	19,000 ...	23	15	0	20	0	0
„	10,000 ...	12	10	0	12	0	0	„	20,000 ...	25	0	0	25	0	0
„	11,000 ...	13	15	0	15	0	0								

At this point the old duties stopped, there being no increase beyond 25*l.* whatever might have been the amount of money secured; but the new duties continue on, *ad infinitum*, at the rate of 1*l.* 5*s.* for every additional 1000*l.*, and in proportion for less than 1000*l.*

A mortgage, or (as in Scotland) a bond without penalty, for securing money to become due, without limit, is available as a security for such an amount, only, as the duty thereon extends to cover. In other such cases of bonds the duty is charged on the amount of the penalty.

A mortgage for securing money by way of rent-charge or annuity is chargeable with *ad valorem* duty on the money advanced. The case of an advance of money under the private Drainage Act (12 & 13 Vict. c. 100) is referred to in the work of a writer on the stamp laws (supplement to Tilsley's Treatise on the Stamp Laws, p. 26) as an instance in which this will apply.

The *ad valorem* duties on annuity bonds are somewhat varied. Where the annuity does not exceed 100*l.*, relief, to some extent, is given; above that amount there is an increase, which is greater as advance is made upwards. The new duty is 2*l.* for every 100*l.* and any fraction of 100*l.* per annum; the former duty was not a per centage, but, as in other cases, according to a scale, but not extending beyond 2000*l.* a year. The present duty is not limited.

A valuable alteration is made in the duty on bonds given for any other purpose than as a security for money, where the penalty is of comparatively small amount. Under the old law the duty in every such case was 1*l.* 15*s.*, or some other fixed sum; it is now the same duty as would be payable on a bond given for securing money to the same amount as the penalty, where such latter duty is less than the fixed sum. Bonds given as a collateral or additional security for money are likewise charged with *ad valorem* duty where it would be less than the fixed duty of 1*l.* or 1*l.* 15*s.* respectively.

Leases.—Under this head the equity of the new system, by comparison with the old, will perhaps be more striking than under any other. The present rate of duty on the rent is 10*s.* per cent.; imposed thus, viz., where the yearly rent exceeds 100*l.*, then for every 50*l.* and any fraction of 50*l.*—5*s.*; but upon rents of lower amount than 50*l.* the proportionate duty is charged in smaller steps, involving a less amount of duty for any fraction; thus, again, having favourable regard to matters of comparatively small value, and reversing the former principle. The repealed duties on leases, computed on the mean sums in the scale, were as follows, viz. 10*l.* per cent. on rents under 20*l.*; 5*l.* per cent. on rents under 100*l.*; 1*l.* 6*s.* 8*d.* on rents under 200*l.*; and gradually decreasing to 13*s.* 4*d.* on rents under 1000*l.*; the maximum duty on a rent of 1000*l.* or upwards being 10*l.* only. Relief for the most part to the agricultural interest no doubt prompted the adoption of so liberal a measure, but it will be found, perhaps, more extensively advantageous to the owners and occupiers of property in large towns.

A lease of minerals reserving a portion of the produce, by reference to an annual maximum or minimum amount, is to be charged with duty on such amount; and where the fine or rent consists of corn, &c., the duty is charged on the value, to be ascertained where there is no special contract by the returns published under the Tithe Commutation Act, or, in Scotland, the fiars prices of the county.

Assignments and surrenders of leases (not upon sale or mortgage) are to pay the same *ad valorem* duty, if not exceeding 1*l.* 15*s.*, as the lease itself would be liable to.

The duties on leases in Ireland are to be the same as in England.

Settlement of Money.—All the advantage afforded by the new Act in respect of the *ad valorem* settlement duties is on sums not exceeding 600*l.* The new duty is 5*s.* for every 100*l.* unlimited, and any fraction of 100*l.* The lowest duty under the former law was 1*l.* 15*s.*, which extended to cover any amount under 1000*l.*, and the highest, 25*l.*, for all sums amounting to 20,000*l.* or upwards; being 7*s.* per cent. on the mean sum under 1000*l.*, and averaging less than 2*s.* 6*d.* on the mean sums above 1000*l.* and under 20,000*l.* Thus the order of taxation is again rightly reversed.

These are the *ad valorem* duties affected by the new Act; and they may be said to be the only ones connected with the transfer of property by way of sale or security. Reference will now be made to other alterations which afford almost uniform relief.

Transfer of Mortgage.—This is an important branch of conveyancing; but it appears from the work of the writer already referred to, that it is one that has been more perplexed than any other by the Stamp Duties; and the result of various modern decisions, although tending to quiet doubts previously existing, was to inflict an amount of charge not considered to have been intended by the legislature. The shifting of a mortgage security from one to another is always a cause of vexation to the debtor; but to the poor man it is a matter of serious moment. Independently of professional charges for investigating the title, and for preparing the conveyance, the stamp duty was, of itself, an intolerable burden. The lowest *ad valorem* mortgage duty, oppressive as it was, amounted only to 1*l.*; but the lowest duty on a simple transfer of mortgage was 1*l.* 15*s.*; and as in every instance a new covenant was, as a matter of course, contained in it, a further duty of 1*l.* 15*s.* became, under a recent authority, chargeable; making 3*l.* 10*s.* (besides a third stamp of 1*l.* 15*s.* for the duty on a lease for a year, of which hereafter, where that attached) upon every transfer of mortgage, whether the money secured was under 100*l.* or above 20,000*l.* This is now remedied. The maximum duty on a transfer of mortgage is 1*l.* 15*s.*; and where, if the transaction was a mortgage, instead of a transfer, the *ad valorem* duty would be less than 1*l.* 15*s.*, then such *ad valorem* duty only is to be charged. Thus, for example, on a transfer of a mortgage for 100*l.*, the stamp duty, instead of 3*l.* 10*s.* as the lowest amount, as heretofore, is now only 2*s.* 6*d.* By this alteration every transfer of mortgage is relieved from one stamp of 1*l.* 15*s.*; and on all transfers where the money secured does not exceed 1400*l.* further proportionate relief is given. Where, on a transfer, further money was advanced, the *ad valorem* duty on such further advance was payable in lieu of one of the duties of 1*l.* 15*s.*; now, in such a case, the new *ad valorem* duty is all that is chargeable.

Further Assurance and further Security.—These instruments, which before were charged with 1*l.* 15*s.* in all cases, are now charged with that amount as a maximum; the *ad valorem* duty being payable where less than 1*l.* 15*s.*

Further Advance.—Besides the duty on the further money lent, 1*l.* 15*s.* was necessary if the deed contained any additional security, by covenant or otherwise, for the original sum. Now, merely the *ad valorem* duty on the further advance is requisite.

Bargain and Sale (*or Lease*) *for a Year.*—Whilst the cumbrous mode of conveyance of freehold property by actual lease and release gave rise to two deeds, there was certainly no inconsistency in imposing a stamp duty upon each of them; but when, by modern enactments, that system was superseded, and one of the instruments ceased to have, in fact, any existence at all, it may be said to be somewhat inconsistent, as it was felt to be exceedingly inconvenient in practice, to encumber the other deed with the duties on both; but so it was; the release, or grant which had a new conveyancing principle given to it, was charged with the duty before payable on the bargain and sale, or lease, for a year, as well as that which was properly its own. These duties are now swept away entirely. Under the title *Conveyance* certain additional duties were imposed on a feoffment and bargain and sale enrolled as an equivalent for the duty on a lease for a year; these are, of course, also repealed.

Progressive Duties.—A vast improvement will be effected in conveyancing when any system can be established which shall materially curtail instruments in their verbosity. Something has been attempted by the legislature in this way, but without, at present, producing in general practice any alteration. The great length to which a deed may extend is by no means an indication of the value of the subject-matter: and it is sufficiently oppressive that, to effect a transaction of perhaps minor importance, and of unavoidable necessity, an instrument of considerable length must be created, swelling the professional charges to an inordinate amount; but the burden is increased by stamp duties imposed, without regard to value, upon every certain quantity of words made use of. The late progressive duties were 1*l.* or 1*l.* 5*s.* on every 1080 words (15 folios) after the first 1080. The new duty, which is charged in the same manner, is a relief in all cases; the maximum is 10*s.*; but where the primary duty is of less amount the progressive duty is not to exceed it. Similar reduced duties under the head Schedule, are also imposed on papers referred to in certain instruments as part thereof but not annexed. A provision is contained in the Act (section 11) that progressive duties shall not be, or be deemed to have been, chargeable on any instrument in respect of *any other instrument*, liable to stamp duty, and duly stamped, incorporated with or referred to in it; so that an old document, duly stamped *per se*, may be made to form a portion of a new one without being taken into account in calculating the progressive duty on the latter.

Duplicates and Counterparts.—In the case of settlements of money and a few other instances where *ad valorem* duties were payable, duplicates were expressly charged with the same duties as the original instruments; and counterparts became also liable, in some cases, to the like duties; but, in general, they may be stated to have been subject to a duty of 1*l.* 15*s.* except as to leases, the counterparts or duplicates of which, where the duty on the original exceeded 1*l.*, were charged with 30*s.* These duties are now reduced to 5*s.* as a maximum, with progressive duties of 2*s.* 6*d.*; the same duty, including the progressive duty, as the original, being imposed where such duty exclusive of progressive duty is less than 5*s.*

Memorial.—The duty on a memorial for registering a deed is reduced from 10*s.* to 2*s.* 6*d.*

Copyhold.—In all cases of sale and mortgage of copyhold property the instruments charged with *ad valorem* duty are, of course, liable only to the new duties; but there is one instance in which a reduction is made where the instrument was not subject to *ad valorem* duty. In the case of an admittance the instrument was charged with 1*l.*; or, where the yearly value did not exceed 1*l.*, with 5*s.* By the new Act these duties are reduced to 2*s.* 6*d.* where the admittance proceeds upon a sale or mortgage. In all other cases the duty on an admittance remains as before.

Covenant.—A particular duty is now for the first time charged on a deed of covenant. It was, it seems, apprehended that where the *ad valorem* bond duty was considerable, a practice might be resorted to of executing a covenant, as a security, which would be liable only as a common deed to 1*l.* 15*s.*, in lieu of giving a bond; it was therefore thought proper to impose the same *ad valorem* duty on a deed of covenant as on a bond, where it exceeded 1*l.* 15*s.* But relief is given in the case of a separate deed of covenant, executed on the sale or mortgage of any lands, for title, &c. by imposing 10*s.*; or less, where the duty on the conveyance is less.

Agreement.—The duty of 2*s.* 6*d.* on an ordinary agreement remains as before, except that this amount is sufficient for any quantity of words less than 30 folios, instead of merely a quantity not exceeding 15 folios. But in lieu of the leap from 2*s.* 6*d.* to 1*l.* 15*s.* in any excess of the latter quantity, and of 1*l.* 5*s.* for every additional quantity of 15 folios, the duty is now 2*s.* 6*d.* for every such further quantity.

The advantage of this may be illustrated by the following example: suppose a contract for the performance of any work according to plans and specifications, the words and figures amounting altogether to 100 folios, the duty under the old law would have been 1*l.* 15*s.*, and five times 1*l.* 5*s.* for five entire quantities of 15 folios after the first, making altogether 8*l.* By the new law the duty imposed is six times 2*s.* 6*d.*, making only 15*s.*

Charter, Precept, Resignation, and Seisin.—The duties on certain instruments in Scotland under these heads, are reduced from 9*s.* to 5*s.*

Warrant of Attorney.—The duties on securities of this description are as before, the same as on bonds, with a reduction of the duty on a warrant of attorney given as a collateral security, from 1*l.* to 5*s.*, where the duty on the principal instrument exceeds that amount; and also, where it is given for money exceeding 200*l.* for which the person giving it is under arrest. A warrant of attorney given for any other purpose than as a security for the payment of money or the transfer of stock is charged with 1*l.* 15*s.*, which is an increase, the former duty in such case being 1*l.* only.

The foregoing are all the cases in which the duties have been altered by the new act; but there are some material provisions which it will be proper to glance at.

All the provisions of former Acts relating to Stamp Duties are kept in force, including exemptions.

Certain agreements for letting lands in Ireland which were charged with *ad valorem* duties as leases, but which, if in England would have been subject only to the duty of 2*s.* 6*d.* as agreements, are to be deemed to have been liable to the latter duty.

Any person receiving money for stamp duty (including legacy duty) and not applying it, is to be accountable to the Crown by summary process.

Transfers of mortgages, further charges, and further securities executed before the 11th October, 1850, are not to be deemed to be liable to the additional duties already pointed out and attaching by reason of the decisions alluded to, but, in this respect, are to be put upon the same footing as those executed subsequently.

The terms on which instruments may be stamped after execution are materially varied. The penalty, in ordinary cases payable on stamping an instrument executed before the passing of the Act is 5*l.*; upon payment of which and the duty, the stamp may be affixed. By the new Act the penalty is 10*l.*; and where the duty required exceeds 10*l.*, then, further interest at 5*l.* per cent. per annum on the duty, calculated from the date or first execution of the instrument; but no amount of interest beyond that of the duty is to be paid by way of penalty. In lieu of a receipt for the duty and penalty as formerly, a stamp denoting the payment of the penalty is to be impressed. One advantage to the party is however given. Under the old law, if an instrument was stamped, but with an insufficient amount, the whole duty was to be paid without regard to what had been already paid besides the penalty; but now, the deficient duty only is required.

Where instruments are executed abroad, the commissioners are empowered to stamp them without penalty at any time within two months after they are received in this kingdom.

Until this Act there existed no power to determine what stamp duty was payable in any case, so as to assure parties that the stamp on an instrument was sufficient. The Commissioners are now invested with a power to adjudicate in all such cases, and to certify by means of a particular stamp, that any instrument is duly stamped, and so to preclude all question upon the point. The fee for obtaining this adjudication is 10*s.* An appeal is given to the Court of Exchequer.

The duties in Great Britain and Ireland are now assimilated, but it appears that a deed liable to Irish duty could not be stamped in London; and *vice versâ*; this is now permitted.

By the Act of the 12 & 13 Vict. c. 80, the discount of 7*l.* 10*s.* per cent. allowed on the purchase of receipt stamps, was taken away; by the act now under consideration it is restored.

Licences to insure against fire both in Great Britain and Ireland are necessary before any such insurance can be made; they were all formerly required to be obtained annually, but by the 5 & 6 Vict. c. 79, such licences in Great Britain were to be permanent; the same provision is by the recent Act made as to Ireland.

One or two examples have been already given of the benefit to be derived from the new scale of duties in particular transactions of small value; it will be well to furnish an instance or two more.

Take the case of a sale of freehold property for 150*l.*, the conveyance consisting of 40 folios, that is one entire quantity of 15 folios after the first, and requiring, therefore, one progressive duty. Under the old law the duties would be as follows:—

	£	s.	d.			
Ad valorem duty	2	0	0			
Ditto in lieu of a lease for a year	1	15	0			
Progressive duty	1	0	0			
Total				4	15	0
Under the new Act the duties are:						
Ad valorem duty	0	15	0			
Progressive duty	0	10	0			
Total				1	5	0

Again, take a mortgage of a freehold estate for the same sum. The duties were the same in amount as on a sale, viz.:—

	£	s.	d.			
Ad valorem duty	2	0	0			
Progressive duty	1	0	0			
Lease for a year duty . .	1	15	0			
				4	15	0
They are now—						
Ad valorem duty	0	3	9			
Progressive duty	0	3	9			
				0	7	6

The great feature of the 16 & 17 Vict. cap. 59, was the reduction of receipt stamps for all sums amounting to 40*s.* and upwards to an uniform rate of 1*d.* The stamp may be either impressed or affixed, but must be cancelled by the signature, and a penalty of 10*l.* is imposed for neglecting or refusing to give such a stamp with a receipt. The other provisions were—that indentures or covenants for an apprentice, clerk, &c., where no money was paid, was fixed at 2*s.* 6*d.*; debentures or certificates for drawbacks or bounties, 1*s.* if not exceeding 10*l.*, 2*s.* 6*d.* above 10*l.* and not exceeding 50*l.*, and 5*s.* if above 50*l.*; drafts or orders for payment of money on demand, 1*d.* (bankers' cheques and letters of credit sent abroad were exempt by this Act; but now, May 1858, a bill is passing through Parliament, by which all bankers' cheques are to bear a penny stamp); policies of assurance, 6*d.* on every 50*l.* up to 500*l.*, 1s. for every additional 100*l.* up to 1000*l.*, and 10*s.* for every additional 1000*l.* (the fractional parts in each case carry the additional stamp). By cap. 63 the stamp on articles of attorney's clerk was reduced from 120*l.* to 80*l.*; attorneys' and conveyancers' certificates were lowered; and also the conveyance duties on feu-rents in Scotland.

The 17 & 18 Vict. c. 83, is for altering certain Stamp Duties, the effect of which is sufficiently shown by the new scale given in the schedule, which we subjoin. It is only necessary further to give the more material enactments not indicated in the schedule. By § 4, bills purporting to be drawn abroad are to be so deemed, though drawn in the United Kingdom, and are chargeable with duty accordingly; and the holder of a bill drawn out of the United Kingdom (§ 5) is to affix an adhesive stamp of the proper amount before negotiating it, and the neglect to do so, or to cancel the stamp, incurs a penalty of 50*l.* Bills purporting to be drawn in sets (§ 6) must be so drawn under a penalty of 100*l.* Unstamped drafts on bankers (§ 7) are not to be circulated beyond fifteen miles from the place where payable, under a penalty of 50*l.*; but drafts (§ 8) lawfully issued unstamped, may be circulated at any distance by affixing and cancelling the proper stamp. Stamps (§ 10) denoting the duty of one penny may be used for receipts or drafts without regard to their special appropriation. All bills, drafts, and notes (§ 12), except Bank of England notes, are rendered liable to the stamp duty. The exemption from the stamp duty (§ 13) of letters acknowledging the receipts of bills, promissory notes, &c., is repealed; but receipts for money paid to the Crown are still exempted. The stamp duty on pawnbrokers' licences in Dublin (§ 20) is reduced from 15*l.* to 7*l.* 10*s.* Instruments liable to stamp duty (§ 27) are to be admitted in evidence in any criminal proceeding although they be not stamped.

Schedule.—Inland bill of exchange, draft, or order for the payment to the bearer, or to order, at any time otherwise than on demand, of any sum of money.

	£	£	*s.*	*d.*
Not exceeding	5	0	0	1
Exceeding £5 and not exceeding .	10	0	0	2
„ 10 „ .	25	0	0	3
„ 25 „ .	50	0	0	6
„ 50 „ .	75	0	0	9
„ 75 „ .	100	0	1	0
„ 100 „ .	200	0	2	0
„ 200 „ .	300	0	3	0
„ 300 „ .	400	0	4	0
„ 400 „ .	500	0	5	0
„ 500 „ .	750	0	7	6
„ 750 „ .	1,000	0	10	0
„ 1,000 „ .	1,500	0	15	0
„ 1,500 „ .	2,000	1	0	0
„ 2,000 „ .	3,000	1	10	0
„ 3,000 „ .	4,000	2	0	0
„ 4,000 and upwards		2	5	0

Foreign bill of exchange drawn in, but payable out of, the United Kingdom.

If drawn singly or otherwise than in a set of three or more, the same duty as on an inland bill of the same amount and tenor.

If drawn in sets of three or more, for every bill of each set,

	£	£	*s.*	*d.*
Where the sum payable thereby shall not exceed	25	0	0	1
And where it shall exceed £25 and not exceed	50	0	0	2
„ 50 „	75	0	0	3
„ 75 „	100	0	0	4
„ 100 „	200	0	0	8
„ 200 „	300	0	1	0
„ 300 „	400	0	1	4
„ 400 „	500	0	1	8
„ 500 „	750	0	2	6
„ 750 „	1,000	0	3	4
„ 1,000 „	1,500	0	5	0
„ 1,500 „	2,000	0	6	8
„ 2,000 „	3,000	0	10	0
„ 3,000 „	4,000	0	13	4
„ 4,000 and upwards . . .		0	15	0

Foreign bill of exchange drawn out of the United Kingdom, and payable within the United Kingdom, the same duty as on an inland bill of the same amount and tenor.

Foreign bill of exchange drawn out of the United Kingdom, and payable out of the United Kingdom, but indorsed or negotiated within the United Kingdom, the same duty as on a foreign bill drawn within the United Kingdom, and payable out of the United Kingdom.

Promissory note for the payment in any other manner than to the bearer on demand of any sum of money,

	£	£	*s.*	*d.*
Not exceeding	5	0	0	1
Exceeding £5 and not exceeding . .	10	0	0	2
„ 10 „	25	0	0	3
„ 25 „	50	0	0	6
„ 50 „	75	0	0	9
„ 75 „	100	0	1	0

Promissory note for the payment, either to the bearer on demand, or in any other manner than to the bearer on demand, of any sum of money,

	£	£	*s.*	*d.*
Exceeding £100 and not exceeding	200	0	2	0
„ 200 „	300	0	3	0
„ 300 „	400	0	4	0
„ 400 „	500	0	5	0
„ 500 „	750	0	7	6
„ 750 „	1,000	0	10	0
„ 1,000 „	1,500	0	15	0
„ 1,500 „	2,000	1	0	0
„ 2,000 „	3,000	1	10	0
„ 3,000 „	4,000	2	0	0
„ 4,000 and upwards		2	5	0

Lease or tack of any lands, tenements, hereditaments, or heritable subjects, for any term of years exceeding thirty-five, at a yearly rent, with or without any sum of money by way of fine, premium, or grassum paid for the same, the following duties in respect of such yearly rent:—

		If the Term shall not exceed 100 years.			If the Term shall exceed 100 years.		
	£	£	*s.*	*d.*	£	*s.*	*d.*
Where the yearly rent shall not exceed	5	0	3	0	0	6	0
And where it shall exceed £5 and not exceed	10	0	6	0	0	12	0
„ 10	15	0	9	0	0	18	0
„ 15	20	0	12	0	1	0	0
„ 20	25	0	15	0	1	10	0
„ 25	50	1	10	0	3	0	0
„ 50	75	2	5	0	4	10	0
„ 75	100	3	0	0	6	0	0
And where the same shall exceed £100, then for every £50, and also for every fractional part of £50		1	10	0	3	0	0

And where any such lease or tack as aforesaid shall be granted in consideration of a fine, premium, or grassum, and also of a yearly rent, such lease or tack shall be chargeable also, in respect of such fine, premium, or grassum, with the *ad valorem* stamp duties granted under the head or title of "conveyance" in the schedule annexed to the Act passed in the 13 & 14 Vict., c. 97.

Exemption.—Any lease made in pursuance of the Trinity College, Dublin, Leasing and Perpetuity Act, 1851.

Conveyance of any kind or description whatsoever in England or Ireland, and charter, disposition, or contract containing the first original constitution of feu and ground annual rights in Scotland (not being a lease or tack for years), in consideration of an annual sum payable in perpetuity or for any indefinite period, whether fee farm or other rent, feu duty, ground annual, or otherwise. The same duties as on a lease or tack for a term exceeding 100 years, at a yearly rent equal to such annual sum.

Exemptions.—Any lease or tack for a life or lives not exceeding three, or for a term of years determinable with a life or lives not exceeding three, by whomsoever granted; and any grant in fee simple or in perpetuity, made in Ireland, in pursuance of the Renewable Leasehold Conversion Act, or in pursuance of the Trinity College (Dublin) Leasing and Perpetuity Act, 1851; all which said leases or tacks and grants respectively shall be chargeable with the stamp duties to which the same were subject and liable before the passing of the Act 16 & 17 Vict. c. 63.

Every such lease or tack, and every such conveyance, charter, disposition, or contract as aforesaid hereby charged with duty, and the duplicate or counterpart thereof respectively, shall be chargeable with the respective stamp duties granted and made payable under the several heads or titles of "Duplicate or Counterpart," and "Progressive Duty," in the schedule annexed to the 13 & 14 Vict. c. 97.

License to demise copyhold lands, tenements, or hereditaments, or the memorandum thereof if granted out of court, and the copy of court roll of any such licence if granted in court:

Where the clear yearly value of the estate to be demised shall be expressed in such licence and shall not exceed 75*l.* The same duty as on a lease at a yearly rent equal to such yearly value, under the Act of the 13 & 14 Vict. c. 97.

And in all other cases . . . . . . 10*s.*

STANDARD MEASURE, WEIGHT, &c. The imperial standard yard, and standard pound troy having been destroyed in the fire at the Houses of Parliament in 1834, and doubts moreover existing as to the accuracy of the methods which had been provided by the act 5 Geo. IV. c. 74, for ascertaining the standard, scientific men have constructed a new standard yard and pound, which have been recently legalised. These standards, copies of which have been deposited in various places, now constitute the standard of measure and weight of the United Kingdom; 18 & 19 Vict. c. 72.

STANLEY, REV. EDWARD, D.D., Bishop of Norwich, was born in London on the 1st of January 1779. He was the second son and seventh child of Sir John Thomas Stanley, Bart., of Alderley Park, Cheshire, by Mary, daughter and heiress of Hugh Owen, Esq. of Penrhos in Anglesea. His elder brother, who inherited the baronetcy on his father's death, was raised to the peerage in 1839 by the title of Baron Stanley of Alderley. In his boyhood the future bishop had a passion for the sea and would have preferred the navy to any other profession. Being destined for the Church however he was sent, in 1798, after a desultory education at various schools, to St. John's College, Cambridge; and here in 1802, he graduated B.A. and was 16th Wrangler of his year. He took the degree of M.A. in 1805. In that year,—having meanwhile travelled on the Continent and having had for some time the curacy of Wendlesham, in Surrey—he was presented by his father to the family living of Alderley. In 1810 he married Catherine, eldest daughter of the Rev. Oswald Leycester, rector of Stoke-upon-Trent, Shropshire. He continued rector of Alderley for the period of thirty-two years (1805-37) during which he discharged his duties in a manner so conscientious and so thorough as to gain the affection of all his parishioners in an unusual degree. He worked assiduously among the population of his parish—which amounted to about 1300; and, besides performing his purely clerical duties, he did everything in his power, by encouraging schools and the like, to promote the intellectual and secular welfare of his parishioners. For the use of the young in his parish he prepared 'A series of Questions on the Bible' which was published in 1815. Inheriting Whig principles from his family, he was noted at this time for great liberality and toleration in his ecclesiastical opinions; though the zeal and the warm-heartedness of his Christianity were unquestioned. It was perhaps his slight interest in matters of purely theological controversy that inclined him at this time to the quiet pursuit of natural history. Using the opportunities afforded him by his position as the clergyman of a rural parish, he gratified his tastes in this direction by becoming acquainted with the geology, the mineralogy, the botany, the entomology, and the ornithology of his parish. He became a contributor on topics of natural history, and on kindred topics, to 'Blackwood's Magazine' and to the 'British Magazine;' and one of his articles in 'Blackwood,' entitled 'An Adventure on the Alps in the Mauvais Pas' is supposed to have suggested to Scott the opening scene in his 'Anne of Geierstein.' The department of natural history which he principally cultivated was ornithology; and in 1835 he published under the auspices of the Society for Promoting Christian Knowledge, his well-known work in two volumes entitled 'A Familiar History of Birds, their Nature, Habits, and Instincts.' He had already lectured on subjects of natural history to one or two Mechanics' Institutions in the north of England, and in 1836 he was Vice-President of the British Association. He was also a Fellow of the Royal Society and President of the Linnæan Society.

Though never obtruding his politics on his parishioners, he had taken part on the liberal side on some of the questions of the day relating to the Church. In 1829 he had published 'A Few Words in favour of our Roman Catholic Brethren,' advocating Roman Catholic Emancipation. In 1835 he published 'A Few Notes on Religion and Education in Ireland.' The spirit shown in these pamphlets, taken along with his excellent character, and his family-connections, recommended him to the Whig government as a suitable man for a vacant bishopric; and accordingly, on the vacation of the see of Norwich by the death of Bishop Bathurst in 1837, Lord Melbourne offered the bishopric to Dr. Stanley. It was with much reluctance that he quitted the parish where he had laboured so long to accept this preferment; with which was conjoined the appointment of Clerk of the Closet of the Chapel Royal. Having accepted the office, however, he set himself with great zeal and punctuality to its duties. Seldom has there been a more hardworking bishop, or one more sanguine in all schemes of improvement. He abandoned his pursuit of natural history and devoted himself exclusively to diocesan business. As the previous bishop had lived to the age of ninety-three, there were necessarily great abuses in the diocese—abuses of non-residence, and the like. These Bishop Stanley set himself to reform with a boldness, which, though successful in the end, aroused much bad feeling against him. As in the House of Lords and elsewhere, where public questions were discussed, he always took what was called "The Liberal side," he was accused of latitudinarianism. In the sense of deviation from any of the standards of the Church the charge was untrue; and nothing but the tolerance of his disposition in all non-essential matters gave any colour to it. Beloved by all who knew him, and with the reputation of being one of the most kindly, sanguine, and hospitable men in the Church, he lived till 1849, when he died unexpectedly on the 6th of September at Brahan Castle in Ross-shire, Scotland, where he was then on a visit. He left five children—three sons and two daughters. His eldest son, Owen Stanley, entered the navy, where he rose to the rank of captain. He was a man of very considerable scientific attainments, and was regarded as an officer of unusual promise. He had been engaged on a survey of a portion of the coast of Australia, which he had just completed, when he died somewhat suddenly in 1849, his death being apparently hastened by the labours of the survey. Bishop Stanley's youngest son, Charles Edward, is in the Royal Engineers; his second son, the Rev. Arthur Penrhyn Stanley, is Regius Professor of Ecclesiastical History at Oxford, and the foregoing particulars have been derived from a memoir prefixed by him to a collection of his father's "Addresses and Charges" published in 1851. Of the bishop's writings his 'History of Birds' is the most important: it has passed through several editions. Among his various pamphlets and sermons may be noted his 'Heads for the Arrangement of Local Information in every Department of Parochial and Rural Interest,' published in 1848.

STANNARY COURTS. The jurisdiction of the Stannary Courts has been extended, and their procedure amended and improved by the statute 18 & 19 Vict. c. 32.

STARCH. [Tissues, Organic, *S.* 1.]

STATUTE OF FRAUDS. The enactments of this statute have been extended by the Mercantile Law Amendment Act, 1856, and the law as to guarantees considerably improved. The alterations thus effected are, however, so entirely technical that the reader can only be referred to them.

STATUTE OF LIMITATIONS. The Mercantile Law Amendment Act, 1856, has removed some of the anomalies which have arisen upon these statutes, but any explanation of the different provisions of this Act would be too technical in its nature, and require too much space to be given here. It may be enough to state, that the general effect of all the enactments of the statute is to remove certain nice legal distinctions and difficulties, which formerly in many cases served only to defeat the ends of justice.

STEFFENS, HEINRICH, was born at Stavanger in Norway on May 2, 1773. His parents removed in 1779 to Helsingör, where he received his early education, and in 1787 he was taken to Copenhagen, as his early-displayed piety and eloquence seemed to point out divinity as his proper study, though he had already acquired a great fondness for natural history. In 1790 he was entered at the University of Copenhagen, where he so distinguished himself that he received in 1794 a travelling prize. He spent the summer of that year at Bergen in Norway, and in the autumn while proceeding to Germany he suffered shipwreck at the mouth of the Elbe, saving only his life, and that with difficulty. After residing about a year in Hamburg, he removed to Kiel, where in 1796 he gave lectures in natural history, and acted as private tutor. He however felt a want of a fundamental principle in natural science, and, repairing to Jena, imagined that he found in the theories of Schelling what he needed. He was intrusted with the revision of Schelling's writings on natural philosophy in 1800, and became one of the warmest supporters of the doctrines of Schelling's school (then in its most flourishing state), at least so far as they were restricted to natural philosophy. After having been created adjunct to the professor of philosophy in the University of Jena, he repaired to Freiberg, where he was instructed by and acquired the friendship of Werner. While here he wrote his 'Geognostisch-Geologischen Aufsätze' ('Geognostic-Geological

Essays'), not published till 1810, which he expanded in 1811-19 into three volumes of a 'Handbuch der Oryktognosie.' On returning to Denmark in 1802, he excited considerable attention by his lectures; but as he experienced some coldness from influential persons, he accepted in 1804 a call from the University of Halle to become professor there, and while there published (in 1806) his 'Grundzüge der philosophischen Naturwissenschaft' ('Fundamental Features of Philosophical Natural Science'). The years 1807-9 he spent with his friends in Holstein. He then returned to Halle, and took an extremely active part, not unattended with danger, in the secret preparations of the Prussian patriots to cast off the French yoke, which they felt to be alike burdensome and disgraceful. When the time for action arrived, Steffens joined the Prussian forces as a volunteer, and by his enthusiastic addresses roused and supported the energy of his comrades, with whom he continued till the entry into Paris in 1813. After this he returned to Breslau, where he had been created professor of physics and of natural history. These offices he held till 1831, when he removed in a similar capacity to the University of Berlin, in which city he died on February 13, 1845. While in Breslau he wrote, in connection with what may be called his professional pursuits, his 'Anthropologie,' published in 1822, in which he strove to elucidate on philosophical principles the existence of mankind in connection with the universe. This subject he continued in his 'Polemische Blättern zur Beförderung der speculativen Physik' ('Polemical Leaves for the advancement of Speculative Physics'), in two parts, issued in 1825 and 1835; but these works rather represent the philosophy of the Schelling school than add to our knowledge by any new facts. The intellectual activity and mental riches of Steffens however were not confined to one branch of knowledge, and he frequently and successfully appealed to the present thoughts and feelings of his fellow-countrymen. To this description of works belong his essay 'Ueber die Idee der Universitäten' ('On the Ideas of the Universities'), 1809; 'Die gegenwärtige Zeit, und wie sie geworden' ('The present Time, and how it became'), 1817; and 'Ueber geheime Verbindungen auf Universitäten' ('On the secret Societies of the Universities'), in 1835. His disinclination also to the attempted church union in Prussia rendered him at first the leader of a considerable number of dissenters from that union, and at length involved him in many controversies, which ultimately occasioned the production of his work 'Von der falschen Theologie und dem wahren Glauben' ('On the false Theology and the true Faith'), in 1824, of which more than one edition has been called for. In 1831 he published 'Wie ich wieder Lutheraner wurde und was mir das Lutherthum ist' ('How I became again a Lutheran, and what Lutheranism is to me'), which is a personal confession of faith, certainly of the Pietist class, but it is of a far higher character of thought than that of most of the works of that sect, and appears to be the result of an inward struggle against the modern system of absolutism, which principle he defines as a positive surrender of the belief in the personality of the Deity. In 1827 also he struck into a new line: he began a series of novels, of which the first 'Die Familien Walseth und Leith,' in three volumes, was followed in 1828 by 'Die vier Norweger,' in six volumes, and that by 'Malcolm' in two. These novels contain many references to himself both in the incidents and opinions, but they also contain well-defined pictures of the peculiarities of national character, narratives of the historical events of the period, with lively and correct descriptions of scenery, especially that of his native country in 'The Four Norwegians,' and all are penetrated with a deep-lying religious feeling, which give them a peculiar character. In the last years of his life he occupied himself with writing a detailed autobiography, 'Was ich erlebte,' published in ten volumes, from 1840 to 1845. It is perhaps too minute, but contains many interesting facts, and a fragment of it has been translated into English under the title of 'Adventures on the Road to Paris,' an account of the advance of the allied armies in 1813. Since his death some posthumous works have been published, 'Nachgelassene Schriften,' with a preface by Schelling.

STELLITE. [Zeolites.]

STEPHENS, JAMES FRANCIS, a distinguished British entomologist, was born at Shoreham, Sussex, on the 16th of September 1792. He was for many years a clerk in the Admiralty Office in Somerset House. Whilst holding this position he devoted his leisure hours to the study of natural history, and was a remarkable example of the knowledge that may be gained by the cultivation of the small portion of time allotted for rest in a government office. In the course of a long life he made one of the most complete collections of British insects extant. This collection was the admiration of foreigners and the constant resort of the British entomologist. Mr. Stephens's taste for entomology led early to his employment in the British Museum, where he assisted Dr. Leach in commencing the present collection of insects in that institution. The literature of entomology is largely indebted for his contributions. In 1829 he commenced the publication of his 'Illustrations of British Entomology,' which was produced in parts and completed in 10 vols. This is one of the largest and most comprehensive works on British entomology, and must secure for its author a lasting name amongst the cultivators of the natural history of his own country. In addition to this splendid work, he published several papers on entomological subjects, which appeared in the 'Transactions of the Entomological Society.' He also was engaged at the time of his death in writing a catalogue of the British *Lepidoptera* in the collections of the British Museum. He also published separately 'The Systematic Catalogue of British Insects,' and 'A Manual of the British Coleoptera.' Although distinguished as an entomologist, he took an interest in all branches of natural history, and was the author of a continuation of Shaw's 'Zoology' comprising an account of the Birds, published in 1827. He was a fellow of the Linnæan Society, and president of the Entomological Society. He died on the 22nd of December 1852, at his house in Kennington, after a few days' illness, of inflammation of the lungs.

STEPHENSON, GEORGE, the inventor of the locomotive steam-engine, was the son of Robert Stephenson and Mabel Carr, and was born June 9th, 1781, at Wylam, a village in Northumberland, where his father was employed as fireman at a colliery; he afterwards removed to Dewley Burn in the same county, where George's first employment was to herd cows, occupying his leisure in modelling clay engines, and even constructing a miniature windmill. He soon began to be employed about the colliery, during which time he displayed a great affection for birds and animals, particularly rabbits, of which he acquired the reputation of having a fine breed. At fourteen years of age he was appointed assistant-fireman to his father, who soon after removed to another colliery at Jolly's Close, where George, then only fifteen, was engaged as fireman to an engine in the neighbourhood. Ambitious of becoming an efficient workman, he strove to attain a thorough knowledge of the engine, and he succeeded so well that at seventeen he was promoted to be a 'plugman,' whose duty it was to see that the engine was in proper working condition, and that the pumps drew water effectually; repairing such accidental defects as might occur. To do this well required an intimate knowledge of construction, and at his leisure hours he would take the machinery to pieces, that he might the better understand it. His father, who had six children, of whom George was the second, had been unable to give them any education, though by example a sound foundation of good principles and morals had been laid, and at eighteen, whilst employed for twelve hours a day in his labours, and earning only twelve shillings a week, George Stephenson commenced a course of self-culture. He attended a small night-school at Walbottle, where in a year he learnt to read, and to write his own name, for which instruction he paid threepence a week. He next, in 1799, placed himself under a Scotchman named Robertson, at Newburn, who for fourpence a week taught him arithmetic, which he acquired with remarkable facility. At twenty he had been advanced to the superior office of brakesman, with increased wages, to which he added, in his leisure hours, by learning to make and mend shoes. At that time he was a big raw-boned fellow, fond of displaying his strength and activity at the village feasts, but remarkable for his temperance, sobriety, industry, and good-temper, yet on one occasion he fought a bully who would have oppressed him, and his victory on that occasion secured him ever after from a repetition of the offence.

When by the most rigid economy Stephenson had saved sufficient money to furnish a small home, he determined to settle, and on the 28th of November 1802 he married Fanny Henderson, with whom he removed to Willington, where he had been appointed brakesman to the engine employed for lifting the ballast brought by the return collier ships to Newcastle. In his new abode at the Ballast Hills, he continued to occupy himself with mechanical experiments, expending much time and great ingenuity in a fruitless effort to obtain perpetual motion; until an accident having obliged him to repair his own clock, he became the general clock-cleaner and mender for the neighbourhood, thus improving his own mechanical skill whilst adding to his income. On the 16th of December 1803 his only child Robert was born, and soon after he removed to Killingworth, where his wife died. In 1804 he was engaged to superintend the working of one of Boulton and Watt's engines at Montrose; but after continuing there a year—during which time he saved about 28*l.*, a considerable sum in his circumstances, and during a period of war-prices of provisions—he returned to Killingworth to find his father in extreme distress, having been accidentally scalded and blinded by a discharge of steam, let in upon him while repairing an engine. Stephenson paid his father's debts at the expense of more than half his savings, and settled his parents in a cottage, where they lived during many years entirely supported by him. He was immediately re-engaged in his old position at Killingworth, but being drawn for the militia, the obtaining a substitute absorbed the remainder of the produce of his economy, and he seriously contemplated emigrating to America, whither his wife's sister and her husband went; but he could not raise money enough to accompany them. He therefore continued his various labours, attending the engine, mending clocks, making and mending shoes, and studying mechanics. His acquired knowledge and mechanical skill enabled him to suggest improvements to his employers, and in 1810 a new engine in the neighbourhood having failed in its work, Stephenson was called in to mend it, which he did most effectually. He received for this job a present of 10*l.*, and was promoted to the post of engineman at good wages. Whilst thus engaged he formed an intimacy with a farmer named Wigham, at Long Benton, whose son John proved of great assistance to him, by increasing his acquaintance with arithmetic, and with some of the principles of mechanics and chemistry; and in 1812 his merit was so far recognised that he was appointed engineer of the colliery, at a salary of 100*l.* a year. He was now elevated above the rank of a mere artisan, but he was not less busy. He projected and carried out many improvements, and among others constructed at the coal-loading place at Willington, the first self-acting incline used in that district, by which the descending laden waggons on the tram-road were made to draw up the empty waggons.

The most important epoch of Stephenson's life was now approaching. Many attempts had been made to construct a locomotive steam-engine, and some had attained a certain degree of success, but none had succeeded in uniting economy with efficiency. Mr. Stephenson carefully examined all within his reach, and at length declared his conviction that he could make a better than any yet produced. He communicated his proposal to his employers: one of them was Lord Ravensworth, who, after giving him a patient hearing, commissioned him to make a trial of his skill. His object at first was only to make an engine for the colliery tramways, but even thus early he told his friends "that there was no limit to the speed of such an engine, if the works could be made to stand it." The difficulties he encountered were great; the engine was built in the workshops at West Moor, Killingworth; the chief workman was the colliery blacksmith, tools had to be made, and everything rested upon the designer of the machine. In ten months it was completed, and on July 25, 1814, it was placed on the railway, and was decidedly successful, drawing eight loaded carriages, weighing thirty tons, at the rate of four miles an hour. It was however a cumbrous affair, and he speedily saw in how many parts it could be improved. Accordingly, in February 1815, he took out a patent for a locomotive, and in the same year constructed an engine, which (with certain mechanical improvements, that, though conceived by him to be necessary, could not be supplied by the manufactories at that time,) may be considered as the model of all that have been since produced.

From Mr. Stephenson's connection with collieries he could scarcely avoid having his attention painfully excited, by the frequent explosions arising from fire-damp, and in 1814 one of the collieries under his care having taken fire, he, at great risk of his life, and with the assistance of the workmen, who trusted to his knowledge and skill, succeeded in extinguishing it by bricking up the passage where the foul air was accumulated. The constant danger from the use of exposed candles in coal-mines was so well known, that many inventors had attempted to produce lamps to meet the difficulty; and as early as 1813 a safety-lamp was invented by Dr. Clanny, but it was found to be unmanageable. Sir Humphry Davy was invited to attempt something; for which purpose he visited Newcastle in August 1815, and on November 9 of that year he read a paper on the construction of his lamp before the Royal Society of London. Mr. Stephenson was at the same time occupied on the same subject. In August he made a drawing for a lamp, which on October 21, 1815, had been made and tested; a second and a third were made, for the purpose of increasing the amount of light; and on November 30, of that year, before he could by any possibility have heard of Davy's invention, his third lamp was finished and tried in Killingworth pit, where it was found thoroughly effective, and has ever since been in use. A controversy has arisen, into which we shall not enter, as to priority of invention. There is, however, every reason to believe that Stephenson invented his lamp long before and had tried it a few days previous to Davy having announced his discovery; and the natural conclusion is, that, urged by the want of a safety-lamp, and reasoning from the same facts, the inventors arrived at the results independently of each other; for the two lamps, although different in construction, are founded upon identical principles, but arrived at by different trains of thought.

We cannot attempt to trace all the improvements in details which Mr. Stephenson introduced in the locomotive, but he very early perceived that, for its proper working, the railway required equal attention, and that a firm bed and a regular level were essential requisites. Very little attention had hitherto been paid to this, and the tramroads were carelessly laid out and not kept in good repair. In 1816 therefore he took out a patent for an improved form of rail and chair, and for further improvements in the locomotive engine, one of which was placing it on springs, and they were attended with marked success.

The construction of railroads had for some time occupied much of the public attention. In 1819 the owners of Hetton Colliery, desiring to turn their tramroad into a railway, employed Mr. Stephenson in its construction. The length was about eight miles, and being over a hilly country, he took advantage of the heights to form self-acting inclines, the locomotive working on the level part; and on the 18th of November 1822 it was opened for traffic. He was next employed to construct the Stockton and Darlington line, for which an act of parliament was obtained by Mr. Pease in 1820, to be worked "with men and horses, or otherwise." The proprietors had agreed, on his recommendation, to make the line as a railroad and not as a tramroad, with stationary engines for the steep gradients, but horse-power was to be used for the levels, for Mr. Stephenson's confident anticipations of the success of his locomotive engines were still regarded with suspicion. He began the work in May 1822, but in 1823 an amended Act being procured for working the line with locomotives, Mr. Stephenson was appointed resident engineer at a salary of 300*l.* per annum, and upon that appointment he removed to Darlington. The line was opened in September, 1825, and an engine driven by Mr. Stephenson himself drew a load of ninety tons at the rate of upwards of eight miles an hour. It proved highly remunerative, for besides a far larger amount of goods traffic than had been calculated on, a passenger traffic arose that had been wholly unthought of; the passengers however were for a time conveyed in carriages drawn by a horse at a speed of ten miles an hour. It may be mentioned, that this railway has created the town and port of Middlesborough-on-Tees, then the site of a farm, but now containing 15,000 inhabitants.

In 1824, while the Darlington line was in progress, Mr. Stephenson, feeling the difficulty he had experienced in constructing his engines in a blacksmith's shop, proposed to Mr. Pease of Darlington, his firm friend and great patron, the establishment of an engine-factory at Newcastle. The proposal was adopted, and for a considerable time it was the only manufactory for locomotives in the kingdom. It is now increased to an enormous extent, and has been the training-school, whence has issued a vast number of skilled workmen and eminent practical engineers.

In 1824 the project of a railway or tramroad between Liverpool and Manchester began to be agitated. Increased facility of communication was imperatively required, but there was much controversy as to the means. At length a railway was decided on, Mr. Stephenson was employed to conduct the survey, and application was made to Parliament for an Act. A strong opposition was raised both within the House of Commons and without. Landowners drove the engineers off their grounds, and before the Committee the most absurd objections were urged against the whole scheme, the idea of any quick transit being a subject for especial ridicule. The Bill was however carried on a second application, and Mr. Stephenson was appointed principal engineer. The work was commenced in June 1826, and after struggling through many difficulties—one, and not the least, being the carrying the railway over Chat Moss—it was opened on Sept. 15, 1830. During its progress eminent engineers had reported against locomotives being worked on the line, recommending horse-traction; but at length Mr. Stephenson prevailed on the Directors to offer a prize for a locomotive engine, conforming to certain conditions, which was done, and the prize of 500*l.* was won by the Rocket engine, in the construction of which he had availed himself of the assistance of his son Robert.

From this moment his fortune was made. Employment of a most remunerative character poured in from all sides. Railways were projected in every direction, and he became the chief engineer of several of them. With these he was incessantly engaged till 1840, when he resigned most of them, and settled at Tapton in Derbyshire, where he commenced a fresh pursuit in working the Clay Cross collieries. At this time he took much interest in the well-doing of the Mechanics' Institutes in his neighbourhood, and on more than one occasion related to them the circumstances of his own career, as an encouragement to the members to adopt a course of steady and persevering industry. His interest in railway extension however continued unabated, and he took an active part, either as engineer, chairman, or shareholder, in the Whitehaven and Maryport, the Yarmouth and Norwich, and the Newcastle and Edinburgh East Coast Line, with which the stupendous work of the High Level Bridge at Newcastle (designed by his son), is connected; he was one of the committee of management, but he did not live to see it completed. He was also employed in Belgium, and he travelled into Spain to inspect a proposed line from the Pyrenees to Madrid, but the project was fruitless. On his return from Spain in 1845 he relinquished still more his attention to railway matters, and occupied himself almost entirely with his collieries and lime-works, with the cultivation of his farm and gardens, and indulged in his old fancy for keeping birds and animals. With the exception of promoting the Ambergate and Manchester Railway, inventing a new self-acting break, of attending the ceremony of opening the Trent Valley Railway (when Sir Robert Peel made a speech complimentary to him), and of being considerably troubled by applications for assistance and advice from projectors and inventors of all kinds, to whom however he was invariably attentive and kind, he passed the remainder of his days in ease and peace. He, however, continued to take great interest in the Institution of Mechanical Engineers of Birmingham, which he had founded, and was President of. He died after a short illness on August 12, 1848, leaving a name rendered illustrious by the patient perseverance of a high-minded industry, and the widely-developed productions of a remarkable genius. A valuable biography of this eminent man has been written by Mr. S. Smiles, to which we are indebted for many of the facts in this notice.

STEREOSCOPE, from *στερεός* (solid) and *σκοπος* (a view, or *σκοπεω* to view), an instrument by which two pictures of any object, taken from different points of view, are seen as a single picture of that object, having the natural appearance of relief or solidity.

The fact that we see with two eyes, yet that only a single representation of the object is presented to the mind, must of course have very early forced itself on the consideration of men of attentive and reflective habits. And it could not fail to be observed that the appearance which an object—a statue or a vase for instance—presents when looked at steadily, and with only one eye, is different from that which it presents if it be then looked at, without changing the position or moving the head, by the other eye alone. Accordingly we find in some of the earlier as well as the later Greek writers on natural philosophy, references more or less full and direct to the subject, and speculations as to the cause. Euclid showed by means of a sphere that each eye sees a dissimilar representation of an object; and Galen some centuries later endeavoured to explain the matter, by stating that the dissimilar pictures are not seen at the same instant but successively, and that these rapidly succeeding pictures produce on the mind the impression which is conceived of the object. At the end of the 15th century, Lionardo da Vinci, and in the 16th and following centuries, Baptista Porta and Aguilonius wrote on the subject of vision as produced by dissimilar pictures seen by each eye; but down to our own time natural philosophers have been almost universally content to adopt the opinion that we see with only one eye at a time. The whole question of vision by one and by two eyes, or of monocular and binocular vision, was re-opened by Mr. Wheatstone—to whom the world is indebted for the application of electricity to telegraphic purposes—in a paper entitled 'Contributions to the Physiology of Vision: Part I. On some Remarkable and hitherto Unobserved Phenomena of Binocular Vision,' read before the Royal Society, June 21st, 1838, and again, before the British Association at Newcastle, in the following August, and printed in the 'Philosophical Transactions' a few months later.

In this paper Mr. Wheatstone argued that the appearance of relief and solidity which we obtain in looking at objects in nature, arises from there being a dissimilar picture of the object projected simultaneously on the retina of each eye, the optic axes of which are not parallel; whereas in viewing a pictorial representation two similar pictures are projected on the retinæ, and hence the resultant flatness. It is not necessary to enter further upon his views, nor upon the theory of vision generally, as the subject has already been treated of fully under the head Sight, vol. xxi., p. 504-6. Mr. Wheatstone sought to elucidate and confirm his theory by an ingenious instrument which he exhibited when he read his paper, and which he called the Stereoscope. This instrument, now known as the Reflecting Stereoscope, consists of two plane mirrors, fixed with their backs to each other at an angle of 90 degrees. These mirrors (or polished glass prisms) are supported on a central stand, which is fixed in a mahogany frame, and two arms, which slide on the frame, support the two pictures (which have been taken from dissimilar points of view) in the same horizontal line, parallel to each other and at equal distances, one on each side of the mirrors. The observer, by placing his eyes as close as he can to the mirrors, the angle of which must coincide with the middle line of his face and forehead, sees the two dissimilar pictures united, so as to give the appearance of the object represented, not as it is seen depicted on a plane surface, but with all the solidity of the object itself. The reflecting stereoscope excited great interest among scientific men when first exhibited, but the pictures prepared for it were almost exclusively dissimilar outlines of various geometrical solids—photography not being then in existence—and by those who did not employ it for a purely scientific purpose it soon came to be regarded as merely an ingenious and somewhat cumbrous as well as expensive optical toy. For most purposes it has been superseded by the more convenient refracting stereoscope; but it possesses some advantages, among others that of exhibiting photographs of any size.

For the Refracting Stereoscope we are indebted to the inventor of another very beautiful contrivance, the Kaleidoscope [Kaleidoscope, *S.* 1, p. 133]. Sir David Brewster having taken certain objections to the theory of Mr. Wheatstone, prosecuted an elaborate series of experiments with a view to the establishment of what he regarded as the more correct theory of binocular vision; and some of these experiments led him to construct the instrument which, in the form it ultimately assumed, he called the Lenticular Stereoscope. He early exhibited his instrument in his classes at St. Andrew's but he first fully explained his views on binocular vision, and made public his invention, in a paper 'On the Law of Visible Position in Single and Binocular Vision, and on the Representation of Solid Figures by the union of Dissimilar Plane Figures on the Retinæ,' which he communicated to the Royal Society of Edinburgh in January 1843. He further explained and defended his views in many subsequent papers, which, like the former, appeared in the 'Edinburgh Transactions' of that and following years. Of these very valuable contributions to the science of optics it is unnecessary to speak further here, and into the controversy which arose between the author and Mr. Wheatstone on their theories of binocular vision, and their respective claims as the inventors of the stereoscope, we shall not enter: the opinions of Sir David Brewster, in their matured and digested form, will be found amply set forth in his work 'The Stereoscope,' (8vo, 1856); those of Mr. Wheatstone must be sought in the paper already referred to, and in another which formed the Bakerian Lecture of the Royal Society for 1852, being 'Part II. of Contributions to the Physiology of Vision, and on Binocular Vision.'

The Lenticular Stereoscope of Sir David Brewster, as described by himself, "consists of a pyramidal box of wood or metal, or any other opaque material, blackened on the inside, and having a lid for the admission of light when the pictures are opaque. The box is open below, in order to let the light pass through the pictures when they are transparent. Another lid is sometimes added, so as to open externally on the bottom of the box, for the purpose of exhibiting dissolving views in the stereoscope. The bottom of the box is generally covered with ground-glass, the surface of which ought to be very fine, or very fine-grained paper may be used. The top of the box consists of two portions, in one of which is the right eye-tube containing a semi-lens, or quarter-lens, and in the other the left eye-tube, also containing a semi-lens or quarter-lens. These two portions may be advantageously made to approach or recede, in order to suit eyes at different distances from one another; and the tubes containing the lenses should draw out, in order to suit long and short-sighted eyes." The two dissimilar pictures (which for convenience are mounted on a thick card, forming the universally known 'slide') are placed in a groove in the bottom of the box, when, on looking through the eye-tubes, they are seen united into a single picture, and the object or objects, if a proper amount of light is obtained, stand out with an almost magical appearance of relief and solidity. The employment of photography for the stereographs has wonderfully extended the range of the instrument, and now, what might have been confined to the study of the natural philosopher as an extremely ingenious piece of scientific apparatus, or have found a somewhat larger though less important circle of admirers as an elegant toy, has become one of the most widely known and universally popular means of social amusement, and, rightly used, an extremely valuable means of instruction.

In describing the instrument, it was said that each of the eye-pieces contained a semi-lens. It is by means of these semi-lenses that the stereoscopic effect is produced, though they do not themselves produce that effect. What they accomplish is the transference of the two dissimilar pictures or stereographs to a middle point. The union of these two pictures, or their superposition on that middle point, produces the stereoscopic effect. The semi-lenses are the two halves of a convex lens, so placed that the edge or thin part of each is turned inwards—the opposite direction that is, to that which it held in its original position. How this acts may be understood by a very simple experiment. If any small object as a coin or medal be laid on a piece of white paper and looked at with the right eye only, through a convex lens, the right half of which is covered by an opaque substance, the coin will be seen some distance on the left of its true position—supposing, that is, that the eye be held close to the lens, and the proper focal distance be chosen. On turning the lens so that the left half is covered, and looking through the uncovered half with the left eye only, the coin will appear a like distance on the right side of its true position. Just so the half lenses in the eye pieces of the stereoscope—which are placed 2½ inches apart, corresponding to the distance between the eyes—make the two pictures in the instrument to approach and become superimposed on each other. But as the pictures are slightly dissimilar, having been taken from points of view correspondent to those of the right and the left eye respectively—and as, consequently, that portion of the right side of all solid objects which the right eye sees is represented in one picture, and that portion of the left side which the left eye sees, in the other, as well as the front which is common to both eyes, it follows that when these pictures are superimposed, the resultant single picture includes all that each eye sees, and therefore has all the apparent roundness, solidity, and relief which the original presented when looked at with both eyes: an effect aided it must be confessed by the isolation of the pictures in the chamber of the stereoscope. Various modifications have been made in the instrument—as the employment of larger lenses, the changing its frame from a pyramidal to an oblong form, &c.—but the principle is the same in all, and some of the changes are certainly not improvements.

From what has been said, an attentive reader will have no doubt drawn the inference that the truthfulness of the stereoscopic picture must depend mainly on the character of the dissimilar pictures or stereographs. This is most certainly the case, though too often overlooked or insufficiently regarded by those who take stereoscopic pictures. Stereographic portraits are usually taken with cameras contrived for the purpose. In order to take stereographs of landscapes, buildings, statuary, &c., the ordinary landscape camera is employed; the camera being removed, after the first picture is taken, to a position parallel to that just occupied, and at an equal distance from the principal object, but more or less distant from the first position in proportion to the distance from the object to be represented. The stereoscopic angle, as it is called, has been laid down by high authority at 1 in 25 for objects 50 feet or more distant, some have even recommended that the camera should be removed to a distance of 4 feet, in order to take views of an object only 20 feet distance. But the effect of such an arrangement is obviously to make one picture represent much more of the right side, the other more of the left side of an object falling within the field of vision, than could be seen by a person standing, say midway, between the two positions. And the two pictures so taken must, when united in the stereoscope, present an exaggerated and therefore untrue representation. In fact there will be, what is so commonly seen in the stereoscope, an unnatural appearance of separation between the chief object and the accessories. You see round the figure in fact, just as in life you see round a statuette or small model, and hence there arises that detached model-like appearance which is often, and very properly, objected to stereoscopic representations. What the stereoscope ought to show is, the representation of an object or objects in nearly the same relative solidity, relief, and separation as the reality possesses; and that is what the stereoscope would exhibit if the stereographs were taken, as they ought to be, and as the most successful (though not the most popular) are taken, from positions little if at all exceeding that of the eyes apart. The great importance of strict accuracy in views of countries beyond the reach of the ordinary traveller, of antiquities, objects of special scientific interest, &c., will be at once acknowledged; and the value of the stereoscope for affording such representations in their greatest attainable perfection is daily becoming more apparent. It will be enough to allude, as illustrating this, to the recently published views in Egypt, in which the antiquities and the scenery of that country are almost literally brought home to those who cannot go to them; and to the very remarkable series of stereographs of the Peak of Teneriffe, published by Mr. Piazzi Smyth, in his recent work, 'Teneriffe, an Astronomer's Experiment,' which gives us almost the very cone itself, in some of its most striking and characteristic phases, to gaze upon and to study.

STERLING, JOHN, was born at Kaimes Castle, in the island of Bute, Scotland, on the 20th of July 1806. Both his parents were Irish by birth, though of Scottish descent; and his father, Edward Sterling (afterwards well known as a leading writer in, and editor of, the 'Times' newspaper, but then pursuing the occupation of a gentleman-farmer, after having been educated for the Irish bar, and having served for some time as a captain in the army) had rented Kaimes Castle a short time before his son's birth. John was the second child of seven, five of whom died while he was still a youth, leaving only himself and an elder brother. In 1809, the family removed to Llanblethian, in Glamorganshire, Wales; and here John Sterling received his first school-education. His father about this time began to contribute to the 'Times' as an occasional correspondent; and the interest he thus took in politics, led him, on the peace of 1814, to remove again with his family to Paris. Driven from Paris by the return of Napoleon from Elba, and the resumption of the war, the family in 1815 settled in London, where gradually the father rose to his eminent position in the world of politics and journalism. He was destined to outlive his son.

After having been at various schools in or near London, Sterling was sent to the University of Glasgow; whence, after a brief stay, he was removed in 1824 to Trinity College, Cambridge. Here Julius Hare, afterwards Archdeacon of Lewes, was his tutor, and here he formed the acquaintance of various young men afterwards distinguished, including Frederick Maurice, Richard Trench, Spedding, J. M. Kemble, Venables, Charles Buller, and Monckton Milnes. In the Union Debating Club of Cambridge, of which these and others were members, Sterling was one of the chief speakers, and it was here perhaps that he first exhibited the qualities of intellect and character which made him afterwards socially celebrated. From Trinity College, Sterling removed, along with his friend Maurice, to Trinity Hall, with an intention of studying law; but in 1827 he left Cambridge altogether.

without taking his degree. In 1828 the 'Athenæum,' then recently started by Mr. Silk Buckingham, was purchased by Sterling, or at his instance, and he and Maurice conducted it and wrote in it for some time. The speculation however in their hands did not answer commercially, and the journal was sold to its present proprietor. Sterling, to whom it was not absolutely necessary that he should engage in any employment for his living, continued to reside in London, the centre of a circle of ardent and thoughtful young men, including not only his college friends, but such additions as John Stuart Mill. An eager radicalism of opinion was then Sterling's characteristic. It was about the year 1828 that he first became acquainted with Coleridge, then living his recluse life at Highgate; and Coleridge's influence on Sterling was great and enduring. It was evident in a three volume novel, entitled 'Arthur Coningsby,' which he wrote in 1829-30, but which was not published till a year or two later. In November 1830 he married; and shortly after, being in ill-health, he and his wife went to the West India island of St. Vincent, where a valuable sugar estate had been bequeathed to him, his elder brother, and a cousin, by one of his mother's uncles. He stayed about fifteen months in St. Vincent, returning to England in August 1832. In the spring of 1833 his novel was published, but obtained little recognition except among the few. Chancing in that year to meet again his tutor, the Rev. Julius Hare, at Bonn, the effect of their conversation on Sterling's mind, then vibrating under the prior influence of Coleridge, was that he resolved to take holy orders in the English Church. He was ordained deacon at Chichester, on Trinity Sunday, 1834, and immediately became curate of Hurstmonceaux in Sussex, where his friend was rector.

Sterling retained his curacy only eight months, resigning it in February 1835, on account of delicate health. It is not improbable that at the same time there was a change, or a tendency to change, in his opinions. From this time, at all events, there was a gradual divergence in his views from the fixed creed of the Church of England, though his relations to many of its most excellent members continued to be as intimate and affectionate as ever. It was in 1835 that he first became acquainted with Mr. Carlyle, then recently settled in London; and it seems evident that gradually the influence of Mr. Carlyle modified the results of that of Coleridge. "Coleridge," says Mr. Carlyle himself, in his memoir of Sterling, "was now dead, not long since; nor was his name henceforth much heard in Sterling's circle; though, on occasion, for a year or two to come, he would still assert his transcendant admiration, especially if Maurice were by to help. But he was getting into German, into various inquiries and sources of knowledge new to him, and his admirations and notions on many things were silently and rapidly modifying themselves." Literature was thenceforward Sterling's chief occupation; though, from all the accounts that remain of him, what he accomplished and has left behind him in literature gives but a faint idea of the influence he exerted in intellectual society, and especially in that of London, by his frankness and powers of talk. Very few men had so many friends or was so loved by them. It was unfortunate for them and him that his extremely precarious health caused him every now and then to absent himself from London and seek a warmer climate. In 1836 he went to the south of France; and in the following year he went to Madeira. While at Madeira he wrote much, and sent some contributions, in prose and verse, to 'Blackwood's Magazine.' In the spring of 1838 he returned to England, and for a time he resided on the southern sea coast, making frequent visits to London. He began to write for the 'Westminster Review,' then under the charge of Mr. John Stuart Mill; he was also busy privately with various compositions in prose and verse. It was at this time too that, in order to secure Sterling's meeting with as many of his friends as possible on his flying visits to London, the famous so-called "Sterling Club" was formed. A list of the members of this club is given in Mr. Carlyle's 'Life of Sterling,' at page 208.

Part of the years 1838 and 1839 were spent by Sterling in Italy; and on his return he took up his abode in Clifton. It was while residing here that he published under the general title of 'Poems, by John Sterling' (Moxon, 1839), a collection of his metrical effusions up to that time. The two next years were spent in migrations from place to place, including a second visit to Madeira, on account of health. In 1841, while living at Falmouth, he published 'The Election: a Poem, in Seven Books'—a poem of English life and society. He was then engaged on what he intended to be his best work—'Strafford, a Tragedy,' which however was not published till 1843. This year, 1843 (he had again been absent in Italy in the interim), was one of calamity to him and his. His wife died in April, and his own always feeble health was rendered more precarious than ever by the accidental bursting of a blood-vessel. Sterling retired to Ventnor in the Isle of Wight in June 1843, where his last labours were on a poem on the subject of 'Cœur de Lion,' still unpublished. Here he sank gradually, and on the 18th of September 1844, he died at the age of thirty-eight. A collection of his 'Essays and Tales' from the 'Athenæum,' 'Blackwood,' and other periodicals, was edited in two volumes, with a memoir prefixed, by Archdeacon Hare, in 1848; the well-known 'Life of Sterling' by Mr. Carlyle, representing the man less in his ecclesiastical than in his general human relations, appeared in 1851; and in the same year 'Twelve Letters by John Sterling' were edited by his relative Mr. Coningham of Brighton.

STERNBERGITE. [Mineralogy, *S.* 1.]

STEVENSON, ROBERT, the celebrated engineer of the Bell Rock Lighthouse, was born at Glasgow on June 8, 1772. His education was conducted under the care of his mother (his father having died when he was young), and when completed he was placed with Mr. Thomas Smith, of Edinburgh, who had projected the mode of improving the illumination of lighthouses by the substitution of oil lamps with parabolic mirrors for the open coal-fires. When that gentleman was appointed engineer to the Northern Lighthouse Commissioners, Stevenson became his assistant; and when only nineteen had the superintendence of the construction of the lighthouse on the island of Little Cumbray, in the Frith of Clyde, between the southern point of the isle of Bute and Kilbride on the coast of Ayr. In 1797, having a short time previously succeeded Mr. Smith as engineer to the Northern Lighthouse Commissioners, he made his first tour of inspection, and afterwards introduced a still greater improvement in the illumination of lighthouses by means of the catoptric principle, and by adopting various means to distinguish one lighthouse from another. In 1807, an Act having been obtained in the previous year, he commenced the construction of the Bell Rock Lighthouse, on a rock in the North Sea, a few miles off Arbroath in Forfarshire, on which the light was exhibited for the first time on Feb. 1, 1811. The rock being extremely small, and almost entirely covered, even at low-water, except in spring-tides, offered great obstacles to the construction, but they were successfully overcome, and an account of the details of the erection and structure, illustrated with plates, was published at Edinburgh in 1824. A controversy has arisen as to the originality of Mr. Stevenson's plans, into which we cannot enter, but it is certain that much of the merit arises from the mechanical means adopted to secure a firm and enduring foundation, and this was undoubtedly done by Mr. Stevenson. In 1814, on another tour of inspection, Sir Walter Scott was a companion of the engineer and commissioners in the voyage, which afforded many materials for descriptions in Scott's poem of 'The Lord of the Isles,' and in the novel of 'The Pirate.' Mr. Stevenson held the situation of engineer till 1842, during which time he erected no fewer than 23 lighthouses. He was also employed in numerous engineering works in various parts of the United Kingdom, but chiefly in Scotland, in connection with the improvement of rivers and harbours, and the erection of piers and bridges, into which latter class of works he introduced some new principles of construction. He likewise surveyed a line of railway between Edinburgh and Glasgow, which, though not adopted, was admitted to be extremely clever. He was employed to report on other lines of railway, and he suggested the use of malleable iron rails instead of the cast-iron rails and tramplates previously in use. In 1828 he became a member of the Institution of Civil Engineers, and while he lived was looked upon as an authority of great weight on all questions connected with the improvements of ports, harbours, and rivers. He died on July 12, 1850, when the Commissioners of Northern Lighthouses passed a resolution acknowledging his great services and merits. He left sons, whom he had brought up to his own profession, who worthily sustain the reputation of their father.

STILBENE. [Chemistry, *S.* 2.]

STILBITE. [Zeolites.]

STILPNOMELAN. [Mineralogy, *S.* 1.]

STOCK-DOVE (*Columba Œnas*). [Columbidæ.]

STOCKS. [Mathiola.]

STOCKS, JOHN E., M.D., was born in 1822. He was educated for the medical profession at University College, London. Here he distinguished himself in his classes, and especially attached himself to the study of botany. He obtained an appointment in the East India Company's service, and soon distinguished himself for his acquaintance with plants. He was sent to Sinde and Beloochistan to report on their vegetable riches, and returned laden with specimens and information. He came back to England about the year 1854, intending to work up his numerous materials for publication. His health however failed him, and after having deposited his collections at Kew, he retired to Dottingham, near Hull, where he died in September 1854.

STOCKTON. [California, *S.* 2.]

STODDART, SIR JOHN, Knight, was born in 1773 in the parish of St. James's, Westminster, but his father, who was a lieutenant in the navy, residing in Wiltshire, he received his early education in the grammar-school at Salisbury under Dr. Skinner. His proficiency in Greek at this school occasioned his being sent to the University of Oxford, where he was entered at Christchurch College in 1790, and graduated as B.A. in 1794. He at first studied divinity, but feeling an inclination for the law he proceeded B.C.L. in 1798, and D.C.L. in 1801. In the meantime he had not neglected general literature, and in 1796 and 1798 he had published translations of Schiller's two dramas of 'Fiesco' and 'Don Carlos,' in conjunction with Dr. Noehden, but to which only their initials appeared on the title-page. At this period he took a favourable view of the French revolution, and in 1797 published a translation from the French, entitled, 'The Five Men; or a View of the Proceedings and Principles of the Executive Directory of France, with the Lives of the present Members.' In 1801 he was admitted a member of the College of Advocates, and published 'Remarks on Local Scenery and Manners in Scotland, during the years 1799 and 1800,' in 2 vols. 4to. In 1803, on the recommendation of Sir William Scott, he was appointed king's advocate and admiralty advocate in Malta, in which situation he remained nearly four years, when he returned to England, and resumed his practice in the courts of Doctors' Commons. In 1810 he commenced writing on political subjects in the 'Times' newspaper, his contributions being marked J. S., and this led to his becoming the political editor in 1812. His writings in this paper were distinguished by great energy, the possession of much varied knowledge, a clear style, with a power of fulmination, too often founded on mere prejudice, that occasioned his receiving the sobriquet of Dr. Slop, and as such he was burlesqued by George Cruikshank in the parodies and satires published by Hone. Dr. Stoddart is said to have taken Burke as his model, but he failed in reaching to any greater similarity than that arising from their dislike to the course taken by the French revolution, which, in the doctor's case, displayed itself in his rancorous denunciations of Bonaparte and his policy. He held this important post till the close of 1816, when, in consequence, it is said, of the disapproval of the proprietors of the continued violence of his attacks on the now imprisoned emperor, his connection with the 'Times' was dissolved, and in 1817 he started an opposition paper called 'The New Times.' It was unsuccessful, and in a short time he left it, retired to private life, and to his practice as an advocate. In 1826 he was appointed chief-justice and judge of the Vice-Admiralty Court of Malta, being knighted at the same time, and in that office he distinguished himself by the able and conscientious manner in which he discharged his duties, until his return to England in 1839. From that time till his death he led a private life, in which he was much and widely esteemed; but occasionally published pamphlets on legal subjects, and took considerable interest in the reform of the law, being one of the earliest members of the Law Amendment Society. He also wrote 'An Introduction to General History,' and a 'Universal Grammar; or Science of Language,' which were printed in the 'Encyclopædia Metropolitana,' but have likewise appeared as separate works. A 'Statistical, Administrative, and Commercial Chart of the United Kingdom, compiled from parliamentary and other authentic documents,' was another of his productions. He died at Brompton-square, near London, on February 16, 1856; and on the first meeting of the Law Amendment Society after his death, Lord Brougham pronounced a warm eulogium on his memory.

STOKE POGES. [Buckinghamshire.]

STOKESLEY. [Yorkshire.]

STONECROP. [Sedum.]

STOWMARKET. [Suffolk.]

STRABANE. [Tyrone.]

STRAMONIN. [Chemistry, *S.* 1.]

STRANGFORD, PERCY CLINTON SYDNEY SMYTHE, sixth VISCOUNT, was born in 1780, and graduated in 1800 at Trinity College, Dublin, obtaining the gold medal and other honorary distinctions. He entered the diplomatic service early. Before he was of age he had gained a high reputation by his contributions to the 'Poetic Register.' In 1801 he succeeded to his father's Irish peerage, and became secretary of legation at Lisbon. Here his love of language and poetry led him to master the Portuguese language, and to translate the poems of Camoens, to which he prefixed the life of that poet. This translation is highly praised by both Lord Byron and Thomas Moore, and attained considerable popularity, several editions having been called for. He became afterwards British envoy at Lisbon, and accompanied the court and royal family of Portugal to Brazil. In 1817 he became ambassador at Stockholm, from whence he was transferred in 1820 to the Sublime Porte, and to St. Petersburg in 1825. In 1828 he was sent on a special mission to the Brazils. He was created a D.C.L. of Oxford in 1834, at the installation of the Duke of Wellington, with whom he had been associated as co-plenipotentiary at the Congress of Verona. He was made in 1825 a Knight Grand Cross of the Hanoverian Guelphic Order, and raised to the peerage of England as Lord Penshurst. Lord Strangford was an ardent lover and patron of literature and the fine arts, an active member and vice-president of the Society of Antiquaries, and a frequent contributor, under the initials of P. C. S. S., to the 'Gentleman's Magazine' and 'Notes and Queries.' He was collecting materials for the biography of his ancestor Endymion Porter, to whom Milton has addressed a sonnet, when he was carried off by a short illness, May 29, 1855.

STRATFORD. [Essex.]

STRAWBERRY-TREE. [Arbutus.]

STREPTOSTACHYS. [Graminaceæ.]

STRICKLAND, HUGH EDWIN, was the grandson of Sir George Strickland on his father's side, and of the celebrated Dr. Edmund Cartwright on his mother's side. He was born at Righton, in the East Riding of Yorkshire, on the 2nd of March 1811. After receiving a careful private education he was placed as a pupil with Dr. Arnold, then living at Laleham, previous to his appointment as head-master at Rugby. After leaving Laleham Mr. Strickland was entered at Oriel College, Oxford. Here the taste which he had acquired in the country for natural history became systematically directed towards geology under the teaching of Dr. Buckland. On leaving Oxford he went to reside with his father at Tewkesbury, and here he studied with great diligence the geology of the Cotswold Hills, and of the great valley of the Severn. Although distinguished as a naturalist, one of his earliest literary productions discovered a taste similar to that of his maternal grandfather. This contribution consisted of the description of a new wind-gauge in the 'Mechanic's Magazine,' for 1825. His papers on the geology of his native district were mostly published in the Proceedings and Transactions of the Geological Society, of which he was an early and active member. The following are the titles of some of these papers:—'Description of a Series of coloured Sections of the Cuttings on the Birmingham and Gloucester Railway.' 'On the Occurrence of the Bristol Bone Bed in the Lower Lias near Tewkesbury.' 'On certain Impressions on the Surface of the Lias Bone Bed in Gloucestershire.' 'Notes of a Section of Leckhampton Hill.' 'On the Elevatory Forces which raised the Malvern Hills.' 'Memoir of the Geology of the Vale of Evesham.' In conjunction with Sir Roderick Murchison he also worked at the geology of the district in which he lived. Thus in the fifth volume of the 'Geological Transactions' a conjoint paper appeared 'On the New Red Sandstone System in Gloucestershire, Worcestershire, and Warwickshire.' They also published a separate work, entitled 'Outline of the Geology of the neighbourhood of Cheltenham.'

In 1835, in company with Mr. Hamilton, he made a journey to Asia Minor. During his travels he made notes, generally on natural history, but more especially on the zoology of the districts through which he passed. In the 'Geological Transactions' he published the following papers, 'On the Geology of the Thracian Bosphorus.' 'On the Geology of the neighbourhood of Smyrna.' 'On the Geology of the Island of Zante.' 'On Currents of Sea-Water running into the Land in Cephalonia.' 'A general Sketch of the Geology of the Western Part of Asia Minor.'

On the failure of the health of Dr. Buckland, Mr. Strickland was appointed reader in geology in the University of Oxford. This post he held at the time of his death in 1853. As a zoologist Mr. Strickland was best known as an ornithologist. He was thoroughly acquainted with the birds inhabiting Great Britain, and gradually extended his knowledge of the forms of these animals. His papers on the classification and description of birds are very numerous. Amongst these the following were published in the 'Proceedings of the Zoological Society:' 'Descriptions of New Species of Birds from West Africa.' 'Notes on a certain Species of Birds from Malacca.' Many other papers on birds were published by him in the 'Annals and Magazine of Natural History,' in Jardine's 'Contributions to Ornithology,' and in other works.

Whilst at Oxford his attention had often been directed to the head and foot of the Dodo, the only existing remains of a bird that had ceased to exist within a comparatively recent period. These remains had occupied the attention of naturalists, and many conjectures had been made as to the exact nature of this bird. Mr. Strickland expended a large amount of time and labour in getting together all the facts that existed with regard to the history and disappearance of this bird [Dodo, vol. ix. pp. 47-55], and published a volume on the subject, entitled 'The Dodo and its Kindred, or the History and Affinities of the Dodo, Solitaire, and other extinct Birds,' London, 4to, 1848. This work contained copies from drawings of this bird, and a discussion on its zoological affinities, and the conclusion of the author that it belonged to the family of *Columbidæ* or *Doves*. In the soundness of this conclusion most naturalists now agree. During his life Mr. Strickland was engaged in preparing a large work on the synonymy of the family of birds, one volume of which has been published since his death.

Mr. Strickland, during his geological studies, had his attention necessarily drawn to the family of Mollusca, and numerous papers on the recent and extinct forms of the Mollusca attest his knowledge of this department of natural history. With his great knowledge of the detailed facts of the natural history sciences it is not matter of surprise that he took a deep interest in classification. He proposed at one of the meetings of the British Association for the Advancement of Science the appointment of a committee for the purpose of reforming the nomenclature of natural history. He was the author of the report issued by this committee, and which has been extremely useful in establishing clear rules for the nomenclature of zoology.

He was one of the original founders and a member of the council of the Ray Society. He was mainly instrumental in inducing this society to undertake the publication of Professor Agassiz's 'Bibliographia Zoologiæ et Geologiæ.' This work he undertook to edit and see through the press, and had completed the third volume at the time of his decease. The original list of works in this book was increased by Mr. Strickland at least one third. His own publications, the list of which was published in the fourth volume and after his death, amounted to eighty-six. He was cut off in the midst of his labours and usefulness. He had been attending the meeting of the British Association for the Advancement of Science held in the year 1853 at Hull. He wished to inspect the cuttings of the Gainsborough and Retford Railway, and whilst thus engaged, note-book in hand, at the Clarborough Tunnel, on that line, he was run over by a passenger train, and killed on the spot, September 14, 1853. He was married in 1845 to the second daughter of Sir William Jardine, Bart., but left no children.

STRONTIA, the name of an Earth, composed of Oxygen and the metal Strontium. Neither strontium nor its oxide is found pure in nature. The Salts of Strontia have a high specific gravity, varying from 3·6 to 4·0. In this respect they resemble Baryta. Two are found in the form of minerals.

Celestine — Sulphate of Strontia — occurs in modified rhombic prisms. Crystals sometimes flattened, often long and slender. Massive varieties :—Columnar or fibrous, forming layers half an inch or more thick, with a pearly lustre; rarely granular. Colour generally a tinge of blue, but sometimes clear white. Lustre vitreous, or a little pearly; transparent to translucent. Hardness 3·0 to 3·5. Specific gravity 3·9 to 4·0. Very brittle. It contains—Sulphuric Acid, 43·6; Strontia, 56·4. Decrepitates before the blow-pipe, and on charcoal fuses rather easily to a milk-white alkaline globule, tinging the flame red. Phosphoresces when heated.

It resembles heavy spar, but is distinguished by its specific characters and behaviour under the blow-pipe. It is distinguished from the carbonate by not effervescing with acids. It is found in the United States of America. Sicily affords very splendid crystallisations associated with sulphur.

The pale sky-blue tint so common with the mineral, gave origin to the name Celestine.

Celestine is used in the arts for making the nitrate of strontia, which is employed for producing a red colour in fireworks. Celestine is changed to sulphuret of strontium by heating with charcoal, and then by means of nitric acid the nitrate is obtained.

Strontianite—Carbonate of Strontia—occurs in modified rhombic prisms. It occurs also fibrous and granular, and sometimes in globular shapes with a radiated structure within.

The colour is usually a light tinge of green; also white, gray, and yellowish-brown. Lustre vitreous, or somewhat resinous. Transparent to translucent. Hardness 3·5 to 4. Specific gravity 3·6 to 3·72. The analysis gives—Strontia, 70·1; Carbonic Acid, 29·9. It fuses before the blow-pipe on thin edges, tinging the flame red; becomes alkaline in a strong heat; effervesces with the acids.

Its effervescence with acids distinguishes it from minerals that are not carbonates; the colour of the flame before the blow-pipe, from witherite; and this character and the fusibility, although difficult, from calcspar. Calcspar sometimes reddens the flame, but not so deeply.

Strontianite occurs in limestone at Scoharie, New York, in crystals, and also fibrous and massive. Strontian in Argyleshire was the first locality known, and gave the name to the mineral and the earth strontia. It occurs there with galena in stellated and fibrous groups and in crystals. It is also used for making nitrate of strontia.

(Dana, *Manual of Mineralogy*.)

STURGEON, WILLIAM, distinguished as an electrician, was born at Whittington, in the county of Lancaster, in 1783. His parents were in humble circumstances, and he was at first apprenticed to a shoemaker; he subsequently entered the militia, and afterwards the Royal Artillery as a private soldier. It was whilst thus engaged that his taste for scientific pursuits commenced, and he employed his leisure hours in making experiments more especially in electricity. He appreciated the discoveries of Oersted, Faraday, Arago, and Ampère, in the newly-created sciences of magneto-electricity and electro-magnetism, and was soon enabled to suggest a modification of Ampère's rotatory cylinders. In 1824 he began to publish the result of his researches, and in that year four papers by him on electricity were printed in the 'Philosophical Magazine.' In 1825 he presented a paper to the Society of Arts which was published in their 'Transactions,' describing a complete set of electro-magnetic apparatus of a novel kind. This apparatus was remarkable for attaining a larger amount of power in a smaller bulk than had been hitherto attained by any other arrangement. For this invention he obtained the large silver medal of the Society of Arts and a purse of thirty guineas.

Soon after the invention of the electro-magnetic machine, Mr. Sturgeon drew attention to the powerful effects to be obtained from the use of soft iron in the construction of the electro-magnetic apparatus. The soft iron horse-shoe magnet has entered more or less into the construction of all electro-magnetic machines since that time. Mr. Sturgeon subsequently directed his attention to the construction of plates for the various kinds of galvanic batteries. In his 'Experimental Researches in Electro-Magnetism, Galvanism,' &c., he first drew attention to the superiority of amalgamated plates of rolled zinc over the unprepared cast zinc before generally used. His method of dipping the zinc plates in acid, and afterwards in mercury, is employed to this day in the majority of galvanic machines. He subsequently suggested many modifications in the forms of machines which are now in daily use, and his name is inseparably connected with the mechanical application of the principles that had been worked out by Oersted, Faraday, and Ampère, since the beginning of the present century. Mr. Sturgeon for some years occupied the chair of Experimental Philosophy in the Hon. East India Company's Military Academy at Addiscombe. During the latter part of his life he filled the office of Lecturer on Science at the Royal Victoria Gallery of Practical Science at Manchester. He died at Manchester in the month of December, 1850.

STURM, JACQUES CHARLES FRANÇOIS, the discoverer of the celebrated theorem which bears his name, was born at Geneva in September, 1803, of a family which had quitted Strasbourg in the middle of the last century. After completing his school education and his classical studies at the college with remarkable success, he became in his fifteenth year a student of the university of his native city, where he made rapid progress in the study of mathematics and philosophy. The sudden death of his father, leaving his mother and four children, of whom Charles was the eldest, without any adequate maintenance, compelled him, before the close of his seventeenth year, to resort to private tuition for the support of himself and his family, and three years afterwards he was recommended as tutor to the son of Madame de Staël. At the close of the year 1823 he accompanied his pupil to Paris; and though he shortly afterwards returned to Geneva, he found no sufficient occupation there, and he finally resolved, in company with his intimate friend and school-fellow, M. Colladon—the present distinguished professor of physics at Geneva—to seek his fortune in the French metropolis. Sturm had already become favourably known to mathematicians by several articles in the 'Annales des Mathématiques' of M. Gergonne, published at Nîmes, on different branches of analysis and geometry, and the strong recommendations which he and his companion bore with them from Lhuillier, and the kind offices of M. Gerono, an eminent teacher of mathematics at Paris, made them known to Ampère, Fourier, Arago, and other eminent members of the Institute of Sciences, who recommended them to pupils as a means of support. Sturm afterwards obtained employment upon the 'Bulletin Universel,' under Baron de Férussac, and was in fact a subordinate in the office of that journal when he published his theorem. The joint labours of Sturm and his friend were shortly after rewarded by a distinction of no ordinary importance, when the Academy of Sciences of the Institute awarded to them, on June 11th, 1827, the great prize of mathematics proposed for the best essay on the compression of liquids. Their memoir was inserted in the 'Mémoires par divers Savants' ('Savants Étrangers'), vol. v., published, agreeably to the very inconvenient usage of the Academy, eleven years afterwards, in 1838.

The determination of the number of real roots of a numerical equation which are included between given limits, is a problem which had occupied the attention of the greatest analysts of the past age—of Warang, of Lagrange, and more especially of Fourier, who of all other analysts had made the nearest approaches to its practical, though he had failed in its theoretical, solution. The attention of Sturm had been for some time directed to this class of researches, which he pursued with remarkable continuity and diligence, encouraged, as he himself assures us, by the instructions and advice of this eminent master. The result was the discovery of the theorem which will be for ever associated with his name, and which conquered the difficulty that had embarrassed all his predecessors, and thus permanently extended the dominion of analysis. [STURM'S THEOREM.]

The memoir which contained this important theorem was presented to the Academy on the 23rd of May, 1829, supplementary papers being read at the two following meetings; and rapidly conducted its author to fortune and public honours. His connection with the 'Bulletin Universel' enabled him to give an immediate account of his method to the world ('Bull. Univ. des Sciences Math. Phys. et Chim.,' vol. xi. p. 419, art. 271, 272, 273). The paper itself was not published till the year 1835, in the 'Mémoires des Savants Étrangers,' vol. vi., where it appears without a date.

In the course of a few years he was chosen a member of the principal scientific societies of Europe: he was elected a member of the Academy as the successor of Ampère in 1836; in the same year he was made Professor of Mathematics, upon the special recommendation of Arago, at the Collège Rollin, répétiteur at the École Polytechnique in 1838, and in 1840 he was appointed to succeed Poisson in the chair of Mechanics in the same school. In 1840 also, he was elected a foreign member of the Royal Society of London, and received the Copley Medal, "for his valuable mathematical labours in the solution of a problem which has baffled some of the greatest mathematicians that the world has produced." The first announcement of the theorem in the English language was not made until 1835, when Professor J. R. Young, of Belfast, inserted the substance of Sturm's memoir in his work entitled 'The General Theory and Solution of Algebraical Equations,' published in that year. The first intimation of it had reached him in the month of May, when his own work was in great part printed, and disregarding a disparaging comment of Lacroix, he thought the discovery of sufficient importance to justify the destruction of many pages of his manuscript prepared for the printer, and the suspension of the work until the volume of the 'Savants Étrangers' should be published. This he received in July, and his own work was published in August. To the appreciation and zeal of this analyst, whose recognition and promulgation of the value of Sturm's labours were thus both immediate and simultaneous, British mathematicians, as well as M. Sturm himself, were greatly indebted. In the preface to his 'Mathematical Dissertations' (one of which is devoted to the theorem) dated November 25, 1840—only five days before the presentation of the Copley medal—he adverts to Sturm's discovery as at that time exciting considerable interest among analysts, as well in this country as on the continent; and he then expresses his own estimation of it in the following terms: "I believe that I have already contributed somewhat to extend the knowledge of this important theorem among British analysts; and although it has been since disparaged and undervalued in certain quarters, I have always entertained the conviction that it must eventually supersede every other method at present known for effecting the complete analysis of a numerical equation." In Professor Young's subsequent introductory volume on 'The Analysis and Solution of Cubic and Biquadratic Equations,' published at the beginning of 1842, he invited the attention of the young analyst to Sturm's method; and the second edition of his former work on equations,—entitled 'The Theory and Solution of Algebraical Equations of the Higher Orders,'—which appeared early in the following year, is chiefly devoted to the analysis and developments of that method and the previous theories of Budan and Fourier.

In France it was not without some difficulty that the substantial rewards of his scientific achievements were obtained; he was a foreigner, and naturally placed at a disadvantage in a contest with native competitors. It is right to notice this both for the honour of France and as a proof of the very high reputation which Sturm had attained. The subsequent memoirs of Sturm, whether first presented to the academy or not, were chiefly printed in the journal of M. Liouville. Two of these memoirs, relating to the discussion of differential and partial differential equations, such as present themselves so commonly in the solution of the more important problems of mathematical physics, possessed a merit so extraordinary that M. Liouville—a most competent judge—declared, at a time when he was himself a competitor with Sturm for a place in the Academy, that "impartial posterity would place them by the side of the finest memoirs of Lagrange."

The first of these two memoirs was presented in 1833 to the concours for the great prize of mathematics, to be awarded by the Academy in 1834 for the most important discovery in that science made known within the preceding three years. The academy conferred the prize on Sturm—not for the memoir which he had submitted to the judgment of the commission, but for that which contained his celebrated theorem and which had been presented in 1829. Other memoirs relate to optics, mechanics, pure analysis, and analytical geometry, and embrace the most difficult questions which have been treated in those several branches of science. One of the latest of these was a communication to the academy on the theory of vision, and is remarkable both for the geometrical and analytical elegance with which many questions subsidiary to the theory are treated in it. It confirms generally,—with one important exception relating to the asserted muscularity of the crystalline lens and the changes attributed to its action,—the views of the late Dr. Thomas Young [YOUNG, THOMAS] in his well-known memoir on this subject: Dr. Young himself, it must be remembered, once relinquished his belief in the muscularity of the lens, though he finally resumed it.

Sturm visited England in 1841, and gave the mathematicians with whom he conversed a high impression, as well of the extent of his knowledge as of his inventive power.

The health of M. Sturm, which had previously been remarkably vigorous, began to decline in 1851, probably in consequence of his laborious public employments and the unremitting severity of his studies. He died on the 18th of December 1855, to the deep regret of a large circle of friends and pupils, to whom he appears to have been singularly endeared by the modesty, truthfulness, and simplicity of his character.

STURMIA, a genus of plants belonging to the natural order *Orchidaceæ* and the tribe *Malaxideæ*. It has a patent perianth; lip anterior, erect or oblique, entire, dilated, much larger than the sepals; stigma roundish; rostellum obsolete, but with an appendage consisting of two tubercles; anthers terminal, deciduous, moveable like a lid, with two distinct cells; column elongated; germen on a twisted stalk.

S. Loeselii has the leaves oblong-lanceolate; stem triangular; lip obovate, longer than the petals; flowers from 6 to 12, in a lax spike, yellowish in colour; the sepals lanceolate; petals linear; the hybernaculum is large, ovate, inclosed in the whitish sheaths of the decayed leaves. It is the *Liparis* of some authors. It is found in spongy bogs in Norfolk, Suffolk, and Cambridgeshire, but is very rare.

(Babington, *Manual of British Botany.*)

STYRACINE. [Chemistry, *S.* 2.]

SUBERYLE. [Chemistry, *S.* 2.]

SUCCESSION DUTIES. For many years persons succeeding to personal property (including leaseholds), whether they took by will as executors or legatees, or merely as administrators or next of kin, were charged with *Legacy Duties*, which were payable over and above the stamp duty, then and still levied in the first instance, on the grant of probate or letters of administration, according to the estimated sworn value of the personal property of the deceased. The legacy duty was chargeable after the estate of the deceased had been realised and administered, on the property distributed among the legatees or next of kin, as the case might be; and varied in amount, according to the consanguinity of the next of kin, or the absence of any relationship between the legatee and the testator. The exemption of real estate from this species of taxation, long complained of as creating an undue preference in favour of the holders of landed property, has at last been removed. By the Succession Duties Act, 1853, duties are imposed on every succession to property, whether real or personal, according to the value and the relationship of the parties to the predecessor. Where the successor is the lineal issue or lineal ancestor of the predecessor, 1*l.* per cent.; where a brother or sister, or a descendant of a brother or sister, 3*l.* per cent.; where a brother or sister of the father or mother, or a descendant of the brother or sister of the father or mother of the predecessor, 5*l.* per cent.; where a brother or sister of the grandfather or grandmother, or a descendant of the brother or sister of the grandfather or grandmother of the predecessor, 6*l.* per cent.; and where the successor is in any other degree of collateral consanguinity to the predecessor, or is a stranger in blood to him, 10*l.* per cent. The value of the succession, if it be to real property, is ascertained by considering the interest of the successor as of the value of an annuity equal to the annual value of the property, estimated as the Act directs; and the duty may be paid by eight equal half-yearly instalments, or at once, according to the wish of the party liable thereto.

SUE, EUGÈNE, the popular romancist, was born at Paris Dec. 10, 1804. His ancestors, who came from Lacolme, near Cannes, in the south of France, settled in the French capital at the beginning of the 18th century, and having adopted the medical profession, produced three generations of respectable physicians, two of whom became celebrated, and enjoyed a very extensive practice. Joseph Sue, his grandfather, and Jean-Joseph Sue, his father, are both mentioned with honourable distinction in the national biographies of France. The latter, who had been principal physician to the Hôpital de la Maison du Roi, and anatomical lecturer to the École Royale des Beaux Arts, during the reign of Louis XVI., was one of the household physicians to Napoleon I.; and the future author of the 'Wandering Jew' was held at the font by the Empress Josephine and her son Eugène Beauharnais, from whom he derives his Christian name.

Dr. Sue, having but two children—a son and a daughter—was desirous of bringing up his son to his own profession, and Eugène in consequence studied medicine at the hospitals as well as at the schools of Paris; and, thanks to his father's position and influence, was enabled at the age of twenty to enter a company of the Royal Body Guards as aide-major. He was soon after transferred to the staff of the French army preparing to enter Spain under the Duke of Angoulême. In this campaign he was present at the siege of Cadiz and at the Trocadero in 1823. In 1825 he quitted the land for the sea service, visited America, Asia, and the coast of the Mediterranean, during which excursions he obtained that knowledge of ocean scenes and sailor life which he has since described with indisputable power in his earlier tales. He was present in 1828 at the battle of Navarino, on board of the line-of-battle ship le Breslau. In 1829 his father died at the age of sixty-nine, leaving to his son an unincumbered estate of 40,000 francs (1600*l.*) a year, besides a splendid museum of anatomy, valued at several thousands more, bequeathed to the nation. Eugène Sue, at this time in his twenty-sixth year, renounced the profession by which his family had acquired so much distinction, and to which he owed his fortune. His taste inclining to art, he became a painter, and in that vocation entered the studio of Gudin. About the same period he felt an ambition to signalise himself in literature, and this was gratified by the insertion of some slight articles in the journal recently established by Emile de Girardin—'Le Voleur.' Encouraged by this success, he began to write tales descriptive of sea adventures, publishing in quick succession, 'Plick et Plock,' 'Atar-Gull,' and 'la Salamandre.' The two former were rejected by the trade, he therefore published them at his own risk. In 1832 he had already become popular both with publishers and their subscribers. But it would be quite a mistake to suppose that he was an advocate of the July revolution—no man at that time could repudiate it more; wherever he went he was loud in denouncing it. His father's name and his private fortune gave him access to the best company; he selected the highest for his cultivation, and lived among the old families of the Faubourg Saint-Germain.

Sue was one of the first to try his skill in framing those historical romances which the genius of Sir Walter Scott had rendered so universally popular. A new market had been opened for the purchase of his, and similar fictions—the newspaper feuilletons. Thus his 'Latréaumont,' his 'Jean Cavalier,' his 'Commandeur' were published, and devoured from day to day by the public. His name had become a magnetic charm in the estimation of those speculators who had once rejected his manuscript. It was presumed that so popular a name was a guarantee for success in literary enterprises; and acting on this presumption, he was engaged at very high terms, having a reputation for concocting vivid scenes of naval adventure, to write a 'History of the French Navy.' But the speculator in this instance was disappointed: the public bought the first volume on account of the name, and refused to buy all the other volumes on account of the work. From 1832 to 1840, Eugène Sue had confined himself to that class of fictions in which he had attempted to emulate, if not to rival, Fenimore Cooper in sea adventures, and Sir Walter Scott in historical delineations. But at this period the novels of Balzac in France, and those of Charles Dickens in England, had created a taste for the novel of real life, or as the French call it, le Roman de Mœurs. He therefore resolved to adopt the new style, and to this change we owe 'Arthur,' the 'Hôtel Lambert,' and 'Mathilde,' published in 1841 and 1842. Making allowance for those licences in morality which are too frequently found in the current French fictions as well as dramas, there is a skill in the combination of the plot, and a power of description in the incidents, in 'Mathilde,' which his earlier tales did not prepare the reader for. The highest critical authorities have admitted that it exhibits more than one of the qualities of a superior novel. It was in this work that Eugène Sue first started that idea of the moral Howard, going about succouring the poor, redressing wrongs, and chastising the wicked, which he developed afterwards in the 'Mysteries of Paris' and the 'Wandering Jew.' These two novels originally appeared in the 'Journal des Debats' and the 'Constitutionnel,' occupying by their great length nearly three years in the course of publication. Including the interval between the conclusion of the former and the first appearance of the latter, the whole of the four years from 1842 to 1846 was taken up with these baleful writings, and the ferment and agitation of the public fancy was excited to the highest degree, without respite or relaxation. The original terms proposed and accepted for each of these fictions, was 100,000 francs (4000*l.*); but it is understood that they were purposely extended and developed, on account of their unexampled success, and much larger sums allowed for them to the author. They were afterwards republished in volumes, going through many editions, and being translated into most living languages. 'Martin, l'Enfant Trouvé,' appeared in 1846 in the columns of the 'Constitutionnel,' and 'Les Sept Péchés Capitaux' in the same paper in 1847-48. Perhaps the most serious censure passed on his writings was that passed on this last by the author himself when he said in bravado, "that he would show the fair side of all these sins;" for the work, which consists of seven separate tales, is nothing else but an apology for each and all of them. The first of these tales—'Pride'—is perhaps the masterpiece of Eugène Sue; the second tale—'Envy'—contains one very dramatic scene; but his 'Avarice,' his 'Sloth,' &c., are unworthy of his reputation.

The 'Mystères du Peuple,' published in 1852, is the last fiction of any note produced by the pen of this voluminous writer. It is intended as an exposure of all the misery and injustice to which the common people of every country have been reduced in all the ages of the world. After the Revolution of Feb. 1848, Sue, who had abandoned his early conservative principles for extreme democratic and socialistic ones, was elected a representative of the Assemblée Nationale; but after the election of Napoleon III. he took no part in politics. He died on Aug. 3, 1857.

SUGAR. [Tissues, Organic, *S.* 1.]

SUGAR-CANE. [Saccharum.]

SULPHARSIN. [Chemistry, *S.* 1.]

SULPHOCYANOGEN. [Chemistry, *S.* 1.]

SUMMARY JURISDICTION. [Justices of the Peace, *S.* 2.]

SUN-DEW. [Drosera, *S.* 1.]

SUN-ROSE. [Helianthemum, *S.* 1.]

SUNDAY. The sale of beer and other liquors on Sunday is now regulated by the statutes 11 & 12 Vict. c. 49, and 18 & 19 Vict. c. 79.

SURGERY. Some references which have been made in other parts of this work will here be made good.

Anus, Diseases of. One of the most frequent diseases of this part of the body is that which is commonly known by the name of Fistula, or *Fistula in Ano.* This disease consists of a fistula or sinus by the side of the rectum. It sometimes opens externally, without communicating with the bowel, and is then termed blind external fistula. It more frequently communicates with the bowel, without opening externally, and is then called blind internal fistula. Usually, however, these sinuses have an opening internally and externally, and the disease then constitutes complete fistula. In this latter form pus, flatus, and fæculent matter, are discharged from the openings. It is accompanied by heat of the parts, great discomfort, and sometimes pain and spasm of the sphincter muscles. It is sometimes attended with acute inflammatory symptoms, and the general health suffers.

When this kind of abscess occurs, the healing is prevented by three circumstances:—1. The fistulous condition of the cavity. 2. The presence of foreign matters. 3. The frequent motion of the part by the action of the neighbouring muscles.

This disease originates most frequently in the interior of the bowel by a small ulcer, which, extending, at last produces a second opening. It is often found in persons labouring under pulmonary consumption, and its persistence and inconvenience are increased by the constant cough which accompanies that disease.

The treatment of fistula is simple, and usually very successful. By laying open the whole of the sinus and dividing the sphincter, the two main obstacles to the cure of this disease are removed. The mode of operating in this case is simple. A grooved probe is introduced into the external opening until it passes out at the internal opening. A probe-pointed bistoury is then introduced along the groove, and the sinus is laid open through its whole length. Usually no important vessels are divided in this operation, so that all that is necessary after is to introduce a slight dressing of lint. An opiate should be given after the operation.

Hæmorrhoids or Piles consist in an enlarged condition of the veins supplying the anus and rectum. This disease is divided into two kinds, external and internal. It seldom occurs before puberty, and is more common in females than males, and in the rich and luxurious, than in the poor and hard-worked. This arises from the fact that whatever tends to determine blood to the lower part of the rectum, and to retard the return of blood from that part, favours piles. Thus they come on in pregnant females, in persons troubled with habitual constipation, abdominal tumours, obstructions in the portal system of veins, and in those who lead sedentary lives or who feed too well.

External piles consist of a congeries of varicose or enlarged veins, which are surrounded by a condensed and enlarged connective tissue, and are covered partly by mucous membrane and partly by loose rugous integument. The parts are sometimes inflamed, at other times free from any capillary derangement. The mucous or rugous surface occasionally becomes ulcerated. It is under these circumstances that the coats of one or more of the veins give way, and they bleed to a greater or less extent. When this does not take place they do not bleed. These two states are called respectively *bleeding* and *blind* piles.

The treatment of this form of piles may be either palliative or radical. The radical cure consists in removing the parts either by the scissors or bistoury, and leaving them to heal in the ordinary way, or a ligature may be passed round the enlarged vessels, and the strangulated part left to slough off. When this operation is not thought desirable, much may be done to relieve the enlargement and pain of piles by a palliative treatment. Whatever will remove the loading of the vessels in the lower part of the bowels will relieve them. Thus parturition removes them when caused by pregnancy. If the part is inflamed, rest, purgatives, poultices, and anodyne applications may be had recourse to. Astringent applications combined with opium may be applied, as gallic and tannic acids. The purgatives most to be recommended are castor oil, or an electuary with the confection of senna, sulphur, and cream of tartar. In cases where the liver is affected, the state of this organ should be especially attended to.

Internal piles, are of three kinds: 1. Varicose veins surrounded by enlarged connective tissue, and covered by mucous membrane, and bleeding or blind. 2. Tumours of the nature of sarcoma. 3. A congeries of blood-vessels resembling erectile tissue, and occuring in the submucous connective tissue. This last form is the most common. They may protrude from the anus or not. When they do not, they descend occasionally when the bowels are acted on, and become very troublesome till they are returned. If not replaced they become constricted and inflamed or bleed. In these cases bleeding usually occurs when the bowels are acted on. When the tumours are replaced, no great inconvenience occurs. If, however, the bleeding continues, the patient becomes pale, thin, and weak; noises in the ears, giddiness, and palpitation of the heart come on, in fact all the symptoms of anæmia set in.

The treatment in this case may be either palliative or radical. Frequently the latter course should at once be had recourse to. The internal tumours are seldom of a kind to allow of removal by the knife, and ligature is by far the safest process. When the base of the tumour is small, it may be pulled down by a tenaculum and a single ligature placed round it; but when the base is broad, a needle with two ligatures is passed directly through the tumour, and a ligature is tied round each half of the tumour. This operation is very painful and difficult, and wherever circumstances will admit is greatly facilitated by the use of chloroform. After the operation opiates should be given.

Nitric acid has been recently recommended in these cases, but unless the tumours are small, and the cases slight, the remedy is liable to fail, and after the infliction of much pain the operation must be had recourse to.

Should the palliative treatment be had recourse to, all those points to which reference has been made under the head of external piles, must be attended to. Astringent remedies and opiates must be injected into the bowels. The bowels must be regulated, the liver looked to, and when the hæmorrhage is considerable, gallic and tannic acids, with acetate of lead, must be given internally.

Prolapsus Ani is a very frequent and troublesome affection of the lower bowels. In consequence of relaxation the rectum passes down, and becoming everted protrudes itself beyond the anus. This protrusion may be either *partial* or *complete.* It is called complete when the entire bowel comes down, and partial when the mucous coat alone descends. The latter is the most frequent, and sometimes accompanies internal piles. Children and old persons are more liable to the complete form. The quantity of bowel or membrane which passes down varies in size, from a mere annular enlargement to a tumour as large as a child's head. It is sometimes accompanied with inflammation, and the mucous membrane throws off a coloured discharge. Great pain and uneasiness are often felt, and general languor and debility are present.

The treatment is either palliative or radical. When this disease depends on general constitutional weakness, tonics, change of air, and a proper regimen, will restore the patient to health. The bowel should always be returned as speedily as possible, and this may be done by proper pressure after lubricating the parts. When they are inflamed, leeches should be applied and rest secured before attempting reduction.

The radical cure is effected by removing one or more of the redundant folds of the mucous membrane by the knife or ligature. The cicatrix thus formed contracts and sustains the replaced parts, or the bowel may be left intact, and a portion of the redundant external integument may be removed, which by its subsequent contraction prevents the painful protrusion.

Imperforate Anus. Children are occasionally born without an anal orifice. Three forms of this malformation are described: 1. The rectum may be fully developed, and have its orifice closed by an external membrane, or a septum may be developed at some distance from the orifice. In the treatment of this form of imperforate anus, nothing more is required than an incision through the occluding membrane. 2. The rectum terminates at some distance from the perineum, and there is a mere depression where the anal orifice ought to be. This is the most common form. It requires a more serious operation than the last. The meconium should be allowed to accumulate, and pressure being made on the abdomen, an incision must be made down to the bowel, and a passage thus established. 3. In this form the rectum is very deficient or altogether absent. An operation like the last may be performed, and failing this, an attempt may be made to form what is called an *artificial anus.* This operation is performed not only for imperforate anus, but in cases where, from tumours, or the impaction of foreign matters, the fæcal matter does not find its way to the anal orifice. The sigmoid flexure of the colon is the part which is preferred for this operation. It may be reached from before or behind. The former is the easiest operation; the latter is the most convenient position for the new opening to the patient. In performing the latter operation, an incision is made midway between the last false rib and the crest of the ileum. The colon is then secured, an incision made into it, and the edges of the bowel brought in contact with the external wound by means of ligatures. This operation, has been successfully performed in cases of non-malignant tumours and other causes of the impaction of the lower bowel. In children with imperforate anus, however, it seldom succeeds, as other malformations often exist which speedily terminate the life of the patient.

AORTA, DISEASES OF. [ARTERIES, DISEASES OF.]

ARTERIES, DISEASES OF. Besides aneurism the arteries are subject to other diseases. [ANEURISM.] The arterial tissues are liable to inflammation, which may be acute or chronic.

Acute Arteritis, is either limited to a particular spot, or it spreads along the course of the artery. When limited, this disease arises from external injury, and is a common result of wounds and ligatures. In the milder forms, this inflammation is attended with the exudation of a plastic matter, which fills up the artery and leads to its obliteration, a result which is sought for in the application of a ligature to arteries. The inflammation may, however, proceed to suppuration and ulceration, when the coats of the artery are opened and hæmorrhage is the result. In every instance of ligature such a result is carefully to be avoided. A still more intense form of inflammation may occur, and the result will be the death of the part and gangrene—a result which sometimes follows wounds involving the destruction of the arterial tissue. It may also come on from a ligature being applied too tightly. In the treatment of such cases the ordinary remedies for inflammation should be applied. Cooling applications should be made to the part, and rest, and an antiphlogistic regimen enjoined.

The spreading form of arteritis occurs in middle age in persons of broken constitution. It is seldom confined to one vessel, but affects the arteries of a whole limb. The tracks of the inflamed arteries are painful to the touch, there is light induration of the affected arteries, the pulse is feeble nd has a peculiar thrilling stroke. The surrounding textures re not often involved in the disease. The pulse in the ffected arteries is feeble, has a thrilling stroke, and gradually diminishes till it finally ceases. The tissues surrounding the arteries are seldom affected with the inflammation, and the skin is not altered, except that it is pale.

The effects on the arterial coats are the production of turgescence, and a loss of the smoothness of the internal coat. There is a tendency of the blood to coagulate and become adherent in the inflamed vessel, and ultimately the canal becomes blocked up. In proportion as these changes are extensive, will be the general local mischief. The temperature and sensation of the part are diminished, and gangrene, unless the disease is arrested, sets in.

The treatment consists in the employment of antiphlogistic measures. Leeches may be applied to the part, and calomel and opium given internally. The employment of stimulants, both internally and externally, should be avoided.

Chronic Arteritis is of more frequent occurrence than acute, and is a state of the artery in which abnormal deposits are formed in the coats of the artery, and which frequently lead to the more serious derangements of the arteries. This disease is not to be detected by any symptoms during life, but is recognised after death by its effects on the arteries. The artery may be affected in spots or throughout its whole extent. The internal coat of the artery is enlarged and is less smooth and serous on its surface. Between the internal and middle coat there is a deposit of a soft, cheesy-looking, granular matter, either in points or patches. This deposit is usually called *atheromatous.* Under the microscope it is found to consist of fatty granules and molecules, which are frequently associated with crystals of cholesterine. The middle coat of the artery is frequently altered in its character, presenting a thin yellow opaque appearance. From this cause the elasticity of the artery is much impaired, its cohesion is diminished, it easily stretches, and is apt to tear. It is in this condition that dilatation of the artery, or true aneurism, takes place. It may also become the seat of ulceration, or it may tear at once, thus leading directly or indirectly to dangerous hæmorrhages. Although these changes are supposed to take place as the result of inflammation, there is no reason to believe that they may not go on quietly without inflammation. It is not improbable that the changes which thus go on in the artery are identical with those which produce fatty degeneration in the other tissues of the body. When this change takes place in the small arteries of the brain, it not unfrequently leads to an attack of apoplexy, from the rupture of the vessel and the effusion of blood upon the brain.

Calcareous deposits between the inner and middle coats of the artery may take place in the same way as the fatty deposits. In this manner the artery becomes ossified. In this case the arteries become hard and non-elastic, the internal coat is dry and shrivelled in appearance, and atheromatous deposits are found mingled with the calcareous.

The treatment of these forms of arterial disease, where they are suspected to exist, should consist in removing all causes that can contribute to hasten the changing condition of the arteries, and to prevent that action which may facilitate the enlargement, or endanger the bursting of the arteries.

Vascular or Erectile Tumour. This is a form of disease of the arterial tissue, sometimes called *Aneurism by Anastomosis.* There are three varieties: 1. The capillaries of the integument may become dilated so as to produce a discoloured elevation of the skin, more or less depressed. These tumours bleed copiously on the slightest abrasion, or from ulceration. It is commonly called *Nævus.* 2. The veins and arteries may be enlarged in the sub-cutaneous areolar tissue, producing a dark livid tumour of the skin. Copious hæmorrhage occurs from any rupture of the skin, but this may be generally arrested by pressure. Such tumours may occur under the mucous membrane, and are exemplified in those forms of hæmorrhoids which are situated partly within and partly without the verge of the anus. 3. The true erectile tumour which is composed of dilated blood-vessels, which are closely crowded together, and open into each other at many points. "These openings may be of secondary formation; the result of close apposition in the dilated vessels. Or more probably they are primary; the structure consisting of a network of dilated capillaries; the openings of communication being the ordinary and original inosculations, and what were intervascular spaces being now condensed into mere fibrous bands. The whole constitutes a vascular network of great capacity and activity of circulation, supplied, for reception of the returned blood, with large and tortuous veins, whose lining membrane is plainly continuous with that of the abnormal vascular cells. Also in the neighbourhood are to be found the feeding arteries; originally, perhaps, twigs, now enlarged to trunks pulsating strongly, and obviously carrying on a plentiful and active supply." (Miller, 'Practice of Surgery.') Such is the nature of those tumours which partake of the character of true erectile tissue. Like this tissue also, these tumours become enlarged and diminished in size, according to the sluggishness or activity of the blood circulating through them. They are compressible, elastic, and of a reddish hue. They are usually subcutaneous, but they are also submucous. The most common situations are beneath the integuments of the face, head, neck, back, and buttocks. The tumour pulsates synchronously with the heart, and may be considerably diminished in size by pressure, but resumes its usual condition when the pressure is withdrawn. On auscultation, a beat is heard, dull and rough, sometimes accompanied by a vibratory thrill.

Ulceration is likely to occur in these tumours, and lead either to great hæmorrhage or their cure.

Erectile tumour may be treated in three different ways :—

1. The tumour may be removed. This is always better done by the ligature than by the knife.

2. The tumour may be starved by diminishing the arterial supply. This is done, as in cases of true aneurism, by the application of a ligature to the artery or arteries which supply the tumour with blood.

3. The structure of the tumour may be changed. This may be effected in various ways; as by pressure, the introduction of a needle, the application of caustic potash, nitric acid, or other agent. A hot needle may be run through, or a wire connected with the poles of a galvanic battery may be passed through the tumour. All these plans have been found to succeed with small erectile tumours.

Varix of the Arteries.—A tortuous and dilated condition of the arteries frequently comes on in the smaller arteries, and produces a painful tumour. It may be removed in the same manner as varicose veins.

Arteriotomy is the term applied to the opening of an artery for the purpose of drawing blood, as phlebotomy is applied to the same operation in a vein. When it is thought desirable to take blood in large quantity and with much rapidity, it is better taken from an artery than from a vein. This operation however is more difficult to perform, and may be attended with ulterior consequences. Hence phlebotomy or venæsection is always preferred, except under urgent circumstances, as the means of drawing blood from the system. When arteriotomy is performed for the sake of blood-letting, one of the superficial anterior branches of the temporal artery is generally selected. In this position the wound is easily healed afterwards by pressure. The accidental wounding of an artery, as is sometimes the case in bleeding from the veins at the bend of the arm, may lead to false aneurism and the necessity of placing a ligature round the wounded artery. Sometimes false aneurism follows arteriotomy in the temporal artery, and in this case it becomes necessary to ligature the arteries on each side of the wound. Sometimes on removing the compress after arteriotomy, an ulcer is found to be formed. If the ulceration spreads, the vessel may be opened and hæmorrhage occur. In this case also the artery must be tied.

Bladder, Diseases of.—The bladder, like every other organ of the body, is liable to inflammation. This disease is called *Cystitis*. When present there is pain and tenderness in the region of the bladder, also in the region of the perineum and sacrum, and along the urethra. The urine is voided very frequently with great pain and straining. The urine passed is clouded with mucus, and afterwards contains pus often mixed with blood. These local symptoms are accompanied with general fever. The inflammation may extend from the bladder to the peritoneum.

This disease may come on after the operations of lithotomy or lithotripsy, or other direct injury. It may be the result of specific inflammation of the urethra, extending to the bladder, or it may come on from irritating medicines acting on the bladder, as cantharides.

In its treatment antiphlogistic remedies of an active kind are needed, such as bleeding generally and locally, antimony, calomel, and opium. Opium should be given by the mouth and per anum for the purpose of relieving the pain. The bowels should be opened by enemata and gentle purgatives; the recumbent position must be absolutely enjoined.

Cystitis may become chronic, or a chronic inflammation of the bladder may be produced by irritation in neighbouring organs, as in the urethra, rectum, or kidneys. There is pain in the bladder, frequent micturition, and mucus in the urine. The mucous membrane of the bladder may ulcerate, and then the urine is mixed with blood and pus. The ulceration may extend through the bladder to the surrounding organs. In the treatment of this disease, the obvious cause must be removed. Opium for the pain, a generous diet, astringent infusions, as of buchu, and mineral acids, are principally recommended. Iron is sometimes of great use, also copaiba. Counter-irritation on the hypogastrium, or over the sacrum, should not be neglected. In very chronic cases it has been recommended to wash out the bladder with warm water by means of a double catheter. Lallemand recommends the direct application of the nitrate of silver.

Irritable Bladder.—A state of the bladder is recognised in which there is no inflammatory action, but in which the symptoms resemble those of cystitis. There is frequent micturition, uneasiness in and about the region of the bladder. The urine is mostly limpid and clear. This state depends on some derangement of the kidneys or general health, or it may come on from piles, stone in the bladder, or thread-worms.

In treating this state the great thing to be done is the removal of any observed cause. Where it comes on in a generally decayed state of the health, the treatment must be directed to this condition of the system.

Hæmaturia.—Blood in the urine may present itself when the kidneys, bladder, or urethra are affected. When it arises from the kidneys the blood presents itself in the form of small tubular cysts, produced in the tubules of the kidneys. When the bladder is the seat of stone, cystitis, or malignant tumours, bloody urine may make its appearance. When the hæmorrhage proceeds from the urethra, the blood passes away independent of the urine. In these cases the cause of the hæmaturia must be treated.

Incontinence of Urine or Enuresis. This disease presents itself in two classes of cases, in children, and in adults. The first is a very common and troublesome disease. The urine is usually passed voluntarily during the day, but in the night it passes away involuntarily. Although frequently treated as though it were a bad habit, it is the result of a morbid state of the system, which must be removed, and the will should only be called into exercise to assist a judicious system of treatment. All causes of general debility should be removed. Sea air, cold sea-bathing, with the administration of iron, especially the tincture of the sesquichloride, are the most appropriate remedies for the want of tone of the nervous system which accompanies this disease. Strychnia has been recommended. The child should not lie on its back, and it should be awakened in the night, at stated intervals, to pass the urine voluntarily. Mechanical remedies are to be condemned.

In the incontinence of adults, either the urine passes away from previous retention, or, as happens in aged people, the bladder loses its tone, and both its expulsive and retentive powers are feeble or gone. In the first case the catheter must be employed to empty the bladder, and the retention treated. In the other case, tonics and other remedies necessary for the debilitated state of the system must be employed. Generally, however, little can be done, and cleanliness and the use of urinals are the only means left.

Retention of Urine. This arises from various causes, and the treatment must vary accordingly. The symptoms in all cases are, an inability to evacuate the urine, whilst the desire to do so is constant and frequently accompanied with pain, straining, and distress. The bladder is distinctly felt to be distended above the pubes, there is dullness on percussion there, and pressure produces great pain. Sickness is frequently present, the pulse becomes rapid, the skin hot, and at last symptoms of the absorption of the urine present themselves, and unless relieved, the patient dies from the blood becoming poisoned by the urea of the urine. All these symptoms are removed by the removal of the urine. This may frequently be done by the catheter, but the disease can only be cured by the removal of the cause.

The following are enumerated as causes of this disease. Stricture of the urethra. Inflammation of the urethra. Irritation and spasm of the neck of the bladder. Priapism. Abscess in the perineum. Abscess in the pelvis. Calculus in the urethra. Injury of the perineum. Paralysis. Diseased prostate. Blood in the bladder. Malignant disease of the bladder or urethra. Imperforate urethra. In each of these cases a special treatment is necessary, but in all it should be remembered that fatal results will occur unless the distended viscus is emptied of its contents. It often happens that for this purpose the catheter cannot be passed into the urethra; under these circumstances the only means left is to puncture the bladder. This operation may be performed from the perineum, the rectum, and the pubes. In puncturing the bladder from the perineum an operation is performed similar to that for lithotomy. [LITHOTOMY.] When this operation is deemed unadvisable, the bladder may be reached from the rectum and punctured here. It is only when these two methods are found to be impracticable that puncturing the bladder through the parietes of the abdomen in the region of the pubes is had recourse to. These operations are not often performed: "but any one of them is much preferable at any time to postponement of relief, and consequent disaster by extravasation; and all, too, are preferable to pushing a metallic catheter by sheer force through an impassably strictured urethra." (Miller.)

Diseases of the Prostate. The prostate gland is liable to the various diseases of other parts of the urinary organ. It may be inflamed, or abscess may occur in it, or it may be subject to malignant disease. It is, however, most liable to *enlargement* or hypertrophy, which is one of the most troublesome and frequent diseases to which old age is liable.

Enlargement of the prostate is of two kinds. One is the result of inflammatory action, and the other is an enlargement independent of that process. The first is only temporary, and may be frequently speedily removed by treatment. It is the result of stricture, gleet, affection of the rectum, or injury to the perineum in riding. Leeches, purgatives, the recumbent position, and counterirritants, are the proper treatment. The second form of enlarged prostate is more difficult to manage. It is one of the consequences of increasing age. The enlargement in these cases may be partial or general. One of the most painful consequences of either is a difficulty in passing the water. This comes on gradually, and is also attended with difficulty in emptying the rectum, as this organ is pressed on by the distended prostate. As the tumour enlarges the calls to empty the bladder are more frequent, and the act is less perfectly accomplished, and a portion of residuary urine remains in the bladder behind the enlargement. Under these circumstances the bladder becomes irritable, and chronic cystitis is established. The symptoms of this disease are then added to those of the enlarged prostate.

There is no cure for this state of things, and the treatment is consequently palliative. Much, however, may be done for the comfort of the patient. All excess and imprudence in diet and exercise must be avoided. The recumbent position must be maintained as much as possible. The bowels regulated by enemata and gentle aperients. Opium, iron, mineral acids, and buchu, may be given according to circumstances. In order to prevent distension the catheter must be had recourse to, and the water drawn off occasionally.

BREAST, DISEASES OF. The mammary gland, especially in the female, is liable to various diseases, requiring the attention of the medical man.

Irritable Mamma. In both married and unmarried females the breast is liable to irritation from sympathy with other parts of the system. In these cases there is often great pain and uneasiness in the breast, and the whole system suffers more or less. There is no inflammation, and no swelling or external alteration of the mamma. The pain is sometimes intermittent or periodic, similar to neuralgia. When the general health is affected this must be attended to. Opium and hemlock may be employed internally, and nitrate of silver, belladonna, and aconite, have been recommended externally.

Mammitis. Inflammation, acute and chronic, of the substance of the mamma is not an unfrequent disease. It comes on from exposure to cold or a blow, or during the period of lactation. The pain is intense; the breasts are swollen, and tender to the touch. From the first there is a tendency to suppuration. The secretion of milk is perverted and arrested. In the treatment leeches and warm fomentations and poultices should be applied to the breast. The bowels should be kept open, and the fever subdued. When matter forms it should be early evacuated. A chronic inflammation is sometimes observed. When this is the case stimulant applications to the breast will be found useful. Where this is attended with abscess it should be opened, so as to give free exit to the pus, and pressure applied.

Tumours of the Breast. The breast is subject to various kinds of partial and general enlargement. The "chronic mammary tumour" of Sir Astley Cooper consists of a partial hypertrophy of the gland. Enlargement of the whole gland also frequently takes place. These enlargements may be got rid of by pressure and treatment of the general health. The lactiferous ducts are sometimes blocked up, so as to produce distension, and an enlargement called *lacteal tumour*. Puncturing the enlarged tube and keeping it open will cure this form of tumour. The breast is also liable to fatty tumours, fibrous tumours, cystic sarcoma, hydatids, and malignant tumours. In many of these cases it becomes necessary to remove the breast. This is done in the following manner: "The patient having been placed recumbent, and duly anæsthetized, the arm on the affected side is raised and held by an assistant, so as to stretch the pectoralis major and facilitate incision. The knife is entered in the axillary aspect of the tumour in a line with the mammilla, and is moved in a semi-elliptical direction towards the opposite point; a similar proceeding is adopted—above or below, as the case may be—to complete the ellipse, and the size of this space necessarily varies according to the extent to which the integument seems to be involved, and according to the natural laxity of the parts. It is a fault to take away an undue amount of sound textures, so that difficulty is experienced in effecting and maintaining apposition of the wound; but it is a worse error to leave tainted parts, whereby reproduction of the disease cannot fail speedily to ensue. It is well to make the lower incision first, otherwise its course and position are apt to be uncertain under the irrigation of blood. Then on each aspect the knife is sloped through the subcutaneous part; and regular dissection is proceeded with from the axilla downwards, dividing the principal vessels and nerves at once, and so rendering the subsequent steps of the operation comparatively bloodless and free from pain. The diseased mass, with its border of comparatively sound tissue, in the case of malignant tumour, having been removed, is carefully examined on every aspect by both sight and touch; and, if need be, the knife is re-applied where thorough removal is not assuredly apparent. The vessels having been secured, the wound is brought together and treated in the ordinary way."

Much has been recently said of the removal of malignant tumours, especially of the breast, by means of escharotics. It is always difficult to decide exactly as to whether a tumour is malignant; and from all that has hitherto been made known of these formations, it would appear that, if they are cured by general or local treatment, the inference is that they were not malignant. With regard to general treatment, the evidence is very decisive that we possess no internal remedy that has any known influence over the progress of those tumours which are truly malignant. A recent American writer has professed to remove cancerous ulcers by a general and local treatment, which has been witnessed and reported on in this country. The cases referred to were treated at the Middlesex Hospital. The general treatment consisted in the administration of iodide of arsenic and the *Sanguinaria Canadensis.* The local treatment consisted in the application of the Sanguinaria and chloride of zinc. The method employed was to make a decoction of the sanguinaria, and, with an equal quantity of the chloride of zinc, to make the whole into a paste with common flour. This paste was applied directly to ulcerated cancers; and, where the skin was unbroken, nitric acid was first employed to produce an eschar. After this process incisions were made into the tumour, and the paste was inserted into the incisions on pieces of calico. This was continued from two to seven weeks, till the whole depth of the tumour was penetrated and removed. When this was effected the application of the paste was discontinued, and the wound allowed to get well. The Sanguinaria seems to exert no effect in this treatment, and its consideration may be altogether set aside. The following passage concludes the report of the surgical staff of the Middlesex Hospital on this mode of treating malignant tumours:—

"The last peculiarity of this treatment is the practice of incisions; and we are of opinion that this is its only but its very great merit. The Sanguinaria is inert; the chloride of zinc paste was known before; but the incisions constitute a new feature in the treatment of cancerous tumours for which we find no parallel in the writings of the past, or in the practice of present surgeons. Cancer in its constitutional nature remains as ruthless and as unassailable as ever."

SUZAMNITE. [Mineralogy, *S.* 1.]

SWEDEN. In 1839, to which date the population was given in the previous article, it amounted to 3,109,772. The following table shows the increase, and also the läns or provinces into which Sweden is divided:—

Läns.	Area in Square Miles.	Population, December 31, 1855.
Malmö . . .	1,774	268,664
Christianstads . . .	2,421	196,121
Halmstads . . .	1,892	110,815
Carlscrona . . .	1,130	111,239
Wexiö	3,771	143,707
Jönköpings . . .	4,274	166,462
Calmar	4,240	212,565
Linköpings . . .	4,236	230,601
Mariestads . . .	3,301	209,236
Wenerborgs . . .	5,015	254,544
Göteborgs . . .	1,883	195,792
Wisby	1,222	46,985
Stockholms . . .	2,899	117,193
Upsala	2,059	90,828
Westerås . . .	2,650	98,941
Nyköpings . . .	2,497	123,689
Örebro	3,250	142,863
Carlstads	6,916	232,521
Falun	12,209	158,755
Gefleborgs . . .	7,529	126,368
Hernösands . . .	9,461	110,148
Ostersunds . . .	19,053	55,988
Umeå	29,258	79,515
Piteå	32,893	60,108
Total . . .	165,833	3,543,648

This area, increased by 3548 square miles of water not included in the läns, and the population column by 97,952, the number of the inhabitants of Stockholm, the capital of the kingdom, gives the total area 169,381 square miles, and the total population 3,641,600.

Manufactures.—The industrial products of Sweden comprise vast quantities of linen, which is manufactured in almost every house, woollen-cloth and other stuffs, refined sugar, tobacco, paper, leather, glass, some calicoes and other cotton goods, cotton twist, silks, china-ware, cast-iron, sail-cloth, soap, spirits, beer, &c. Ship-building is carried on to some extent in most of the harbours of the Baltic.

Internal Commerce.—The internal commerce in corn, salt, and manufactured goods, especially the linens of Wenerborgs-Län, which are carried to the most remote parts of the country, is very considerable. This commerce is facilitated by the excellent roads, and in winter by the whole country being covered with snow for four or five months, which renders the conveyance of goods in sledges easy and expeditious. In summer a like advantage is derived from the navigation of the sea, which washes most of the provinces. The Trolhättan Canal is navigated by a great number of barges, which bring down to Göteborgs, for export, large quantities of iron and steel, and timber in planks and boards; and they carry into the interior corn, whiskey, salt, herrings, sugar, butter, fish, wine, and some other articles. Large barges ply also on the other canals, conveying heavy goods of different descriptions, such as bar-iron, alum, corn, salt, herrings and strömings, whiskey, bricks, and tiles. A railway has been commenced, of which a portion, from Örebro to Arboga, with a branch from Dylta to Nora, was open in 1858. It is intended ultimately to connect the Wener lake with the Malar lake, and thence with Stockholm, Arboga being a great entrepôt for iron.

Navigation and Foreign Commerce.—The Swedes are much given to a sea-faring life. Their vessels visit most of the countries contiguous to the Atlantic, and they are also employed in the carrying-trade between other countries, especially in the Mediterranean and on the coasts of South America. The mercantile navy at the end of 1855 numbered 2874 vessels (carrying together 126,236 lasts), exclusive of those carrying less than ten lasts; and 131 steamers. The total number of foreign (including Norwegian) ships that entered Swedish ports in 1855 amounted to 6733, carrying 200,880 lasts; the departures numbered 10,565 vessels, measuring 428,384 lasts. The imports were valued at 56,561,000 crowns; the exports at 63,898,000 crowns. The foreign trade extends to most countries in Europe and America. The chief imports are brought from the following countries, which are named in order of the values:—The Hanse Towns, Great Britain, Brazil, Norway, Russia, Denmark, United States, East Indies and Australia, Prussia, and the West Indies. The best customers for Swedish exports are Great Britain, Denmark, the Hanse Towns, France, Prussia, United States, Russia, and Portugal.

The principal articles of export from Sweden are iron and timber. Norway takes a considerable quantity of iron, and sends fish in return. Stockholm receives from Finland three-fourths of the fire-wood which it consumes, the northern provinces not being able to supply the article either so cheap or so good. Finland also exports to Stockholm meat, butter, cheese, bacon, flour, hides, pitch, and tar. Other articles of export are copper, cobalt, alum, tar, pitch, hemp, oil, paper, tree-bark, tobacco and snuff, bricks, furs, some linens, vessels, and some minor articles. The chief articles of import are : sugar, coffee, salt-fish, hides, cotton-twist, cotton in wool, woollen stuffs, linens, cottons, wine and brandy, wool, dye-stuffs, raisins, almonds, pepper, cinnamon, arrack and rum, butter, bacon, tobacco, soap, train-oil, ginger, lacquered ware, tea, tallow, potashes, and oil.

Education.—Sweden has two universities, Upsala and Lund. The average annual attendance at the former is about 1000 students; at the latter, between 400 and 500. There are besides, 12 gymnasia for higher instruction, preparatory to the universities; 41 lardoms skola, or grammar schools, and 40 apologist schools, where the common branches are taught, with, in some instances, French and German. For elementary education, the law of 1842 commanded the erection of a school in each commune or parish. Owing to the sparseness of the population this was found to be in many instances impracticable; in such cases however the communes are divided into districts, each of which is visited in turn by ambulatory schoolmasters. Schoolmasters are trained by government and paid by the communes in kind. In 1850 there were 2107 stationary and 1351 ambulatory schoolmasters. Of the masters, 218 were clergymen and 690 church clerks. In that year, 143,526 children were receiving instruction in the stationary schools, 126,178 in ambulatory schools, 128,996 were instructed at home, 6223 in the secondary schools above named, and 17,465 in private schools, making a total of 422,388 altogether under instruction. It is a general practice in Sweden for parents, especially those who live in the country, to instruct their children in the long winter evenings.

Finance, &c.—The income of the state has been calculated for 1856 and 1857 at 14,358,300 crowns; and the expenditure at 12,876,920 crowns; but in the budget proposed for 1858, 1859, and 1860, the receipts are set down at 25,427,500 crowns, and the expenditure at 24,217,000 crowns. These sums are for Sweden independent of Norway. The strength of the army and navy are stated under Military and Naval Forces, *S.* 2. The present king, Oscar I., succeeded his father in March, 1844.

SWEET-SOP. [Anonaceæ.]

SWEET-WILLIAM. [Dianthus.]

SWIFT. [Swallows.]

SWIMMING-BIRDS. [Natatores.]

SWITZERLAND. There is no material alteration in Switzerland, but the following table gives the area of the different cantons, the number of their representatives in the National Council, and the population in 1850:—

Cantons.	Area in Square Miles.	Population in 1850.	Representatives.
Aargau . . .	501	199,852	10
Appenzell . . .	152	54,893	3
Basel . . .	184	77,583	3
Bern . . .	2,556	458,301	23
Freyburg . .	563	99,891	5
St. Gall . . .	758	169,625	8
Geneva . . .	91	64,146	3
Glarus . . .	279	30,213	2
Grisons . . .	2,962	89,895	4
Luzern . . .	586	132,843	7
Neufchâtel . .	250	70,753	4
Schaffhausen . .	115	35,300	2
Schwyz . . .	338	44,168	2
Soleure . . .	254	69,674	3
Thurgau . .	268	88,908	4
Ticino . . .	1,033	117,759	6
Unterwalden . .	262	25,138	2

Cantons.	Area in Square Miles.	Population in 1850.	Representatives.
Uri	420	14,505	1
Valais . . .	1,658	81,559	4
Vaud . . .	1,180	199,575	10
Zug . . .	85	17,461	1
Zürich . . .	684	250,698	13
Total . .	15,179	2,392,740	120

SYCAMORE-FIG. [Ficus.]

SYLVIADÆ. The following is a list of the British species of this family, as given in Yarrell's 'British Birds':—

Accentor alpinus, Alpine Accentor.

A. modularis, the Hedge Accentor, or Hedge-Warbler.

Erythaca rubecula, the Redbreast, or Robin. [Erythaca, *S.* 2.]

Phœnicura Suecica, the Blue-Throated Warbler. [Blue-Breast.]

P. ruticilla, the Redstart. [Warblers.]

P. tithys, the Black Redstart.

Saxicola rubicola, the Stonechat. [Warblers.]

S. rubetra, the Whinchat. [Whinchat.]

S. œnanthe, the Wheatear. [Wheatear.]

Salicaria locustella, the Grasshopper Warbler.

S. phragmites, the Sedge Warbler. [Salicaria, *S.* 2.]

S. luscinoides, Savi's Warbler. [Salicaria, *S.* 2.]

S. arundinacea, the Reed Warbler. [Salicaria, *S.* 2.]

Philomela luscinia, the Nightingale. [Nightingale.]

Curruca atricapilla, the Black-Cap Warbler. [Black-Cap.]

C. hortensis, the Garden Warbler.

C. cinerea, the Common Whitethroat. [Whitethroat.]

C. sylviella, the Lesser Whitethroat.

Sylvia sylvicola, the Wood Warbler.

S. Trochilus, the Willow-Warbler.

S. hippolais, the Chiff-Chaff.

Melizophilus Dartfordiensis, the Dartford Warbler.

Regulus cristatus, Golden-Crested Regulus. [Regulus, *S.* 2.]

R. ignicapillus, Fire-Crested Regulus. [Regulus, *S.* 2.]

R. modestus, Dalmatian Regulus. [Regulus, *S.* 2.]

(Yarrell, *History of British Birds.*)

SYMONDS, REAR-ADMIRAL SIR WILLIAM, C.B., F.R.S., Surveyor of the Navy, was born on the 24th of September 1782, entered the navy at an early age, and during the early part of his career was much engaged in active service on the coasts of France and Spain, and in the West Indies. But his reputation chiefly rests upon his skill as a naval architect. Notwithstanding the innovation in established usage which had been made by the genius and vigour of Seppings [Seppings, Sir Robert, *S.* 2] destroying the force of those prescriptive restraints which had so long trammelled the older ship-wrights, enterprise in naval architecture was still checked by the custom of building ships of certain dimensions, which had been officially established, and a restriction with respect to tonnage was always imposed on constructors. It remained for Commander Symonds to procure the removal of this restriction. He was first allowed, but under, it is said, a very unusual and restrictive penalty, to construct a corvette, the Columbine. To her he was appointed, December 4, 1826, and so great was the success which attended him in the experimental cruises he made during the next twelve months, that he was advanced, as a reward, to post-rank, by a commission bearing date December 5, 1827. In these cruises the sailing qualities of Captain Symonds's ship were compared with those of other ships constructed respectively by Sir Robert Seppings, the School of Naval Architecture, and Captain Hayes. And although no fact directly conducive to improvement in naval architecture was established by these and subsequent trials, it was found that great superiority in cruising was exhibited by the Columbine, and the zeal and devotion of Captain Symonds were farther rewarded. At the beginning of 1831, by the munificence of the late (fourth) Duke of Portland, he was enabled to build, as an improvement upon the Columbine, the 10-gun brig Pantaloon, the triumph of which vessel led to the construction, under his superintendence, of the Vernon 50, Vestal 26, Snake 16, and other ships. Improved velocity and greater stability, obtained by great breadth of beam, and diminution of breadth immediately below the water-line, were the characteristics of these new vessels. The restriction arising from the prescribed limit of tonnage was first broken through in the case of the Vernon, which Captain Symonds was allowed to construct free from that impediment. And, even whilst she was upon the stocks, she was considered to present such excellent qualities, that it was deemed Captain Symonds had already given sufficient proof of his skill in naval architecture to be entitled to the highest post and responsibilty in that profession. In 1832 on the 9th of June, he was offered, and accepted, the office of Surveyor of the Navy, in succession to Sir Robert Seppings. This appointment was associated with the entire removal of restriction as to the amount of tonnage in ships of the navy. Captain Symonds therefore had liberty for the exercise of judgment and talent in designing ships, which had not been granted to the commissioners or surveyors of the navy before; so that he might at once build ships on the best conditions of excellence that both science and practice had yet indicated. This freedom from conditions in determining the dimensions of ships, was taken ample advantage of by him; having a great principle to bring out in practice, he applied it with a decision, which, in a short time, altered the general character of no inconsiderable part of our navy. He had the merit of having boldly taken the lead in a path which future constructors, intending to carry on improvements in our ships, may pursue with the highest advantage. Considerable difference of opinion exists as to the value of the totality of qualities possessed by Captain Symonds's ships; but it was remarked in 1849, two years after he had retired from office, that of the 180 vessels of different kinds, built during the period of sixteen years, for which he was surveyor of the navy, and all upon the same principles of construction, as already noticed, and as originally adopted in the Pantaloon, none had foundered.

Captain Symonds received the honour of knighthood in 1836. He had received the thanks of the Admiralty in 1830 for a memoir containing 'Sailing Directions for the Adriatic Sea;' and again, in 1837, for "the valuable qualities of his several ships, and for improvements introduced by him into the navy;" he was elected a Fellow of the Royal Society on June 4th, 1835, and nominated a C.B. of the Civil division in 1848. In 1854 he became a Rear-Admiral on the retired list. He died, March 30, 1856, on his voyage from Malta to Marseille.

(O'Byrne, *Naval Biographical Dictionary;* Fincham, *History of Naval Architecture, &c.*)

SYNÆTHERES. [Porcupines.]

SYNAPTÆ, a family of *Echinodermata*, belonging to the order *Holothuriadæ*. It is characterised in this order by the absence of suckers. It is represented in the British seas by the genus *Chirodota*, which has a cylindrical and vermiform body, elongated tentacula, digitate at their extremities.

C. digitata has a vermiform body, white with orange spots, the tentacula long, pedunculated, digitate. This animal was first found by Montagu on the shores of South Devon. It is very rare. Professsor E. Forbes, in his 'History of British Star-Fishes,' says that he never had seen a living specimen.

SYNAPTASE. [Chemistry, *S.* 2.]

SYNGNATHIDÆ, a family of Fishes, embracing, according to some authors, the Pipe-Fishes, the Sea-Horses, and the Winged Sea-Horses. These forms are sometimes assigned to distinct families, as in the following definitions:—

Syngnathidæ, Pipe-Fishes. — Body prolonged, slender, linear, or angulated; snout greatly prolonged, cylindrical; mouth terminal, vertical. Ventral fins absent; caudal fin wanting in some.

Hippocampidæ, Sea-Horses.—Head and body compressed; snout narrow, tubular; mouth terminal. Pectorals small; dorsal single; caudal fin wanting.

Pegasidæ, Winged Sea-Horses.—Body broad, depressed; snout suddenly contracted, narrow, somewhat protractile; mouth terminal, beneath. Pectorals generally large; caudal fin small.

They all agree in having the endo-skeleton partially ossified; exo-skeleton ganoid; gills tufted (hence the group is named *Lophobranchia*), in the opercular aperture being small, and the swimming-bladder without an air-duct. We shall illustrate this family by a short description of the British species:—

Syngnathus has the body elongated, slender, covered with a series of indurated plates arranged in parallel lines. Head long; both jaws produced, united, tubular. No ventral fins.

In certain of the species the males are furnished with an elongated pouch under the tail; these are called marsupial, and include the British species *S. Acus* and *S. Typhle.*

S. Acus, the Great Pipe-Fish, is one of the most common forms of the genus. It is found on many parts of the coast, sometimes at low-water amongst sea-weeds; at other times in deep water. The most curious feature in the economy of this fish is the fact that the roe is transferred from the belly of the female to the pouch of the male.

S. Typhle (Linnæus), the Deep-Nosed Pipe-Fish, Lesser Pipe-Fish, or Shorter Pipe-Fish; *Acus Aristotelis* and *Typhle antiquorum* of Willughby. This fish is distinguished from the last by the more compressed form of the jaws. From the British species it is distinguished by the possession on the part of the male of a pouch for the reception of the ova. The habits of this fish resemble those of the last.

S. æquoreus, the Æquoreal Pipe-Fish. This fish has no subcaudal pouch. It is comparatively rare on the British coast.

S. anguineus, the Snake Pipe-Fish. Although this and the preceding species possess no subcaudal pouch, the ova after exclusion from the female are carried by the male in separate hemispheric depressions on the external surface of the abdomen.

S. ophidion, the Straight-Nosed Pipe-Fish, is known by its straight nose. It is about nine inches in length.

S. lumbriciformis, the Worm Pipe-Fish, is the smallest of the British species. It has been taken on various parts of the coast. It does not exceed five inches in length. The young of this species have been observed to undergo a curious metamorphosis. On their escape from the egg the tail is covered with a fin-like membrane, and it also possesses pectoral fins. During their growth the caudal membrane and pectoral fins are absorbed.

Hippocampus.—The jaws are united and tubular, the mouth placed at the end. The body compressed, short, and deep. The whole length of the body and tail divided by longitudinal and transverse ridges, with tubercular points at the angles of intersection; both sexes have pectoral and dorsal fins; the females only have an anal fin; neither has ventral or caudal fins.

H. brevirostris, the Sea-Horse, or Short-Nosed Hippocampus, is occasionally met with on the British coasts. The habits of these creatures are very singular. When swimming about they maintain a vertical position, but the tail is ready to grasp whatever meets it in the water. It quickly entwines in any direction round weeds or other objects, and when fixed the animal intently watches surrounding objects, and darts at its prey with great dexterity. When two are together they often twist their tails together. Their eyes move independently of each other, as in the chameleon.

Pegasus has a snout as in the previous genera, but the mouth is under it, and moveable. Two distinct ventral fins behind the pectoral, which are often large, hence the name of *Pegasus*, or Flying Horse. The species are found in Indian Seas.

(Yarrell, *History of British Fishes*; Adams, *Manual of Natural History.*)

SYNODUS. [ISOPODA.]

SYRINGINE. [CHEMISTRY, *S.* 2.]

SYRINX. [SIPHUNCULOIDEA, *S.* 2.]

SYSTEM, SEXUAL. [SEXUAL SYSTEM, *S.* 2.]

T

TAHITI. [OTAHEITE.]

TALFOURD, SIR THOMAS NOON, KNT., was born January 26, 1795, at Doxey, a suburb of the town of Stafford, where his mother was then on a visit. His birth was premature. His father was a brewer at Reading in Berkshire. His mother was a daughter of Thomas Noon, minister of a congregation of Independents in that town, to which sect his father also belonged. Thomas Noon Talfourd was educated at the grammar-school of Reading, under Dr. Valpy, for whom he always entertained an affectionate respect. In the year 1813 he was placed for legal instruction under Mr. Chitty, the special pleader, and in 1817 commenced practice as a special pleader on his own account. During many years of the earlier part of his residence in London his income was derived chiefly from his literary labours, as a contributor to the 'London Magazine,' the 'New Monthly Magazine,' and other periodicals. He was called to the bar by the authorities of the Middle Temple, February 9, 1821, and in 1822 he married the daughter of John Towell Rutt, Esq., of Clapton, near London, the editor of Dr. Priestley's works. He soon afterwards joined the Oxford Circuit. By steady application, rather than by any peculiar aptitude or liking for the law, he gradually rose in his profession. He was a fluent speaker, distinguished by feeling and fancy, more than by argumentative powers. After about ten years practice he applied for a silk gown, but his claim of the dignity of Queen's counsel was deferred till his patience was exhausted, and he therefore, in Hilary Term, 1833, assumed the coif, and became Mr. Serjeant Talfourd. He was also for some years Recorder of Banbury.

At the general election in 1835 Mr. Serjeant Talfourd was returned to parliament as one of the members for the borough of Reading, Mr. Fyshe Palmer, the previous liberal member, having retired. In 1837 Mr. Palmer again came forward, and was returned with Mr. Talfourd. At the next election two conservatives were returned, and Mr. Talfourd was out of parliament from 1841 to 1847, when he was again returned for Reading, and retained his seat till July 1849, when he vacated it on his being appointed successor to Mr. Justice Coltman in the Court of Common Pleas, on which occasion he also received the honour of knighthood. As a member of the legislature Mr. Serjeant Talfourd may be said to have added two valuable enactments to the statutes of the realm—the Custody of Infants Act (2 & 3 Vict., c. 54), and the Copyright Act, which he first introduced in 1837, but which was strongly opposed, and was not passed into a law till 1842 (5 Vict., c. 45), when he was not a member of parliament, and then in a modified form.

During all this period of legal and parliamentary activity Mr. Talfourd continued his labours in literature. He was for several years law-reporter of circuit cases for the 'Times' newspaper, and he continued to contribute to the 'New Monthly Magazine,' and also to the 'Retrospective Review,' the 'Edinburgh Review,' the 'Quarterly Review,' and the 'Law Magazine,' to which last he furnished in January, 1846, an able article 'On the Principle of Advocacy in the Practice of the Bar.' In 1835, he printed for private circulation two editions of his tragedy of 'Ion.' On the 26th of May, 1836, the tragedy was acted for the benefit of his friend Mr. Macready, at Covent Garden Theatre, and at the same time was published. It was afterwards acted with success at the Haymarket Theatre, and elsewhere. The tragedies of the Greek dramatists were occasionally performed by the scholars at Dr. Valpy's school in Reading, and there Mr. Talfourd acquired his taste for dramatic literature. The first two privately printed editions of his tragedy of 'Ion' were dedicated to his venerable master, who, however, died before it was acted, and then a 'Notice of the late Dr. Valpy' was "prefixed instead of Dedication to the first published Edition of Ion." The title is borrowed from the 'Ιων' of Euripides, which also suggested the leading incident of a foundling youth educated in a temple, and assisting in its services, but nothing more. His next tragedy, 'The Athenian Captive,' was published in 1838, and was performed in the same year at the Haymarket Theatre with moderate success. This tragedy was succeeded by that of 'Glencoe, or the Fate of the Macdonalds,' first represented at the Haymarket, May 23, 1840. 'The Castilian,' an Historical Tragedy, in Five Acts, was published in 1853, but was not acted. In none of these tragedies does he display much of what may be properly called dramatic skill, nor does he excite that kind or degree of interest which arises from distinctness and discrimination of character, depth of emotion, and truthfulness of thought and expression. They may be rather regarded as dramas of poetic sentiment and description. The blank verse is smooth, graceful, and "in linked sweetness long drawn out," but all the individuals use indiscriminately the same elaborate form of expression, and the meaning is not unfrequently rendered obscure by the redundancy of the diction.

In 1837 Mr. Talfourd published the 'Letters of Charles Lamb, with a Sketch of his Life,' 8vo. In 1848, after the death of Lamb's sister, he published 'Final Memorials of Charles Lamb, consisting of Letters,' &c. 2 vols. 8vo, a domestic tragedy of the most affecting interest, which had been long known to a few friends, but was not till then disclosed to the public. [LAMB, CHARLES.] On the 20th of June, 1844, he was created a Doctor of Civil Law by the University of Oxford. In 1845 he published 'Vacation Rambles and Thoughts, comprising the Recollections of Three Continental Tours in the Vacations of 1841, 1842, and 1843,' 2 vols. 8vo, and in 1854, a 'Supplement to the Vacation Rambles, consisting of Recollections of a Tour through France to Italy, and Homeward by Switzerland, in the Vacation of 1846,' fcap 8vo. The journeys were all rapidly made, and the information which the volumes contain is very scanty. Some of his speeches as an advocate and also as a member of parliament were published in a separate form. He was an eloquent speaker, and had extraordinary command of language, but his style was too florid to be very effective. His reputation is that of a sound lawyer for deciding cases, at the same time that his persevering labour, great practice, and love of justice, made him respected both as an advocate and a judge. In his private character he was amiable and social in an eminent degree, and he had a large circle of friends, chiefly literary and legal.

The death of Mr. Justice Talfourd occurred on the 13th of March, 1854. He had opened the assizes at Stafford on Saturday the 11th, and on Monday morning, while delivering his charge to the grand jury, and commenting on the increase of crime and its causes, he was observed to be much excited. Suddenly his face became flushed, his head bent forward, and his body swayed on one side. He was immediately borne out of court to the judge's chambers, where it was found that he had ceased to live. He was buried in the cemetery at Norwood, near London. He left issue three sons and two daughters. In 1855 the members of the Oxford Circuit placed a bust of him, sculptured by Lough, in the Crown Court at Stafford. It is an excellent likeness.

TALLOW, or TALLAGH. [WATERFORD.]

TANACETINE. [CHEMISTRY, *S.* 2.]

TANGHINE. [CHEMISTRY, *S.* 2.]

TAPE-WORMS. [ENTOZOA; PHYSIC, PRACTICE OF (*Worms*), *S.* 2.]

TAPITELÆ. [ARANEIDÆ, *S.* 2.]

TAPLOW. [BUCKINGHAMSHIRE.]

TARANDUS (*Rangifer*). [DEER.]

TARRAGON. [ARTEMISIA.]

TARTALIC ACID. [CHEMISTRY, *S.* 2.]

TARVER, JOHN CHARLES, was born of English parents at Dieppe, Normandy, March 27th, 1790. At the breaking out of the war in 1793, his family, in common with all other English residents at Dieppe, were thrown into prison. At that time the little boy was staying at the country-house of a friend of his mother (M. Féral, de la Carperie, ingénieur en chef des ponts et chaussées du Departement de la Seine Inférieure), and when his family, through the interest of friends, had the means of escape given them, he was left behind in France until an opportunity should offer to send him to England. This never occurred. But M. Féral, faithful to his trust, brought the child up as his own son, educated him partly himself and partly at the government school at Pont-Audemer, and at the age of fifteen took him into his own employment in the several works he was superintending under the government. In the year 1808 M. Féral got the youth an appointment in the Administration de la Marine, in which service he remained, first as secretary to the admiral of the fleet at Toulon, and afterwards in different ports, as Leghorn, La Spezzia, Genoa, and Brest, till at the cessation of the war in 1814 he was enabled to renew his intercourse with his family. In March 1815 he obtained a short leave of absence, and hastened to England, where he found his mother, brother, and sister living. He returned to Paris at the expiration of his leave in April, where he found that Bonaparte had escaped from Elba, and had put himself at the head of his army, and that the king, Louis XVIII., had fled. Such being the uncertain state of affairs, and his own desire to return to his family being very strong, Mr. Tarver gave up his situation, and in less than a week rejoined his mother. He soon sought and obtained employment as a French master; first at the grammar-school at Macclesfield in Cheshire, where he remained three years. In 1818 he went to live at Windsor, and in 1826 he was appointed French master to Eton school, which situation he held till his death April 15th, 1851, aged sixty-one.

Besides having written several elementary works, now used at Eton and some other public schools, he published while at Macclesfield a 'Dictionary of French Verbs, showing their Government and Peculiarities.' During his residence at Windsor he wrote his translation of the 'Inferno' of Dante in French prose, with a volume of notes; and subsequently 'Lectures on French History,' 'Paris, Ancient and Modern,' and some minor works. He also revised the grammars of Wanostrocht and Levizac, and Nugent's 'Pocket French and English Dictionary.' For the last ten years of his life he was engaged on his 'Phraseological French and English Dictionary,' an original work of immense labour, and which has given to its author a high place amongst those who have most distinguished themselves in philological studies.

TASMANIA. A full description of this colony, formerly more generally known as *Van Diemen's Land*, will be found in vol. xxiv. The following gives the material alterations that have taken place.

The population in December 1847 had increased to 70,164, of whom 47,828 were males and 22,336 females. Of this total 33,173 were either free emigrants, or were born in the colony; the rest were then or had been convicts. Emigration to Victoria colony has combined with other causes to prevent any material increase of the population of Tasmania. On Dec. 31, 1855, it was only 69,962, of whom 7740 were convicts, although 10,887 emigrants had arrived during the year. The greater part merely made it the place of transit, but many of the old settlers must also have left.

Notwithstanding this drawback the colony is highly prosperous, and its trade and commerce have been continually expanding. The efforts of the local government are rapidly extending improvements over the island. Among the greatest works is a bridge over the Derwent, on the high road from Hobart Town to Launceston; it is of wood, and has 20 bays, or arches, of 32 feet span each.

The exports to Great Britain in 1853 included 5,514,756 lbs. of wool (the average quantity for four years, 1849-52, had been upwards of 5,000,000 lbs.); 9599 hides (the average number for the previous four years had been about 300,000); 778 cwt. tallow; 4762 cwt. bark; and 405 tuns spermaceti-oil. The declared value of the imports of British produce and manufactures from Great Britain in 1853 was 1,408,927*l.*, the average for the preceding four years being only about 420,000*l.* Of foreign and colonial produce, chiefly spirits, wine, and tobacco, imported from Great Britain, the declared value for 1853 was 694,790*l.* The number of sailing vessels entered as belonging to Van Diemen's Land on December 31st, 1854, was, Hobart Town, 219, tonnage 21,473; Launceston 62, tonnage 6389. Of steam-vessels 6, of 510 tons aggregate burden, were entered at Hobart Town, and 2 of 356 tons at Launceston. In 1854 the value of the imports was 2,604,680*l.*, of which 1,776,694*l.* was from Great Britain; the exports amounted to 1,433,021*l.*, consisting chiefly of wool, oil, timber, cattle, flour, and grain. The extent of land under cultivation was 127,732 acres, of which 49,920 were of wheat, and 35,320 of oats; while the sheep numbered 1,631,308, the horned cattle 103,752, the horses 17,384, and the swine 22,598. The land revenue had amounted to 112,225*l.*

Hobart Town, the capital of the colony, is built upon an undulating surface, on the left bank of the river Derwent. The streets are of good width, and laid out on a regular plan, and contain many good dwelling-houses and shops. Some improvements have been made of late years, particularly in the construction of a new market-place in the town, and of docks and wharves at the river-side. Several of the public buildings are handsome. A small rivulet which runs through the town, affords a supply of fresh-water. The population on December 31st, 1847, was 21,467, of whom 38 were aborigines.

Launceston, the second town of the colony, is situated at the confluence of the North Esk and South Esk, which there form the Tamar, 45 miles from its outfall in Bass's Strait. It is 124 miles N. by W. from Hobart Town. Launceston contains a government house, a court house, jail, barracks, and other public buildings, and several places of worship. Convenient wharfs have been constructed. The population in 1847 was 10,100. The shipping trade is important. A good highway extends from Hobart Town to Launceston, and there are inns along it at short distances from each other.

Richmond is situated on the Coal River, about 12 miles N.E. from Hobart Town, and contains a population of 8300. *Longford* has a population of 3690. *Avoca* is a small town in the rural deanery of Longford, with a population of 963.

Tasmania is divided into 19 police districts, and each of the districts generally contains a town or village of the same name. Lincoln, Perth, and George Town at Port Dalrymple, are places of some importance. They are seated on the Tamar, or the Macquarrie, as it is called in the upper part of its course.

Government.—Tasmania is administered, under the 13 & 14 Vict., cap. 59, by a Lieutenant-Governor, who is assisted by an Executive Council and a Legislative Council, of whom two-thirds are elected and one-third nominated. The judicature consists of a supreme court, courts of quarter sessions, and courts of requests.

A bishop of Tasmania was appointed in 1842, whose diocese includes the whole island and its dependencies, and is divided into the archdeaconry of Hobart Town, containing 34 places of worship, and the rural deanery of Longford, containing 19 places of worship. There are also 13 places of worship of the Church of Scotland, 3 for Roman Catholics, 21 for Wesleyan Methodists, 15 for Independents, 3 for Baptists, and 2 for Jews. Of these bodies all except the Independents and Jews receive government aid. There are numerous private schools in Hobart Town and Launceston, besides schools supported by the Government.

TAYLOR, GENERAL ZACHARY, late President of the United States of North America, was born Sept. 24, 1784, in Orange County, Virginia. He was the third son of Col. Richard Taylor, who had distinguished himself in the war of the Revolution, and who in 1785 removed with his family to Kentucky, where the settlers were then very few. Col. Taylor obtained from President Jefferson, May 3, 1808, a commission for his son Zachary as first-lieutenant in the 7th regiment of the United States Infantry. In 1810 Zachary Taylor married. On the breaking out of the war in 1812, having then become Captain Taylor, he was placed in command of Fort Harrison, a stockade on the river Wabash, for his defence of which against the attacks of the hostile Indians he received the brevet rank of major. He distinguished himself on several other occasions during the war, but when it terminated he was reduced from his brevet rank of major to his previous rank of captain, a step backward which he refused to consent to, and resigned his commission. He was, however, in the course of the year reinstated in his rank of major by President Madison. In 1816 he was placed in command of the post at Green Bay, on Lake Michigan, and on the 20th of April, 1819, received his commission as lieutenant-colonel. In 1832 he received his commission as colonel from President Jackson, and in that year served under General Scott in the Black Hawk war. He subsequently held the command of Fort Crawford at Prairie du Chien, where he remained till 1836, when the Seminole war in Florida called for his services. The manner in which he there performed his harassing duties acquired for him great reputation among his countrymen, and the battle of Okeechobee, fought Dec. 25, 1837, gained him the rank of brigadier-general by brevet. In 1838 he was appointed to the command of all the troops in Florida, where he remained till 1840, when the command of the south-western division of the army was assigned to him.

In 1845, on the annexation of Texas, General Taylor was ordered to place his troops in a suitable position for defending that country against a threatened invasion from Mexico, and in August he concentrated his troops at Corpus Christi. There he remained till March 11, 1846, when he broke up his cantonments, and moved westward with a small army of occupation of about 4000 regular troops. He reached the Rio Colorado on the 20th of March, crossed it without opposition, and on the 29th of March arrived at the Rio Grande, opposite Matamoras. On the 8th of May he gained the victory of Palo Alto, and on the 9th of May that of Resaco de la Palma. On the 21st, 22nd, and 23rd of September, he attacked and captured the city of Monterey, which was strongly fortified, and defended by a superior force. On the 22nd and 23rd of February he gained the victory of Buena Vista, in which the Mexican army of 20,000 men under General Santa Anna, was defeated with very great loss by the American army of about 6000 men. This victory led to negotiations for peace, and the treaty was ratified in February, 1848. Meantime General Taylor had returned to his residence at Baton Rouge, in Louisiana, where he had purchased an estate, and on the 1st of June, 1848, the Whig Convention in Philadelphia put him in nomination for the presidency. On the 7th of November, 1848, he was elected President of the United States of America, and on the 4th of March, 1849, he was inaugurated, and entered upon his term of office. He died July 9, 1850, at Washington, and was forthwith succeeded as President by Millard Fillmore, the Vice-President. He left a widow, one son, and two daughters.

TCHAD, LAKE. [Africa, *S.* 2.]

TCHADDA. [Quorra; Africa, *S.* 2.]

TEETHING. [Dentition.]

TEGNÉR, ESAIAS, universally acknowledged by the Swedes as the greatest poet of Sweden, was born on the 13th of November, 1782, at Kyrkerud in Wermland. His father, also named Esaias, the son of a peasant, Lucas Esaison, of Tegnaby, in the diocese of Wexio, had a turn for learning, became a student at the University of Lund, took orders, and was the first of the family to assume the dignity of a surname. He took that of Tegnér, from his birthplace of Tegnaby, a village which is part of the estates of the diocese of Wexio. As a parish-priest he was highly respected for diligence and piety. His wife, whose maiden name was Seidelius, was noted for her force of character and her talents, which she sometimes exercised in writing verses. The poet grew up till his tenth year at Millesvik, on the Lake Wener, where his father had been appointed pastor, and which it may be noticed is in a remarkably ugly part of the country. It is in particular destitute of trees. "King Olof, the tree-feller, a name well known in Swedish history, took his pleasure there," it has been remarked, "with axe and fire, and the trees have not grown again for a thousand years." In February, 1792, when Esaias was in his tenth year, his father died, leaving a widow and six children, four sons and two daughters, in whose circumstances this event produced a great change. The four sons were all remarkable in their way. Lars Gustaf, the eldest, was of a mild and earnest character, strongly tinged with mysticism; Elof, the second, was full of wit and acuteness; the third, Johannes, was silly from childhood, but had such powers of memory that when he was desired to attend to what was going on in church, he could on his return repeat every word he had heard in it, without being able to draw any distinction between the lessons, the banns of marriage, and the sermon. Esaias, the youngest, was of a remarkably flexible character, and at different times of his life exhibited a striking resemblance to each of his brothers in their prominent characteristics.

At the time of his father's death, the two elder brothers, who were intended for the church, were already students at Lund; the expenses of their education quite absorbed the resources of the family when deprived of a head, and the widow was grateful to a friend of her husband, Jakob Branting, a Kronofogde, or sort of tax-collector, for offering to take the youngest off her hands, and make use of him to assist him in his business. Esaias soon made himself a most useful assistant, and was to the end of his life remarkable for his quickness with figures. He found among Branting's books, 'Bjorners Kampadater,' a folio volume of the 17th century, containing a number of Icelandic sagas, with, in the same page, the Swedish translation; and almost his first attempt at composition seems to have been a poem called 'Atle,' founded on one of these sagas. The poem of 'Frithiof,' the great achievement of his riper years, was founded on another. His only recorded attempt at poetry previous to 'Atle' seems to have been when a child at Millesvik, an epitaph on a goose, a worthy companion to Dr. Johnson's famous epitaph on a duck. Branting, who noticed his young assistant's love of books and aptitude for learning, was smitten with the thought that he was degrading him out of his proper sphere; and one starry night, when, as he was driving home with him from a tax-collecting expedition, he turned the conversation on the heavenly bodies, and the boy, then aged thirteen, who had just been reading Bastholm's 'Philosophy for the Unlearned,' discoursed with fluency of things which Branting had never heard of, this feeling became too strong to be kept under. Lars Gustaf, the elder brother, was then acting as private tutor in the family of Captain Löwenhjelm, an officer with nine children. Branting wrote off to the captain in March, 1796, to say that he felt it a sin to keep such a boy as Esaias from study, and to propose that he should be admitted to share, with the captain's boys, the instructions of his elder brother. Löwenhjelm at once consented, and the whole course of the young poet's life was changed. "I now began," he says in an autobiographical notice, written in after-life, "to study Latin; the method adopted was the old and sound, and, in my opinion, the only right one, which may indeed seem tedious and tiresome, but in the end, by the greater certainty it gives, spares time instead of wasting it." He stated that he began French and English at the same time—French in Telemachus and English in Ossian's Poems; but his memory deceived him: a letter written by him in 1793, which was afterwards found, showed that at the age of ten he was already studying Latin and French at Millesvik. Ossian's Poems delighted him to such a degree that he learned English without any assistance. A door is still shown at Malwa, the residence of Captain Löwenhjelm, which bears the marks of the iron rod with which Tegnér used to thrust at it, when enthusiastically shouting out in English one of his favourite passages from Ossian—"The spear of Connell is keen!" In the next year the services of Lars were transferred to the family of Christopher Myrhman, an iron-master at Rämen, near Filipstad, who made some of the best iron in Sweden, and was a man of learning as well as a man of business. Lars made a stipulation that his brother should accompany him, and they both soon became almost members of the family. Myrhman had eight sons and four daughters: Lars was tutor of the four eldest sons; Esaias became at the age of fifteen tutor of three of the others, and the lover of one of the daughters, whom he married some years later.

At Rämen they found an excellent library in the classical languages, and a good collection of Swedish, French, and English books, but not a single German book; it was at the period before the introduction of German literature into Sweden. Of Shakspere, however, there was only 'Hamlet,' "which, strange to say," remarks Tegnér, "interested me very little. It requires, however, a riper age than I had then reached." He threw himself with vehemence on Homer. According to his own recollections afterwards, he in seven months after commencing the study of Greek, had read the 'Iliad' three times through and the 'Odyssey' twice, besides going through Virgil, Horace, and Ovid in Latin. "It seemed to those around him," says Böttiger, in his biography, "as if he had been born with the foreign languages in his brain, and it only needed a gentle shake to wake the slumberers into life." He made himself at the same time a proficient in chess and skittles. Often when the girl came to light his fire in the morning she found him still with his clothes on continuing the studies he had pursued all night. In 1799, when he went with his three pupils to the University of Lund, he passed such an examination to matriculate that it was said it would have sufficed for a degree. His want of means became however at this time so pressing, though he was supported by contributions from Branting and Myrhman, that he resolved to relinquish a learned career; but a life of Anacreon which he wrote in classical Latin, led Professor Norberg to advise him and apparently to assist him to continue the struggle. For some time he studied eighteen or twenty hours a day; he made proficiency in mathematics, as well as in other studies, but unfortunately at the same time that he became remarkable for learning, he became remarkable for the awkwardness, reserve, and rusticity of his manners. A post as under librarian, and afterwards that of assistant-teacher of æsthetics, increased his income, and finally, in 1806, he was enabled to marry, and Anna Myrhman became his partner for life. Then a change took place, which was extraordinary, strange, and sudden. Immediately after his marriage he became all at once as fond of company as he had been averse to it, lively, open, and full of spirits to an extreme, which seems on many occasions to have led him to objectionable levity. The wit of the Greek professor at Lund was often censured as passing the bounds of decorum. This professorship was conferred on him almost as a right when, in 1812, a separate professorship of Greek was first established at Lund. Together with the professorship he received the living of Stäfje, which obliged him to take holy orders, and for the next twelve years of his life he passed his time happily in the duties of his professorship, and in the cultivation of poetry, which he had commenced some time before, but which he prosecuted during this time with such success that he was finally hailed by common consent the first poet of Sweden living or dead.

His first public appearance in verse which attracted any attention, was on a melancholy occasion—the loss of his brother Lars Gustaf, who died in 1802. His elegy on that event was inserted in the 'Transactions' of the Literary Society of Gottenburg, from whom it received some sort of prize. It was in 1808 however when there was an alarm of invasion that he suddenly burst forth as a poet of the first order, by his 'War-Song of the Scanian Land-Defenders,' or 'Local Militia.' "This warlike dithyrambic," says Böttiger, "sounded like a tocsin in every patriotic ear. Tones at once so grand and beautiful had never before been heard from the Swedish lyre. The electric lines ran like wildfire through the kingdom, bearing testimony that the North now owned a Tyrtæus fully equal to him who sang in Sparta." In 1811 another patriotic poem entitled 'Svea,' won the prize of the Swedish Academy; it was a spirited outburst of indignation at the degeneracy of the modern Swedes, compared with their ancestors, whose swords weighed so heavily in the balance of Europe. Tegnér, who visited Stockholm to receive the prize, became acquainted with many of its literary men, at a time of transition when the Phosphorists, headed by Palmblad [PALMBLAD, *S.* 2], the introducers of German Literature into their country, were contending against the old French school of classicality and elegance, whose chief literary representative was Leopold. Tegnér, who was thought by his youth and his genius, naturally to belong to the anti-classical party, excited some surprise by his undertaking the defence of Leopold, which he afterwards followed up by dedicating to him his poem of 'Axel.' His consecration as a priest in 1812 gave occasion to a poem on that subject, which was afterwards surpassed by a poem of the same kind, his 'Nattvardsbarnen;' or children of the Lord's Supper, a sort of religious idyl, in 1820. In the same year, 1820, some cantos of his 'Frithiofs Saga,' a romantic tale of ancient Scandinavia, appeared in the 'Iduna,' a periodical published by the Gothic Society, of which Geijer [GEIJER, *S.* 2] was the leading member, with whom Tegnér had become personally acquainted in the country before either of them emerged into fame. His reputation was enhanced in 1821 by the publication of 'Axel,' a brief poetic romance, still thought by many the finest of his poems. It attained its culminating point in 1825, by the completion of 'Frithiofs Saga,' which became at once the most popular poem that has ever appeared in Sweden. From the period of the publication of 'Axel,' if not before, the name of Tegnér was recognised as that of the undisputed head of Swedish poetry.

This period of Tegnér's life was brought to a close by an unexpected, and at least at the outset, an unwelcome event. In 1824 he received the intelligence that the clergy of the diocese of Wexio had presented his name to the king as one of the three whom they nominated for the vacant bishopric, and that the king had been pleased to select him for that office. As a clergyman he had not been remarkable for gravity of demeanour, and the general impression was that an excellent Greek professor and an unequalled poet would now be turned into a very indifferent bishop. These expectations were disappointed. From the time of his appointment Tegnér's life took a different course. He ceased to appear as a poet, and gave himself up to the business of his diocese, and in particular to the management of its revenues, in which his early experience with Branting was said to be found of use. Almost the only unepiscopal episode we hear of for some years is on that memorable day in 1829 when he presented the poetical crown to Oehlenschläger [OEHLENSCHLÄGER, *S.* 2]. He gave himself up to theological studies, and was found in his study "walled up with fathers of the church and biblical commentators." Thirty-one new churches were built in his diocese during his episcopate. At the diets which he attended he was distinguished for his conservative principles and his opposition to what he called 'Radicalism,' at the time when his old friend Geijer, who had at one time been tending the same way, suddenly broke with the conservative party, on account of its propensity to carry reaction too far. His old liveliness was still to be found in his private letters. In the Diet of 1834 financial affairs were the chief subject; he complained to a friend of his being bilious and unwell, so unwell, he said, that he was as little able to comprehend financial affairs as a member of the Bank committee. "As for biliousness," he added, "it is unnecessary to carry that with one to the Diet, it can easily be got there, and in fact belongs to the order of the day." Tegnér was still looked upon with such favour by his order, that in 1839 he was one of the three candidates proposed for the archbishopric of Upsal. Next year, alas! he was the inmate of a lunatic asylum. "God preserve my understanding," he had written shortly before in a letter to one of his friends; "there runs a vein of madness in my family. With me it has hitherto broken out in poetry, which is a milder kind of madness, but who can give me the assurance, that it will always take that way?" A seclusion of some months in an institution for the insane at Schleswig enabled him to return in 1841 to his family, and partially to his duties, and he was even able to preach so lately as June, 1845, but after that he sank gradually. He was confined chiefly to his house and his room. He lay on the sofa, in cheerful spirits, and passed his time in reading. "About him," says Böttiger, "was generally seen a pile of books of different sorts and sizes, from the old Greek folio to the last fashionable novel, but some volumes of Ariosto and Walter Scott were never wanting." After a stroke of paralysis and still weakened health, he died without pain on the 2nd of November 1846, shortly before midnight and during a beautiful appearance of the northern lights. His wife survived him, and he left six children, one of whom, a daughter, is married to Professor Böttiger of Upsal. Böttiger is himself a poet, and one of his best-known pieces is a description of a little incident which occurred to him in the Bay of Naples, where having been interested by witnessing the emotions which a stranger evinced over a book he was reading, and afterwards finding the book lying where the stranger had left it, he took it up and found it was 'Frithiofs Saga.' Tegnér, as we have seen, had lost his father in 1792; his mother survived till 1836, when she died at the age of ninety. In 1822, when the king of Sweden, Bernadotte, was returning from a visit to Norway, he heard that Tegnér's mother lived in a village he was passing through, expressed a desire for an interview, and told her that she had given birth to a son of whom she and Sweden might be proud. The mother of such a son however had passed most of her life in anxiously tending on another son, the poor idiot Johannes, who at last in an unguarded moment walked into a river and was drowned.

The works of Tegnér were collected and published in six volumes by his son-in-law Professor Böttiger (Stockholm, 1847-48). Nearly three of the volumes are occupied by his smaller poems, two by prose works, chiefly speeches, and extracts from letters, and a volume and a half by the larger poems, on which the reputation of Tegnér is chiefly founded, and by a biography of the poet, from which we have taken most of our details. The smaller poems are many of them occasional verses on subjects of slight importance, but some are vigorous and interesting. One of his earliest is on 'Pitt and Nelson,' both of whom are objects of strong condemnation, Nelson being called 'the Tamerlane of the Sea;' another, remarkably well written, is a dialogue between England and France, vituperating each other, in which England has decidedly the worst of the fray. The sympathies of Tegnér seem to have been extremely limited, his contempt for Germans and Germany is repeatedly expressed, and it would be difficult to find in his writings praise of any country but his own, which, except on a tour for health to Carlsbad in 1833, was the only one he had ever seen, or apparently ever wished to see. In one of his letters he even declares his aversion to Stockholm as that hateful object a "large small town." His speeches are in great reputation both in Sweden and Germany for their lucidity and eloquence. They were chiefly delivered at anniversaries of grammar-schools and on similar occasions, and are of much the same character as those delivered in England and America at mechanics institutes, &c., and bearing on the same class of subjects—the benefits of education, the utility of particular studies, &c. Of the larger poems, 'Frithiof,' 'Axel,' and the 'Children of the Lord's Supper,' the English reader has an opportunity of forming almost as good a judgment as the Swedish. No foreign poet has been so fortunate as Tegnér in his English translators. Of 'Frithiof' there are at least five versions, more in number than we have of any other foreign poem of this century, and several of them are good. The first, by the Rev. William Strong, published in 1833, is undoubtedly the worst, but is still the work of a man of learning, and of an enthusiast for his original; an anonymous one, by several hands, which appeared in Paris in 1835, is apparently in part by Frye, who deserves more notice than he has met with; a third, by R. G. Latham, in 1838, though not equal to Latham's 'Axel,' is a fair representation of the original; a fourth, by G. Stephens, now Professor of English at the University of Copenhagen, was issued at Stockholm in 1841, and accompanied by a letter from Tegnér to say that he thought it the best English translation of himself he had seen; a fifth, by Oscar Baker, in 1841, possesses considerable merit. It is possible that the English reader, on the perusal of some of these, may arrive at the opinion that the 'Frithiofs Saga' has been considerably overrated. The same conviction has been arrived at by several English readers, among others the writer of this article, on the perusal of the original. The poem of 'Frithiof' has no deep pathos, no vivid eloquence. Its general character is that of neatness and prettiness rather than anything superior. It sinks often into tameness, and never rises to sublimity. The story, which follows too closely the original saga, is that of a young Northern warrior who is enamoured of the sister of two young kings, who is denied her hand by her brothers, who, in his indignant proceedings thereupon, accidentally burns the sacred grove of Balder, leaves the country on a warlike expedition, on his return finds his beloved married to an old king, who generously puts an end to his existence when he discovers he is in the lovers' way, and finally obtains the hand of the lady after having humbly expiated the sacrilege against Balder of which he has been guilty. This story is told in four-and-twenty cantos, of which some are as short as ballads, and each one is in a different measure, one in blank verse, another in hexameters, &c. That an epic poem would be improved by a variety of metre, was a proposition laid down long ago by Dr. Watts, if not before him; but this mechanical variety of four-and-twenty different metres, not one repeated, has somewhat of a childish appearance. Tegnér's poem of 'Axel' is in what may be called the Byronic metre, and in tone and structure strongly reminds the reader of Byron's 'Mazeppa,' on which it was doubtless modelled. The story is slight and commonplace—a maiden who follows her lover to the wars in male attire, and whose death in combat drives her lover distracted—but the spirit with which it is told atones for every deficiency. Those who are fond of 'Mazeppa' are sure to like this poem, either in the original, or its excellent English translation by R. G. Latham. There are two others, one by Oscar Baker, who has also translated 'Svea,' and another in 'Blackwood's Magazine.' The 'Children of the Lord's Supper' has been admirably translated by Professor Longfellow, who has also rendered various passages from 'Frithiof' and 'Axel.'

TEIDÆ, a family of Saurian Reptiles. [SAURIANS.] The following is a synopsis of the genera:—

I. Throat with two cross-folds, with larger 6-sided scales between.

A. Ventral shields small, long, smooth. Tongue contractile.

1. *Teius.*—Toes 5-5. Femoral pores distinct. Two species.
2. *Callopistes.*—Femoral pores none. Toes 5-5. One species.

B. Ventral shields broad, smooth.

* Tongue elongate, sheathed at the base. Teeth compressed.

3. *Ameiva.*—Toes 5-5. Teeth 3-lobed. Six species.

** Tongue not sheathed, free at the base.

4. *Cnemidophorus.*—Teeth compressed longitudinally, 3 lobed. Toes 5-5. Six species.

5. *Dicrodon.*—Teeth compressed transversely, bifid. Toes 5-5. One species.

6. *Acrantus.*—Teeth compressed transversely, bifid. Toes 5-4. One species.

II. Throat with a collar of large shields.

a. Collar and ventral shields keeled. Tail round.

7. *Acanthopyga.*—Scales of back large, of sides granular. One species.

8. *Centropyx.*—Scales of back and sides moderate, in many series. One species.

b. Collar and ventral shields smooth, elongate. Tail round.

9. *Emminia.*—Scales of back rhombic, keeled, equal. One species.

c. Collar and ventral shields smooth, elongate. Tail compressed.

10. *Crocodilurus.*—Scales of back equal, similar. One species.

11. *Custa.*—Scales of back unequal. Throat with a collar of large scales. One species.

12. *Ada.*—Scales of back unequal. Throat with two plaits. One species.

This family is well-illustrated by the *Teius Teguixin* of the British Museum Catalogue. It is the *Lacerta Teguixin*, Linn.; *Tejus Teguixin*, Schinz.; Le Grand Sauvegarde d'Amérique, Cuv.; Variegated Lizard, Shaw; Great American Safeguard, Griffith's Cuvier.

The warm countries of America are the native places of the *Teidæ*, which arrive at a considerable size, often measuring as much as 4 or 5 feet in length. Messrs. Duméril and Bibron state that they ordinarily inhabit the fields and the borders of woods, although they never climb trees; but they also appear to frequent sandy, and consequently arid tracts, where they are said to excavate burrows, in which they lay themselves up for the winter. When, in their flight to avoid pursuit, they come upon a lake, pond, or river, they plunge in, according to D'Azara, to escape from the danger which menaces them, and do not leave the water till all fear of danger is past. These Lizards, observe Messrs. Duméril and Bibron, have not, indeed, webbed feet; but their long and slightly compressed tail becomes, without doubt, under such circumstances, a sort of oar, of which they well avail themselves. D'Azara states that they feed on fruits and insects, and that they also eat serpents, toads, young chicks, and eggs. He also relates that they are fond of honey; and that in order to procure it without fear of the bees, they come forward at intervals, and, as they run away each time, give the hive a blow with their tail, till by repeated attacks they weary out the industrious insects, and drive them from their home. For figure of the Variegated Lizard, see SAUVEGARDE.

TENANT AND LANDLORD. The provisions of the statutes 4 Geo. II., c. 28, and 11 Geo. II., c. 19, and 57 Geo. III., c. 52, have been superseded by those of the Common Law Procedure Act, 1852; the landlord's remedy remains, however, the same, the procedure alone is altered. [EJECTMENT, *S.* 2]. Besides the remedy given to landlords in certain cases by the statute 1 & 2 Vict., c. 74, another equally summary method of recovering possession of premises when they are held over by a tenant, is afforded by the action of ejectment in the County Court. This tribunal may be applied to whenever the rent or value of the premises does not exceed 50*l.*, and no fine has been paid. [COUNTY COURTS, *S.* 2].

TENNANT, WILLIAM, was born in 1785 at the little fishing-town of Easter Anstruther, in the County of Fife, Scotland, and was educated in the town-school, where he had for a fellow-student the afterwards celebrated Dr. Chalmers. In 1799 he was sent to the University of St. Andrews, and acquired some knowledge of and a taste for the classical languages from the instruction and lectures of Dr. Hill and Dr. Hunter, but circumstances prevented his continuance for more than two sessions. At an early period of life he had lost the use of his feet, and could only move by the assistance of crutches. He was thus precluded from most active employments, and in 1801 he became clerk to his brother, who carried on the business of a corn-factor at Glasgow, whence he subsequently removed to Anstruther. Whilst in this situation he most zealously prosecuted his studies. He made himself acquainted with the best classics in verse and prose; with Ariosto, Camoens, and Wieland, in modern languages; and with Hebrew; nearly all of which was accomplished by his own unaided efforts. While residing in his father's house at Anstruther, and painfully aware of approaching commercial embarrassments, he wrote, and published anonymously in 1812, in his own little town his chief poem, 'Anster Fair.' It is a humorous fairy tale, adopting Maggie Lauder for its heroine, describing the scenery, the customs, and characters to be found and observed at Anstruther Fair and in the neighbouring towns and villages, written with a slight sprinkling of the Scottish dialect, in the ottava rima, which had fallen into disuse, though soon afterwards adopted by Lord Byron, whose example was quickly followed by others. The poem made but little way with the public at first, indeed it was hardly made known; but it attracted the attention and praise of A. F. Tytler, Lord Woodhouselee, and in 1814 a highly favourable review of it appeared in the 'Edinburgh Review' from the pen of Mr. Jeffrey. In his own narrow circle, however, it had made an impression in his favour, and probably assisted in procuring him the appointment in the autumn of 1813, of parish schoolmaster of Dnnino, a rural upland district between Anstruther and St. Andrews, of which the income was about 40*l.* a year. While residing here, with the assistance of books from the library of the neighbouring university, he made himself master of the Arabic, Syriac, and Persian languages. In 1816 he was removed to a school at Lasswade, a pleasant village near Edinburgh, with a larger salary, affording him also an opportunity of becoming known to the most eminent literary men of that capital. He continued to prosecute his studies, and in 1819 was elected teacher of the classical and oriental languages in the institution founded under the will of Mr. M'Nab for promoting education at Dollar in Clackmannanshire. Here he continued till the beginning of 1835, when he succeeded the Rev. Archibald Baird in the professorship of Oriental languages at St. Mary's College, St. Andrews. At St. Andrews, where the university session extends from early in November to the end of May, he henceforward passed his winters, while the summers were spent at a little villa called Devon Grove, near Dollar. His leisure was employed in compiling grammars of the Syriac and Chaldee languages, published in 1840. His other works were—'The Thane of Fife,' 1822; 'Cardinal Beaton,' a tragedy, 1823, and 'John Balliol,' a drama, 1825, both pieces, though not ranking high as dramas, displaying much poetical power, with considerable originality; 'The Dinging Down of the Cathedral' [of St. Andrews], a descriptive poem in the Scottish dialect; 'Hebrew Dramas founded on Bible History,' 1845; and a 'Life of Allan Ramsay, with Remarks on his Writings,' prefixed to an edition of the 'Gentle Shepherd,' not published till 1852 at New York. Another little production deserves to be mentioned, as showing the cheerfulness with which he bore the calamity of his lameness. 'The Anster Concert,' a small pamphlet of 12 pages, published at Cupar, in Jan. 1811, purports to be by W. Crookleg, and preceded by some months the publication of his 'Anster Fair.' It is in the Scottish dialect, with mottoes on the title-page in Hebrew, Greek, Latin, and English, and pleasantly alludes to the peculiarities of the inhabitants of Anstruther, as well as to his own condition. He also wrote some miscellaneous poems, including translations from the Persian, Greek, and German, of more than average merit. He died on the 15th of February, 1848, at his house near Dollar.

TERBIUM. [CHEMISTRY, *S.* 1.]

TEROPIAMMON. [CHEMISTRY, *S.* 2.]

TERRICOLA. [ANNELIDA.]

TESTUDINARIA, a genus of Dictyogenous Plants, belonging to the natural order *Dioscoreaceæ*.

T. Elephantipes, the Elephant's-Foot Plant, is well known in our collections of plants from its curious truncate rootstock, looking like an elephant's foot. It is covered with a soft corky bark, which is split so as to give it a rough character. From the top of this thick mass a climbing stem is sent, which bears the leaves and flowers. Like the rest of Dictyogens this stem has not the regular division of the parts of the stem seen in most Exogenous Plants.

TETRAONYX. [TORTOISES.]

TEXAS, one of the United States of North America, lies between 26° and 36° 30′ N. lat., 93° 30′ and 106° W. long. It is bounded E. by the state of Louisiana; N.E. by that of Arkansas; N. by the Indian Territory; W. by the Territory of New Mexico; S.W. by the Republic of Mexico; and S. by the Gulf of Mexico. Its greatest length from north to south is 700 miles; its greatest width from east to west, 800 miles. The area is 274,356 square miles. The population in 1850 was 212,592 (of whom 58,161 were slaves), or 0·65 to the square mile. This however does not include the Indians, chiefly occupying the hill country, who were in 1853 estimated by the Commissioner of Indian Affairs at 29,000. The federal representative population according to the Census of 1850 was 189,327, in which number three-fifths of the slaves are included. This, according to the present ratio of representation, entitles the state to send two representatives to Congress. To the Senate, like each of the other United States, Texas sends two members.

Surface, Hydrography, &c.—The surface of so vast a country is of course greatly varied, but it may be broadly described as comprising a low and level region, an undulating or prairie tract, and a hilly or mountainous district, answering generally to what have been called Southern and Eastern, Middle, and Western Texas.

The level region occupies the entire coast, and reaches 60 or 80 miles into the interior. For 10 or 12 miles inland the country is subject to inundation, but behind this swampy tract it rises imperceptibly for some miles, and then stretches out in a wide plain with a nearly level surface. This plain is from 10 to 30 feet above the water-courses, and with the exception of the low bottoms along the banks of the rivers, it is not subject to inundation. The tide, though it varies only from two to three feet, ascends the rivers to the distance of 45 or 50 miles from the sea in a straight line. The whole of the plain is wooded, with the exception of the highest tracts of land between the rivers, which are destitute of trees, and exhibit fine prairies. The forests consist of different kinds of oak, hickory, iron-wood, sugar-maple, and other useful trees, which are found in the southern states of the American Union. The whole of this tract is in process of conversion into an immense field, producing cotton, maize, wheat, tobacco, and every kind of plants and fruit-trees which grow in the temperate zone and on the borders of the tropics; the sugar-cane flourishes here, but is not much cultivated.

The undulating country at the back of this plain, though naturally less fertile, has a more genial and healthy climate, and with moderate culture appears capable of producing almost unlimited supplies of corn, cotton, and tobacco, while the uplands afford vast and excellent grazing-grounds, being covered with grass, which maintains its verdure during many months. This is the most populous and productive portion of the state. The country between the river-bottoms generally rises from them with a gentle acclivity to an elevation of 200 to 400 feet, and presents for the most part an undulating surface, on which isolated hills of moderate elevation are dispersed. By far the greatest part of this tract is destitute of trees, which occur only in isolated clumps about the bases and declivities of the hills, and at considerable distances from one another.

Western Texas, the hilly and mountainous district, includes the southern portion of the Sierra Sagramento, and a nearly parallel range on the east called the Guadalupe Mountains. This region is little known, being as yet left to the Indian tribes, chiefly Cumanches, to the wild animals, and to the hunter. Many of the mountains are believed to rise more than 2000 feet above their bases. Most of the rivers of Texas have their origin in the mountain region, and American writers speculate freely on what it may become when the 'water-power' is fairly turned to account.

Texas owes much of its great capability for agricultural purposes to its numerous rivers and the regularity of their course. Nearly all the rivers, even those which run only 50 miles, are navigable for small craft in the greatest part of their course. The most remarkable of these rivers from west to east are—the *Rio Grande*, noticed under MEXICO, between which country and Texas it forms the boundary; the *Rio Nueces*, which flows about 250 miles with a general south-eastern course; the *San Antonio;* the *Rio Guadalupe*, which falls into a lagune forming the harbour of Espiritu Santo; the *Colorado*, or *Red River of Texas*, which traverses in its upper course the mountain tract of San Saba, flows upwards of 400 miles, and falls into the lagune constituting the harbour of Matagorda; the *Rio Brazos* or *Brazos de Dios*, whose origin is near to that of the Red River, and which, flowing chiefly in a south-south-easterly direction, intersects nearly the centre of Texas and the most fertile districts, and enters the sea after a course of more than 400 miles; and the *Rio Trinidad*, which, after a course of more than 300 miles in a south-south-easterly direction through a very fertile tract, falls into Galveston Bay. Red River and Sabine River, which separate Texas from the Indian territory and Louisiana, are noticed under LOUISIANA. The *Sabine* has a length of 350 miles, and is navigable for 150 miles, and much higher, by keel boats. Before reaching the gulf it expands into a lake 30 miles long and 8 miles wide. The bar at its mouth has 4 feet of water over it at low tide.

There are several good harbours along the coast. The low coast is skirted by a number of long flat islands, separated from the main by narrow straits; but these are much deeper than those farther south, and afford in several places good anchorage for vessels of moderate burden. The bars at the mouths of the rivers have tolerably deep water on them, and there is no part of the extensive Gulf of Mexico which has more or better harbours, bays, and inlets than those of Texas. There are no lakes of any importance in the state; and no canals have yet been constructed.

A southern Pacific railway is to cross Texas from east to west, and several other railways are projected, but none have as yet been carried into execution. The ordinary roads are many of them well laid out, and in good condition.

Geology, Mineralogy, &c.—The geological features of Texas have been but cursorily examined. The mountainous country consists chiefly of igneous and metamorphic rocks. In the eastern portion of this district a considerable belt of Lower Silurian strata has been observed. North of this, along the Saba River, carboniferous strata occur. Much of the centre and north of the state appears to belong to the cretaceous system of rocks; while the whole of the level region, and the low districts bordering the Gulf of Mexico, consist of tertiary and recent deposits.

In minerals the state is believed to be very rich. Gold has been found along several of the smaller streams of the western portion of the mountain district. Silver also occurs in the hill country, and the silver mine of Saba is said to have been one of the richest in America during the Spanish occupation. Iron ore appears to be very widely diffused. Lead and copper have also been found in several places. Coal occurs on the Trinidad and Brazos rivers. Alum is obtained in two or three places. Salt occurs very extensively in salt springs and lagunes; large quantities are annually taken from a salt lake near the Rio Grande. Potash and soda are also obtained in dry seasons near the salt lagunes. Asphaltum is obtained on the coast. From the limestone of the prairie country abundance of lime is obtained. Red and white sandstone, or freestone, may be quarried through a large portion of the state. A soft white stone, which becomes quite hard on exposure to the atmosphere, and is very useful for building purposes, is found in several places along the eastern side of the hill country. Agate, chalcedony, and jasper, are found. Saline, white and blue sulphur, and other mineral springs, said to possess considerable curative properties, are very numerous.

Climate, Productions, &c.—The temperature varies according to the locality, from tropical to temperate; yet, except along parts of the coast and the rivers where subject to inundations, the climate is said to be generally pleasant and salubrious—in some places eminently so. The summer heat is modified by refreshing breezes, which blow almost uninterruptedly from the south. In winter, ice is seldom seen, except in the northern part of the state. Texas has periodical winds: from March to November they are from the south, and little rain falls; the rest of the year northerly winds prevail, and in December and January they are strong and keen.

The characteristics of the soil and productions have been noticed in speaking of the surface of the country. Cotton has now become the staple of Texas: it generally grows well and of good quality; that grown along the coast is said to be little inferior to the celebrated Georgian Sea Island cotton. Tobacco also thrives well, and is becoming an important product of the state. The sugar-cane flourishes, but, as already noticed, engages very little attention from the Texan farmer. All the cereals produce abundant crops. Maize is the chief grain staple: two crops of it are frequently obtained annually. Wheat and oats are the next in importance among the cereals, and both are grown extensively. Buckwheat, rye, and millet are also grown. Rice is somewhat largely cultivated, and its culture could be very greatly extended. Both common and sweet potatoes are largely raised. Indigo, vanilla, and the chili, or cayenne pepper, are indigenous almost throughout the state.

All kinds of fruit ripen well. The vine grows luxuriantly, and it appears probable that Texas will become a wine-growing country. The orange, lemon, fig, peach, nectarine, pine-apple, olive, paw-paw, plum, apple, gooseberry, and many other fruits of both southern and northern climes ripen here side by side; while indigenous fruits are very numerous. Garden vegetables of almost every kind thrive remarkably here. Among the indigenous plants are the yaupan, or Texan tea-tree, the leaves of which yield an infusion which serves as an agreeable and cheap substitute for the tea of China; and the nopal, which is a favourite food of the cochineal insect, while cattle and horses feed on its fruit and leaves, and its wood is used for making fences, and for fuel. The native wild flowers include many of the choicest favourites of the European garden and conservatory; among others are the dahlia, stellaria of every variety, geraniums, passion-flowers, trumpet flowers, perpetual roses, mimosas, and an endless variety more of the most brilliant hues.

The forests of live oak and cedar surpass those of any other state in the Union. The entire coast, the river bottoms, and the chief part of the eastern section of the state, are heavily timbered with pine, oak, ash, hickory, walnut, cedar, cypress, and other forest trees, often of noble dimensions; and forest islands occur all over the prairie country.

Horses and cattle form an important portion of the wealth of Texas, the rich prairies affording unlimited pasture-grounds. Swine are also raised in vast numbers. The wild animals, once so numerous, are rapidly diminishing in numbers. Buffaloes however yet roam the wilds in herds of many thousands; as do also deer. Wolves and foxes are still numerous, and the black bear abounds among the cane-brakes of the coast. The peccari and the wild-hog are numerous in the woods. Mustangs are found in droves in the west and north; when domesticated, they are much prized for their fleetness. Moose-deer, antelopes, mountain-goats, racoons, opossums, rabbits, squirrels, and numerous smaller animals abound in the forests and about the hills. Wild-fowl, in almost interminable numbers and of the most various kinds, afford ample supplies of game to the sportsman; and there are numerous singing-birds, paroquets, mocking-birds, &c. All the rivers abound in fish, both of the ordinary kinds, as cod, mullet, pike, &c., and of species not usually met with, as the red-fish (which gives its name to Red-Fish River, where it abounds), a fish of delicious flavour and large size, sometimes weighing 50lbs.; the gar-fish, remarkable for the length of its snout; the alligator-gar, which is said to measure several yards in length, and to resemble the alligator in shape, &c. The common alligator is met with of very large dimensions, in the lagunes and the lower course of several rivers. Oysters, lobsters, crabs, and other shell-fish are taken all along the coast. Turtles abound in the bays and harbours.

Manufactures, Commerce, &c.—The manufacturing industry is chiefly that incidental to an agricultural state, the bulk of the capital being invested in grist and saw-mills, tanneries, implement-manufactories, &c. There are somewhat considerable iron-works, machine-shops, and carriage and harness factories.

The direct foreign commerce, though steadily increasing, is not very great, most of the exports being made coastwise to New York, New Orleans, &c. The exports during the year ending June 30, 1853, amounted to 1,029,681 dollars, of which 569,918 dollars were of domestic produce. The imports during the same period amounted to 281,459 dollars, of which 156,144 dollars were carried in American and 125,315 dollars in foreign vessels. The total shipping owned in the state in 1850 was 3897 tons, of which 3309 tons belonged to the district of Galveston.

Divisions, Towns, &c.—Texas is divided into 77 counties. Austin City is the political capital, but Galveston is the chief commercial emporium, and the most populous town in the state. The following are the more important towns: the population is that of 1850:—

Austin City, the capital, is situated on the left bank of the Rio Colorado, in 30° 28′ N. lat., 97° 45′ W. long.: population 629. It is merely a village, but it contains the state buildings, and supports two weekly newspapers.

Galveston, a city and port of entry, and the capital of Galveston county, is situated near the east end of Galveston Island, about 200 miles S.E. from Austin: population, 4177. The harbour of Galveston is the best in Texas, and six-sevenths of the shipping of the state belong to this port. The trade of Galveston is very considerable, and is steadily increasing. A regular line of communication by steam-ships is maintained with New Orleans. There are a few good public buildings in the city, and numerous warehouses, hotels, &c. Galveston Island, on which the city stands, is 32 miles long and about 2 miles wide. It was once a favourite lurking place for pirates, but is now thoroughly cultivated, and the residence of several wealthy farmers. During summer it is much resorted to by invalids.

Houston stands at the head of steam-navigation on Buffalo bayou, 160 miles E.S.E. from Austin City: population, 2396. Next to Galveston, Houston is the chief business town in the state, being the centre of a rich cotton district. There are several public buildings, churches, and schools. A wharf 500 feet long, with a cotton press at each end, extends along the front of the city.

San Antonio, near the source of the river of the same name, 75 miles S.E. by S. from Austin City, population 3488, is the oldest town in Texas, and one of the oldest in North America. It contains several ecclesiastical edifices erected during the Spanish occupation, a large ruinous fortress, and other vestiges of its former possessors; also a United States arsenal and some modern structures.

History, Government, &c.—Until 1836 Texas formed a part of Mexico. For some years prior to that date the American colonists, an active, numerous, and united body, had been making every possible effort to prepare the way for a revolt against the Mexican authority. In 1835 hostilities commenced in earnest. The Mexican government was unable to suppress the rising; and eventually the Mexican army, under General Santa Anna, the president of Mexico, was defeated at Jacinto by the Texans, under the American general Houston. Santa Anna was made prisoner, and, as a condition of his release, agreed to sign a treaty acknowledging the independence of Texas. The Mexican senate disavowed the authority of Santa Anna to make such a treaty, but no steps were taken towards effecting a re-conquest of Texas; and in 1845 the United States of North America formally admitted Texas into the Union as a sovereign state. This led at once to war between Mexico and the United States; but the former country was in too disorganised a condition to hope for success in such a contest, and, after suffering a series of humiliating defeats, was constrained to accept peace on terms of acknowledging the independence of Texas, and ceding to the United States a large portion of territory, including the whole of the northern provinces.

The constitution was adopted in August, and ratified in October, 1845. By it the right of voting is vested in every free white male citizen who shall have resided in the state for one year. The legislature consists of a Senate of not less than 19 nor more than 33 (at present 21) members, who are elected for four years; and a House of Representatives, of not less than 45 nor more than 90 (at present 66) members, who are elected for two years. The governor is elected for two years. The state is entirely free from debt. The revenue for the year ending October 1857, was 1,544,694 dollars, and the expenditure the same. The state militia is composed of about 18,500 men and 1248 commissioned officers. In 1850 there were in the state two colleges, having 7 teachers and 165 students; and 349 public schools, having 360 teachers and 7946 scholars.

(*Gazetteers of the United States; Official Reports relating to Texas, &c.; Seventh Census of the United States; American Almanac;* Marcou, Humboldt, &c.)

THALARCTOS. [Bear.]

THALLOGENS, a class of Plants proposed by Lindley for those Flowerless Plants which are distinguished by the absence of an axial stem. It includes all the *Cryptogamia*, with the exception of Ferns and Mosses.

THEIN. [Chemistry, S. 1.]

THENARD, LOUIS-JACQUES, BARON, a distinguished French chemist, was born at Nogent-sur-Seine on the 4th of May, 1777. He went to Paris early in life, and became a pupil of Vanquelin. He devoted himself with so much zeal and success to the study of chemistry that when he was only twenty years old he was appointed demonstrator of chemistry in the Polytechnic School of Paris. By his unwearied assiduity and great knowledge of his subject he was at last made professor of chemistry in the College of France and in the University. In 1824 he received the title of Baron on the occasion of the coronation of Charles X. In 1833 he was made a member of the Academy, and in the same year he was elevated to the dignity of a peer of France. In 1837 he resigned his professorship of chemistry in the Polytechnic School, and in 1840 he gave up his chair in the University of Paris. Baron Thenard was one of the most active chemists in the first half of the 19th century. His separate works however are not numerous. One of the best known of his literary productions he published in conjunction with M. Gay Lussac; it is entitled 'Recherches physico-chimiques.' This work was published after the discovery of the metallic nature of soda and potash by Sir Humphry Davy. Numerous experiments on the subject of the action of the galvanic pile are recorded, and methods of obtaining potassium and sodium independent of galvanism are indicated. Other subjects of high scientific interest were discussed in this work, which served to give its authors the first position amongst experimental chemists. In 1813 M. Thenard commenced the publication of his 'Traité de Chimie élémentaire, théorique et pratique.' This work is a valuable introduction to the science of chemistry, and has gone through several editions and been translated into German; the last edition was published in France in five volumes in 1836. The great contributions of Thenard to the science of chemistry are to be found in the scientific journals and transactions of scientific societies of his time. Of these there is a vast number, embracing the whole range of chemical science. There is indeed no branch of chemistry at which he did not labour, and there is no subject he has worked at on which he has not thrown considerable light. He died in the month of June 1857, and was buried publicly in Paris on the 23rd of that month. For many years before his death Baron Thenard had withdrawn from the active pursuit of chemical science. To the last however he took a deep interest in the development of the educational institutions of France. He was an administrator of the College of France and of the Faculty of Sciences, and vice-president for many years of the Superior Council of Public Instruction; and he has contributed more largely than any other individual since the death of Cuvier to the development of the scientific institutions of France.

THERAPEUTICS. Under this head it is proposed to give an account alphabetically of some of the more important compounds that have been introduced into the list of the 'Materia Medica' since the publication of the first Supplement to the 'Penny Cyclopædia.'

Anamerta or **Anamirta**, the name of a genus of plants belonging to the natural order *Menispermaceæ*, to which the plant yielding the Cocculus Indicus of commerce is now referred. It has the following characters: flowers diœcious, calyx of 6 sepals in a double series with 2-close pressed bracteoles, corolla none; stamens on separate flowers united into a central column, dilated at the apex; anthers numerous, covering the whole globose apex of the column. The flowers with pistils are not known, but the fruit is a 1- to 3-celled drupe. The seed is globose, deeply excavated at the hilum, albumen fleshy, cotyledon very thin, diverging. The plant which yields the berries of commerce is the only species of this genus. It is a strong climbing shrub, and is met with on the coasts of Malabar and the Eastern Islands. It is called *Anamirta Cocculus*.

Anæsthetics, is the term applied to those agents, which, on being applied or administered to the human body produce either a local or general insensibility. Such agents act more especially on certain parts of the nervous system, depriving it both of its power of communicating and perceiving impressions made upon its sensitive function. The state of anæsthesia comes on in various forms of paralytic disease, and as such has been known and described by medical writers. Anæsthesia can also be produced by artificial means, as in those states of the nervous system brought on by what is called animal magnetism. In this state of the system the anæsthesia is sometimes so perfect that surgical operations have been performed on persons whilst in it perfectly unconsciously. This was known previously to the general introduction of anæsthetic agents during the performance of surgical operations generally. All narcotic medicines will produce conditions of anæsthesia, in which surgical operations may be performed without pain. During the action of alcohol on the nervous system in drunkenness, operations have been performed without the knowledge of the patient. Although these circumstances have been generally known, it was not till about the year 1847 that any attempt was made to introduce anæsthetic agents as a means of alleviating pain during the performance of surgical operations. About this time two gentlemen in America, Drs. Morton and Jackson, made experiments on human beings with the nitrous oxide (laughing gas), and found that a state of insensibility could be produced by its agency, under which operations could be performed. The effects of this gas in producing excitement of the nervous system had been made known by the experiments of Sir Humphry Davy, and its peculiar action was often exhibited in the lecture-room of the chemist. It was also known that sulphuric ether produced similar effects on the human system. The merit, however, of the application of these remedies to the production of insensibility during the performance of surgical operations is due to Drs. Morton and Jackson. Having discovered that ether was much preferable for this purpose to nitrous oxide, they made known the important fact, that under the influence of this agent an insensibility might be produced under which persons might undergo the most severe operations without pain, and might be restored from this condition without injury to their health. This announcement was speedily made known, and in the course of a few months the facts were realised in all parts of the world. In London the action of this agent was extensively tried, and realised the most sanguine expectations. The action of ether, and the best method of administering its vapour, was investigated by Dr. John Snow, who in September, 1849, published a work on the 'Inhalation of the Vapour of Ether.' After the success of the first experiments with ether it was found that other agents similarly constituted acted in the same way upon the human system. This subject was investigated with great success in Edinburgh, and led to the discovery by Dr. Simpson of that city, that chloroform, a terchloride of formyle, acted more speedily and efficaciously than even ether. From this time chloroform became more generally used, and is now the substance which is generally employed for the production of artificial anæsthesia. After this Dr. Snow found that amylene was capable of producing the same effects as chloroform. Whilst Dr. Richardson has shown from experiments on living animals that the dust of the common puff-ball, *Lycoperdon giganteum*, which had been used by Apiarians for stupifying bees, had also the property of producing insensibility.

These agents appear to act entirely through the nervous system, and according to the time employed in their administration will be their effect on the nervous centres. The first part of the nervous system which appears to be affected is the brain, and a kind of intoxication comes on in which the patient is excited, the intellectual powers are deranged, and the person acts as though drunk. This effect is produced much more quickly by the vapours of the above-mentioned substances than by drinking alcohol, it also passes off much more rapidly. It was to this action more especially that the effects of the nitrous oxide and ether were confined previous to the discovery of their anæsthetic properties. If, however, the use of the vapour is persevered in, the effect extends from the brain to the cerebellum, and this organ loses the power of regulating the movements of the body. This effect on the body is also produced by the drinking of alcohol. As the vapour continues to act on the system, the next nervous centre affected is the spinal cord, and the functions of sensation and motion more immediately under the control of this part of the nervous system, are more or less affected. It is in this stage that consciousness and the powers of motion and sensation are entirely lost, and the individual is pronounced in a state of anæsthesia. In this condition animal life is held in abeyance, and the body is insensible to all external agents. There is still, however, a sufficient amount of nervous power left to maintain the functions of organic life. The heart beats, the lungs perform their functions, and other actions essential to life are carried on. These functions are, however, under the influence of these anæsthetic agents, and should too large a dose of them be administered, they cease, and death ensues. This is one of the accidents to which the employment of these remedies is exposed, and against which the greatest precaution should be employed.

Dr. Snow, who has practically studied the agency of these remedies more extensively than any other writer, divides the action of ether into five stages. "In the *first degree* the person experiences various changes of feeling, but still retains a correct consciousness of where he is, and what is occurring around him, and a capacity to direct his voluntary movements. In this stage the patient's feelings are generally agreeable, often highly so. In this stage it is not practicable to perform operations without a certain amount of pain. When, however, persons have experienced the more intense degrees of the anæsthetic agent, they return to this stage, and are free from the pain of an operation, whilst their consciousness has sufficiently returned to enable them to know what is going on. In the *second degree* the mental functions may be exercised and voluntary actions performed, but in a disordered manner. In this stage persons are often seized with a tendency to laugh, sob, or scream. They throw themselves about, their actions are instinctive, and not under the direction of their intelligence. In this stage it is not advisable to perform operations, and many operators not carrying the action of the anæsthetic further than this stage have regarded it as useless. The patient may return to this stage from a further one, but it is most desirable that operations should not be performed in it. In the *third degree* there is no evidence of any mental function being exercised, consequently no voluntary motions occur, but muscular contractions in addition to those concerned in respiration may occur. There is sometimes great rigidity of the muscles, but more frequently this is not present. There is a tendency to moan but not to utter any articulate sounds. "If this degree is well established, and if the patient has been detained in it at the same point, by inhaling at intervals, or by inhaling dilute vapour, an operation may usually be performed without producing any other effect than a distortion of the features expressive of pain, and perhaps a slight moaning and an increased frequency of respiration, and in some instances a general rigidity of the muscular system." There is never any recollection of operations in this degree, even when symptoms of pain have been exhibited.

'In the *fourth degree* no movements are seen, except those of respiration, and they are incapable of being influenced by external impressions. All the muscles are relaxed, and the limbs hang down, or rest in any position in which they are supported. The breathing is deep, regular, and automatic, and there is much snoring. In this degree the patient always remains perfectly passive under every kind of operation. It lasts seldom more than two or three minutes after the inhalation is discontinued. The integrity of the functions of respiration and circulation is not impaired. The pulse is distinct, and however much deranged in previous stages, is little disturbed in this; the sensibility of the glottis and pharynx is maintained, and the patient swallows without difficulty. In the *fifth degree* the movements of respiration and circulation become impaired, and every care should be taken to prevent the action of the vapour from arriving at this point, as death may shortly ensue.

With regard to the quantity of ether required, and the time necessary, Dr. Snow makes the following remarks: "If a middle-aged man, about the average size, is supplied with air mixed with vapour of ether in the proportion of 45 per cent. vapour to 55 per cent. air, and breathes it easily and without obstruction, he usually consumes about two drachms of ether per minute. It is not all absorbed, for a part is expired after passing no further than the trachea. At the end of the first minute he is usually in the first degree of etherisation; of the second minute in the second degree; of the third minute in the third degree; and at the end of four minutes, having inhaled an ounce of ether, in the fourth degree. If the inhalation is now discontinued, he commonly remains in this degree of etherisation for one or two minutes, passes gradually back into the third degree, which lasts for three or four minutes, at the end of which time he is in the second degree, which lasts about five minutes, to give place to a feeling of intoxication and exhilaration, which lasts for ten or fifteen minutes, or longer, before it entirely subsides."

The general effects of chloroform resemble closely those of ether. It is, however, a more potent remedy, and produces anæsthesia more rapidly and certainly than ether. Hence it has been employed more generally. This substance was originally discovered by Liebig and Soubeiran in 1831, and its chemical nature was investigated by Dumas. He first pointed out that the liquid which had been called chloric ether, and chloride of carbon, was composed as follows, $C_2 H Cl_3$, and called it chloroform. Liebig subsequently pointed out that it was a terchloride or perchloride of the base formyle. This substance is prepared according to the Pharmacopœia of the London College of Physicians as follows:—Take of chlorinated lime iv. lb.; rectified spirit Oss; water Ox; chloride of calcium broken into pieces ʒj. Put the chlorinated lime first mixed with the water into a retort, and then add the spirit, so that the mixture may fill only a third part of the retort. It is then heated in a sand-bath, and as soon as ebullition begins the heat is withdrawn. The liquid is then distilled into a receiver. A quart of water is then added to the distilled liquid and well shaken. The heavier portion which subsides is then separated, and the chloride of calcium added to it, and frequently shaken for an hour. The liquid, which is the chloroform, is again distilled from a glass retort into a glass receiver. It is a transparent colourless liquid having a specific gravity of 1·48. It boils at 140° Fah., and the density of its vapour is 4·2. It has a fragrant ethereal apple-like odour, and a slightly acid sweet taste. It is soluble in alcohol and ether, but requires 2000 parts of water for its solution. It dissolves camphor, Indian-rubber, wax, and resins. It is not inflammable. This substance is sometimes given internally in doses of from five to ten minims, and acts as a stimulant sedative antispasmodic and anæsthetic.

Administered in the form of vapour as an anæsthetic, chloroform is much more powerful than ether. This effect seems to arise from its being much more sparingly soluble in the blood than ether. "The quantity of chloroform" says Dr. Snow, "required to induce insensibility is less than one tenth as much by measure as in the case of ether. Viewed in this manner, it is more than ten times as strong; but to ascertain their comparative physiological power, when inhaled in a similar manner, their volatility requires to be taken into account. In order to perceive the relative strength of these two medicines, we may suppose that the air which a patient breathes is saturated at 60°,—the ordinary temperature of a dwelling room,—with one or other of the vapours, and see how much air he would have to breathe in either case, in order to be narcotised to the third degree, —the extent of insensibility usually required in a surgical operation. Thirty-six minims is about the average quantity of chloroform required to produce this degree of narcotism in the adult, and this would saturate 257 cubic inches of air at 60°, making it expand to nearly 300 cubic inches, which would be breathed in 12 ordinary respirations of 25 cubic inches each. The quantity of ether usually required to produce the same amount of insensibility in the adult, is about 7½ fluid drachms; this would saturate 440 cubic inches of air at 60°, and increase its volume to rather more than 800 cubic inches, which would require 32 ordinary respirations to breathe it. We see, therefore, that 12 inspirations of air charged with vapour of chloroform are equal to 32 similar inspirations of air charged with vapour of ether, at the same temperature; and that, consequently, chloroform is nearly three times as strong as ether. In actual practice the difference in strength is generally greater than this, for ether abstracts much more caloric than chloroform during its evaporation, thereby reducing the temperature of the air passing over it, and the sponge or whatever contains it, and limiting its own evaporation, in a greater degree."—'Edinburgh Medical and Surgical Journal,' No. 180.

It is on account of its greater strength that a larger number of accidents have occurred with chloroform than with ether. At the same time, where great care is taken in its administration, there seems to be no reason why chloroform should not be employed for the production of anæsthesia. The usual method of administering this agent is to sprinkle a few drops upon a handkerchief and apply it to the mouth and nostrils of the patient in such a way that the patient may take air into the lungs, which is saturated with the vapour of chloroform. During this operation care should be taken that a larger quantity of the vapour is not inhaled than will produce the fourth stage of anæsthesia. By removing the handkerchief from time to time the patient may be kept in the third or fourth stage, according as it seems desirable. Although the administering of chloroform in the handkerchief is undoubtedly the most simple and convenient plan, it appears to be much safer to use an instrument called an inhaler by which the quantity administered can be regulated and controlled with certainty. Such an instrument was early introduced and employed by Dr. Snow, and the accidents which have occurred have certainly been fewer when this instrument has been employed than with the handkerchief. In the inhaler employed by Dr. Snow, the compartment containing the chloroform is surrounded with cold water, to limit the quantity taken up by the air, and the expiration valve of the face-piece is so adapted as to admit additional air to any extent to dilute the vapour still further. From an investigation of the fatal cases, and experiments upon animals, Dr. Snow has arrived at the following conclusions:—

1. Chloroform vapour, if it be inhaled in large proportion with atmospheric air, destroys life by paralysing the heart.

2. In smaller proportions, but long continued, it produces death apparently by the brain, and by interfering with the respiratory function. In such cases the heart is found to beat after the respiration has ceased.

3. Chloroform vapour, if it be blown upon the heart, paralyses it immediately.

4. Atmospheric air loaded with from 4 to 5, or even 6 per cent. of chloroform vapour may be safely administered, inasmuch as that mixture will not act directly upon the heart, but will give timely notice of its increasing effects in modifying the normal discharge of the functions of life. The average time occupied in producing insensibility is from three to four minutes.

5. The proportion of as much as from 8 to 10 per cent. of vapour of chloroform to atmospheric air is a dangerous mixture, as it suddenly charges the blood going into the heart with a poison capable of acting directly on that organ.

In cases where an over-dose of chloroform has been administered, the only remedy which appears to offer a chance of relief, is artificial respiration. Where the muscles of the tongue become relaxed, and this organ falls back over the glottis, it should be pulled forward till the patient revives. It might be desirable to open the jugular vein in order to relieve the distension of the right cavities of the heart.

The cases in which ether was first employed, and in which chloroform is to be recommended as an anæsthetic, are those in which operations producing pain are performed. There are no operations, from the extraction of a tooth to the capital operations of surgery, in which it may not be employed. At the same time it may always become a question whether it is worth while running the slight hazard of fatal effects for the sake of relieving a small amount of pain. Where chloroform is skilfully administered, there appears to be little or no hazard, but unfortunately it is not every one who is prepared to administer chloroform successfully. As a rule it may be stated, that it is not advisable for the surgeon who operates to administer the chloroform, and a competent assistant should always be employed to do this. Whatever may be the doubt in the minor operations of surgery, the beneficial effect of relieving pain upon the subsequent welfare of the patient in the capital operations of surgery, have led surgeons very generally to insist on its administration in these cases. It has now been shown, both by Dr. Simpson and Dr. Snow, that the fatal cases, after capital operations, more especially amputations, are fewer when chloroform has been administered, than when this or some other anæsthetic has not been employed. Looking to these results, it would appear that the life saved by the use of chloroform has been much greater than that sacrificed by its careless administration. When in addition to this it is recollected how great an amount of suffering is prevented, there can be little doubt about the propriety of its administration.

It has been supposed that certain states of the system are less favourable to the administration of chloroform than others, but Dr. Snow has pointed out that in these states of the system, the pain of an operation would be as likely to act as injuriously as the chloroform. At the same time, it would appear that a certain number of the fatal cases have occurred in persons with diseased heart, and perhaps in these caution should be employed.

Besides in operations with the knife, chloroform has been employed to facilitate the reduction of dislocations and of hernia. It has also been recommended in asthma, and as a means of procuring sleep in excessive watchfulness. It was first introduced by Dr. Simpson, of Edinburgh, as a means of alleviating the pain attendant upon child-birth, and although it has been much opposed in these cases, it is at the present day very largely administered by the obstetric practitioners of Great Britain. In some of the more difficult cases it becomes an important aid to the accoucheur, and in all cases it diminishes the suffering without in any way interfering with the natural actions attendant upon this condition. The injurious effects attributed to chloroform are at most problematical, and the benefits so decided as to lead to its use wherever circumstances will permit. At the same time here, as in other cases, it is not desirable that the operator should administer the chloroform, and as the services of an assistant, or person competent to administer cannot always be procured, it is not likely to come into general use throughout the country. But when assistants can be found, there is no doubt that it is an alleviation of suffering that ought not to be discountenanced.

From having experimented with various agents, Dr. Snow was induced to try the action of Amylene as an anæsthetic on the human system. This substance is a colourless mobile fluid, having a specific gravity of 0·659. It is very volatile, and boils at 102°. Its composition is $C^{10} H^{10}$. It is soluble in ten or eleven pints of water, and its odour is not disagreeable. The quantity of amylene required to produce anæsthesia is intermediate between that of chloroform and ether. The quantity of amylene consumed in Dr. Snow's inhaler was at the rate of rather more than a fluid drachm in a minute, and in this way insensibility was produced in about three minutes. Although Dr. Snow successfully administered this remedy in several cases, he met with one fatal case, and has since abandoned its use.

Other substances are capable of producing anæsthesia in the form of vapour, but none of these have been generally employed.

(Snow, *On the Inhalation of the Vapour of Ether*, 1847; *On Narcotism by the Inhalation of Vapours*, *Medical Gazette*, 1848 to 1851; *On Death from Chloroform*, *Lancet*, 1856. Richardson, *On the Anæsthetic Properties of Lycoperdon Proteus*, 1853. Pereira, *The Elements of Materia Medica and Therapeutics*, 1853.)

ARTANTHE ELONGATA, the plant which yields the medicinal agent known by the name of Matico. This plant belongs to the natural order *Piperaceæ*, and is the *Piper angustifolium* of Ruiz and Pavon, the *Piper elongatum* of Vahl, and the *Stephensia elongata* of Kunth. Although this plant has long been used by the natives of Peru as a remedy in various diseases, it was not known till recently that it produced the substance known as matico. The term matico is, however, applied in Peru to other substances, and Dr. Lindley states that the leaves of *Eupatorium glutinosum* were sent to him under that name.

Artanthe elongata, the true matico plant is a shrub about 12 feet high with jointed stem and branches. Its leaves are harsh, short-stalked, lanceolate, acuminate, pubescent beneath, tessellated or rough on the upper side on account of the sunken veins. The spikes are solitary, cylindrical, and opposite the leaves; the bracts lanceolate and the flowers hermaphrodite.

It is a native of Peru, and is found at Huanuco, Cucheco, Panao, Chaclea, and Muna. It flowers from July to September.

BEBEERINE, *Bibrina*, *Biberine*, *Beebeerina*, is a vegetable alkaloid, obtained from the *Nectandra Rodiæi* (Schomburgk), the Bibira, or Greenheart Tree. The properties of this tree were first noticed by Bancroft, in 1769. Dr. Roder in 1834 recommended it as a substitute for Cinchona Bark. He stated that it contained the alkaloid which he called Bebeerine. In 1843 Dr. Douglas Maclagan of Edinburgh confirmed Dr. Roder's discovery and investigated further the properties of the alkaloid. In 1844 Sir Robert Schomburgk brought specimens of the tree from British Guiana, where it is called Bibiru or Sipiri. This plant belongs to the genus Nectandra [NECTANDRA, *S.* 1], and to the order Lauraceæ. It is a large forest tree 60 feet or more in height, undivided by branches till near the top, and covered by an ash-gray smooth bark; the leaves are 5 or 6 inches long and 2 or 3 inches broad, nearly opposite, oblong, elliptical, shortly acuminate, coriaceous, smooth, shining, and obscurely netted on the upper side. Panicles few-flowered, flowers yellowish white; the anthers all thick, oblong, without glands. The fruit is somewhat obovate, globular, and slightly compressed, 6½ to 7½ inches in circumference; the seed in each fruit, about the size of a walnut.

The part used in medicine is the bark. It is derived from the trunk, and comes over in flat heavy pieces from 1 to 2 feet long, from 2 to 6 inches broad, and about 3 or 4 inches thick. The epidermis is brittle and of a grayish-brown colour. Internally the bark is of a cinnamon-brown colour. The fracture is rough and fibrous. The taste is bitter, astringent, and aromatic. The seeds also contain the bebeerine, on which the medicinal properties of the plant depends. The following is Dr. Maclagan's analysis of the two:—

	Bark.	Seed.
Bebeerine	2·56	2·20
Tannin and resinous matter . .	2·53	4·04
Soluble matter	4·34	9·40
Starch	...	53·51
Fibre and albumen	62·92	11·24
Ashes	7·13	0·31
Water	14·07	18·13
Loss	6·45	1·17
	100·00	100·00

The alkaloid bebeerine is obtained by decomposing commercial sulphate of bebeerine by ammonia; the precipitate is washed with cold water, triturated whilst still moist with moist hydrated oxide of lead, dried in a water-bath and exhausted rectified spirit; an alcoholic solution of bebeerine is thus obtained. The alcohol may then be distilled from the bebeerine. If this is heated with ether a part will be left undissolved. Dr. Maclagan thought this another alkaloid and called it sipeerine, but he now regards it as bebeerine in an oxidised condition.

When bebeerine is obtained from its etherial solution, it is a yellow, amorphous, resinous-looking substance, but in the form of powder it is white.

The effect of the Bibiru bark is the same as that of cinchona. It is bitter and tonic, and possesses antiperiodic or febrifugal virtues. The alkaloid possesses the same properties, and from experiments which have hitherto been made, although it is not so powerfully febrifugal as quinine, it does not produce the headache, feverishness, singing in the ears, and other symptoms which are sometimes found to follow the administration of quinine. In intermittent and remittent fevers, in neuralgia, and as a genuine tonic it has been recommended, and especially in those cases where quinine disagrees.

BERTHOLETIA. [BERTHOLLETIA].

CADMIUM, IODIDE OF. The preparations of iodine with the metals have many of them been found to be very efficacious in the treatment of disease both internally and externally. Dr. Garrod has recently recommended the Iodide of Cadmium for external application. "I had," he says, "previously felt the want of an agent containing iodine, and fitted for external application—those usually employed having many objections. The free iodine, or iodine combined with iodide of potassium, as occurs in unguentum iodinii compositum, P. L., is frequently too *irritant* in its nature, besides which its disagreeable odour, and the staining of the cuticle which it produces is often very objectionable.

"The simple iodide of potassium ointment, as ordinarily dispensed, is gritty in character, often to such an extent as to render its application to delicate skins impracticable, and it not unfrequently becomes brown from liberation of free iodine; now, although these inconveniences may be removed by proper management and care as to the purity of the drug, nevertheless I am disposed to look upon the salt, when mixed with fatty substances, as not very readily absorbed by the skin, and consequently not well adapted to produce the peculiar local effects of iodine which is often so advantageous to obtain; for it must be remembered that iodine is not always used simply for its rubefacient or counter-irritant action."

He adds, that the iodide of cadmium is not open to these objections. Mixed with eight parts of lard it forms a perfectly white and soft ointment, which produces but little local action upon the skin, and appears to be readily absorbed when properly applied with friction.

Dr. Garrod recommends this ointment in enlarged scrofulous glands, in joints affected by chronic inflammatory disease, in various cutaneous diseases, and chilblains.

The iodide of cadmium crystallises in white 6-sided nacreous tables, and is soluble in water and alcohol.

CHROMIC ACID has been recommended by Mr. Marshall as an escharotic. In warts and tumours where a powerful caustic is indicated, it appears to be a useful remedy. He recommends 100 grains of the crystallised acid in an ounce of distilled water. In the 'Record of Pharmacy and Therapeutics' the following account of the application of this solution is given:—

"The solution is best applied by aid of a pointed glass rod, or, where a large quantity is needed, by means of a small glass tube drawn to a point. Only so much should be applied as will saturate the diseased growth, avoiding the surrounding healthy mucous membrane; for although the solution is not sufficiently powerful as an escharotic to destroy or even vesicate the mucous membrane, it may give rise to an unnecessary amount of subsequent inflammatory action, which of course it is well to avoid, but from which no serious consequences have been found to ensue. Any superfluous acid may be removed by a piece of wet lint. The first effect of its application to the warts is to produce a slight smarting pain. If, however, any ulcerated surface be touched, the pain is of a burning character, more lasting, but not so acute and intolerable as that caused by the nitrate of silver, or by nitric acid, with or without arsenious acid. After a short time the pain passes off, but there is gradually established a certain aching and soreness, dependent on the excitement of more or less inflammation in the parts. This inflammatory action is accompanied by a purulent discharge, and under its influence the morbid growths rapidly waste, in some cases being thrown off altogether, and in others undergoing a partial though evident diminution in size. The best immediate dressing to the parts is dry lint, as that does not dilute the strength of the chromic acid solution, and is at the same time clean. Afterwards the lint should be changed twice daily, or, what appears to be better as a check to any inflammation, the parts may be washed with a solution of lead, and dressed with lint moistened in the same.

"In most cases of warts, one application suffices, the cure being completed in from four to eight days. The extreme period to which the inflammation set up by the chromic acid has been found to continue active is about four days. In severe cases, where the warts are large, repeated applications are necessary, each being followed by less inconvenience and loss of the characteristic inflammatory action. In but one instance, so far as hitherto observed, have more than three applications been required, and in that there was great neglect as to proper cleanliness and dressing."

COD LIVER OIL is an oil obtained from the liver of the common cod, *Gadus Morrhua*, Linnæus. This, and other oils from fish, have been for a long time popular remedies amongst people living on the sea-shore, especially those engaged in fishing. In 1782 it was recommended by Dr. Percival as a remedy in chronic rheumatism, and in 1809 Dr. Bardsley stated it was a popular remedy in many parts of Lancashire. In 1841, Dr. Bennett, of Edinburgh, wrote a treatise on the 'Oleum Jecoris Aselli,' recommending it especially in scrofulous diseases.

Although this oil is named after the Cod, from the liver of which animal it is most frequently and abundantly obtained, other fish yield oil in their livers and adipose tissue with which this oil is frequently mixed. The oil sold in England usually comes from Newfoundland, where it is obtained by pressure from the livers of the innumerable codfish which are caught in the seas around that country. As it comes into the market it is usually of a chestnut-brown colour, and has a fishy smell. It is now, however, subjected to a preparation, by which its colour is almost entirely removed, and to a considerable extent its smell. Although more agreeable to the taste, it does not appear that its therapeutical properties are improved by this process. The following is Dr. De Jongh's analysis of the three kinds of oil which are to be found in the shops of London:—

Constituents.	Pale Oil.	Pale brown Oil.	Brown Oil.
Oleic acid (with Gadine and two other substances)	74·03300	71·75700	69.78500
Margaric acid . . .	11·75700	15·42100	16·14500
Glycerine	10·17700	9 07300	9·71100
Butyric acid	0·07436	...	0·15875
Acetic acid	0·04571	...	0·12506
Fellinic and Cholic Acids with a small quantity of Margarine, oleine, and bilifulvin . . .	0·04300	0·06200	0·29900
Bilifulvin, bilifellinic acid and two peculiar substances . . .	0·26800	0·44500	0·87600
A peculiar substance, soluble in alcohol . .	0·00600	0·01300	0·03800
A peculiar substance, soluble in water, alcohol, and ether . . .	0·00100	0·00200	0·00500
Iodine	0·03740	0·04060	0·02950
Chlorine and traces of bromine	0·14880	0·15880	0·08400
Phosphoric acid	0·09135	0·07890	0·05365
Sulphuric acid	0·07100	0·08595	0·01010
Phosphorus	0·02125	0·01136	0·00754
Lime	0·15150	0·16780	0·08170
Magnesia	0·00880	0·01230	0·00380
Soda	0·05540	0·06810	0·01790
Iron	...	...	a trace
Loss	3·00943	2·60319	2·56900
Cod Liver Oil	100·00000	100·00000	100·00000

Although this oil has been recommended in a variety of diseases, and has been administered in a most injudicious manner, in all kinds of disorders, the cases in which it has proved most successful are those of a gouty, and rheumatic, and scrofulous character. It has been found especially serviceable in the rickets of children, and in cases of phthisis. When first given it produces nausea, indigestion, and even vomiting; but, when persevered in, it is usually unattended with any unpleasant symptoms. In order to derive benefit from its use, it must be continued for several weeks, and even months. One of its most striking effects in cases where emaciation has set in, is its tendency to produce plumpness and to increase the nutritionary processes in the system. Cases are recorded in which persons have increased several pounds in weight in the course of a few weeks under the use of this remedy. Whilst this increase of weight is going on, there is increased tone and vigour in the system, and persons frequently gain considerable strength under its influence. In cases of phthisis many of the more urgent symptoms are relieved by its administration, and sometimes the progress of the disease has been entirely suspended.

The dose at the commencement should be half an ounce three times a day, which may be increased to one or even two ounces, should the stomach be able to bear it. It is given on coffee, milk, or peppermint-water. A small quantity of common salt taken before and after the oil will sometimes cause it to agree when other means have failed.

The nature of the action of this oil has been much debated by medical practitioners. Whilst some are inclined to regard the small quantities of iodine and bromine it contains as the active agents, others attribute its effects to the oily acids, which it has in common with all other oils. It is well known that oil plays an important part in the development of the albuminous tissues, and is universally present in the eggs of the lower animals, and it is supposed that its introduction into the system in cases where the adipose tissue is manifestly deficient has an effect on the nutrition of the tissues generally. If this were the case, other oils ought to act in the same manner, and to a certain extent this is true, as it has been found that other animal oils, and even vegetable oils, exercise a similar effect. At the same time, it has been found that cod liver oil is more digestible and less liable to disagree with the stomach than other oils, and it is consequently used in preference to all others. An oleaginous diet has been found, however, a valuable adjunct to the use of the cod liver oil, and in young children who will not take the oil, cream has been substituted with advantage.

In cases of rheumatism and scrofulous swellings the external application of the oil has been attended with advantage.

The friction of the whole body in cases of phthisis and scrofulous diathesis has also been strongly recommended by Dr. Simpson of Edinburgh.

When other remedies are employed in conjunction with cod liver oil, they may be added to this substance, and many preparations of this kind are kept ready for use by the druggists. An objection has been urged against these compounds that if kept long the oil becomes rancid, and decomposition of the medicines take place. They are therefore best prepared extemporaneously.

DEODORISERS AND DISINFECTANTS. Although these terms are frequently used as synonymous, they yet have different meanings. Deodorisers are substances which deprive decomposing animal and vegetable substances of their disagreeable smell; whilst disinfectants are agents which have the power of destroying the infectious or contagious properties, more especially of animal poisons. Many substances which have the power of effecting the first object, do not attain the last; and it is important to know that frequently when a foul smell is removed, an animal poison may yet remain behind. In fact, many of the most powerful animal poisons are not attended with any smell at all, as those of the small pox, typhus and scarlet fever.

One of the most powerful deodorisers knows is *chlorine*. This arises from its affinity for hydrogen gas which enters into the composition of those gases which most powerfully affect the senses in a disagreeable manner, as sulphuretted, phosphuretted, and carburetted hydrogen. As these gases have an injurious effect of their own upon the system, and affect the senses disagreeably, they should always be got rid of as quickly as possible, and the various preparations of chlorine, more especially chlorine itself, and chlorinated lime and soda have been employed for this purpose. The chlorides of zinc, iron, and the metals may also be used for this purpose when added to liquid or solid bodies. One of the most effectual methods of evolving chlorine in the air has recently been proposed by M. Lambossy. It consists in obtaining chlorine from common salt by the following process. Take of common salt two table spoonfuls, red lead two tea spoonfuls, oil of vitriol half a wine glass full, water a quart. Mix the red lead with the salt, and add to it the water, stir the mixture well with a glass rod, and add very gradually the oil of vitriol, sulphate of lead is precipitated, and sulphate of soda and chlorine remain in solution. By exposure to the air the chlorine escapes very gradually and uniformly. When not wanted the bottle may be closed.

Oxygen is another powerful deodoriser. By the action of the oxygen of the atmosphere all animal and vegetable substances decomposing at length become purified. It is, however, desirable to supply oxygen faster than can be done from the atmosphere, and this can be effected by the manganic acid and permanganate of potassa. Manganic acid consists of one part of manganese and three of oxygen, whilst permanganate of potash consists of one part of potash and two of manganic acid.

These substances, more especially the permanganate of potash, give off readily their oxygen gas: and on being mixed with decaying animal and vegetable substances render them perfectly pure to the smell. Dr. Hoffman, in a report made to the Board of Health on these substances, in 1856, says:—

"The manganates and permanganates surpass in their deodorising and disinfecting powers most compounds which are usually employed for this purpose. Metallic salts, such as the compounds of lead, iron, and zinc, &c., act extremely well, if the odour to be removed arise from sulphuretted hydrogen and ammonia, or substances analogous to the latter; when a metallic sulphide and a salt of a metal ammonium is formed. But, frequently, the odour belongs to substances of a different class, which are fixed by neither of the constituents of the metallic salt. The odour of the water, which in my experiments yielded perfectly to the action of the manganates, was scarcely altered by the use of very considerable quantities of the usual metallic salts. Moreover, the offensive substances are not destroyed by metallic salts, but only fixed; they appear again—the sulphuretted hydrogen by the action of an acid, the ammonia-like compounds by that of a powerfully fixed alkali. The manganates and permanganates, on the other hand, destroy the smelling substances completely; containing, as they do, a large quantity of oxygen, the very agent which accomplishes all natural disinfection, they give rise to an actual process of combustion, in consequence of which the cause of the odour or putrefaction is permanently removed. They resemble, in this respect, the alkaline hypochlorites, such as hypochlorite of potash, soda, or lime (chloride of lime), the action of which is likewise permanent. The hypochlorites act with less energy and rapidity than the manganates, and are in this respect inferior; but they have an advantage over the latter by their evolving chlorine in the gaseous state, and destroying in this manner odorons and putrefactive substances which are diffused in the atmosphere. But as the chlorine evolved is frequently found objectionable by, and injurious to, patients, it would be important to ascertain whether the same effect could not be accomplished by exposing the contaminated air to the action of extended surfaces of solutions of the manganates and permanganates, either contained in shallow vessels, or diffused over sheets of wire gauze.

"The manganates and permanganates have, moreover, the advantage of possessing peculiar and strongly marked colours, whereby they are readily and safely distinguished from other compounds. In consequence of this marked coloration, accidents which have been frequently caused by the incautious and erroneous use of hypochlorites, or of metallic salts, are scarcely possible with the manganates and permanganates, which are, moreover, in themselves comparatively innoxious."

A solution of twenty grains of permanganate of potash in a pint of water has been of much service as an application to phagedænic ulcerations, and to sloughing sores in various parts of the body. It has also been found particularly beneficial as an application to cancerous sores, where the smell is sometimes very offensive.

Where clothes, bedding, and other materials have been in contact with poisonous effluvia, one of the most powerful *disinfectants* is *heat*. The application of heat to such articles may either be effected by subjecting them to the action of boiling water, or exposing them to heat in ovens or closed vessels constructed for the purpose.

(See *Minute of Information on Disinfection and Deodorisation*, published by General Board of Health, 1857).

DIPHTHERITE. [PHYSIC, PRACTICE OF, *S.* 2].

HYPOPHOSPHOROUS ACID is a compound of phosphorus and oxygen, in the proportion of one equivalent of each. It may be prepared by the decomposition of phosphide of barium, strontium, or calcium by water. It combines with the alkalies and oxides of the metals, forming hyposulphites. These substances have lately been introduced into medicine as a remedy for pulmonary consumption. In a paper presented to the Academy of Medicine, in Paris, Dr. Churchill has given an account of thirty-five cases of phthisis, which he had treated with these remedies. Out of this number he states that nine recovered; in eight the evidences of disease disappeared; in eleven, much improvement took place, and eleven died. Dr. Churchill believes that the immediate cause of tuberculosis is the decrease of phosphorus in the system.

"The specific remedy," he says, "of this complaint consists in the employment of a preparation of phosphorus which presents two characters—the first of being fit for immediate assimilation, and the second of being at the same time in the lowest possible state of oxidation. The hypophosphites of lime and soda are the salts which have hitherto presented these two characters in the most complete manner. Either of these salts, administered in doses varying from ten to forty-five grains per diem, may be used in the treatment of phthisis. The highest dose which I have given to adults has been fifteen grains per day.

"These preparations have a direct action on the tubercular diathesis, and dispel with a really wonderful rapidity all the symptoms which characterise the disease. When the morbid deposit which is the special result of the dyscrasia is recent, when the softening is only incipient, and does not take place too rapidly, the tubercles are removed by absorption, and disappear without leaving any trace. When the deposit is of older date, and the softening has reached a somewhat higher degree, the breaking down process may continue in spite of the treatment, and the issue of the case will depend on the pathological peculiarities of the lesion, on its extent, and especially on the presence or absence of complications. I have made numerous attempts to modify the local mischief by means of inhalations of several substances, but I have obtained no favourable results except such as were owing to the general treatment.

"The physiological effects which I have observed during the administration of the hypophosphites of soda, lime, potash, and ammonia, prove that these salts have a double action. On the one hand they immediately increase the principle (whatever it may be) which constitutes nervous power, and they present us, on the other hand, very efficient blood-generating agents, far superior to any hitherto known. These preparations possess in the highest degree all the therapeutical properties attributed by former observers to phosphorus, and are devoid of the dangers which have almost consigned this substance to oblivion. It cannot be doubted that hypophosphorous preparations will henceforth rank foremost in therapeutics."

The salts of hypophosphorous acid can be prepared by adding the bases to a solution of the acid in water.

Hypophosphite of Potash occurs in the form of a white opaque powder, readily soluble in water and in alcohol. It is very deliquescent, and ought to be kept in stoppered bottles.

Hypophosphite of Soda crystallises in nacreous rectangular plates. It is a less deliquescent salt than the last, and dissolves readily in alcohol and water.

Hypophosphite of Lime crystallises in rectangular or six-sided columns. It is not deliquescent, and possesses a bitter taste. It is perfectly soluble in water, and is the most convenient form for administering the hypophosphites.

Hypophosphite of Ammonia has a similar appearance to the lime-salt. It is, however, deliquescent in the air. When heated gently, it gives off ammonia, and leaves hydrated hypophosphorous acid.

IODOFORM, a compound of iodine, and the compound radical formyle. It was discovered by Serullas, and has recently been investigated physiologically and therapeutically by MM. Moretin and Humbot. It is a solid body occurring in pearly scales of a sulphur yellow colour, friable, soft to the touch, of a persistent aromatic odour, with a mild and uncorrosive taste. When this substance is administered to animals, they die from smaller doses than of iodine, and exhibit symptoms of great depression and exhaustion. The symptoms of depression are followed by convulsions, contractions, and other effects upon the nervous system. After death they exhibit no signs of any marked lesions of the stomach or intestines.

The authors above mentioned suggest that this remedy may be employed in all cases where iodine is indicated. It is more rapidly absorbed into the system than iodine, and produces none of the local irritations which have been observed to attend the action of iodine. They recommend it from its soothing properties in neuralgic disorders. They have also employed it with success in goitre, scrofula, rickets, and syphilis. The dose is from half a grain to eight grains in the course of the twenty-four hours.

KOSSO or KOUSSO, the Abyssinian name for the flowers of the *Brayera anthelmintica*, a plant belonging to the natural order *Rosaceæ*. The Kosso has been recently introduced into European practice as a powerful remedy for worms. It has been known in Abyssinia upwards of two centuries, as an anthelmintic, and has been mentioned by several writers. The plant which yields it has been named after Dr. Brayer, a French physician who resided a considerable time at Constantinople, and having had opportunities of witnessing the anthelmintic properties of this plant, brought some of it to Paris in 1823. On being sent to Kunth, he found it to be a new genus of plants belonging to the order Rosaceæ.

The *Brayera* is an Abyssinian tree twenty feet in height, with round rusty tomentose-villose branches, marked by the annular cicatrices of the fallen leaves. The leaves are crowded, alternate, and sheathy at the base. The leaflets are oblong, or elliptical lanceolate, acute, serrate, villose at the margin and on the nerves of the under surface. Stipules adnate to the petiole. Flowers diœcious, small, and greenish, the calyx with the tube bibracteolate at the base and turbinate; throat constricted internally by a membranous ring; limb 10-partite; the segments in two series, the five outer ones much larger, oblong-lanceolate, obtuse, reticulately veined, stellately patent, the five inner ones alternate, smaller spathulate. Petals five, inserted in the throat of the calyx, small linear. Stamens from fifteen to twenty, inserted along the petals. Filaments free, unequal in length. Anthers bilocular, dehiscing longitudinally. Carpels, two placed at the bottom of the calyx, free, unilocular, containing one or two pendulous ovules. Styles terminal, exserted from the throat of the calyx, thickened upwards. Stigmas subpeltate-dilated, crenate-oblong.

This plant grows in Tyre, Agame, and Shoa, and is cultivated everywhere. Dr. Beke says it grows throughout the entire table-land of north-eastern Abyssinia, at an elevation of 6000 feet. He found it at the mouth of the Abai (Bruce's Nile) at an elevation of close upon 9000 feet. Bruce describes the flowers as being of a greenish colour, tinged with purple, and when fully blown of a deep red or purple. The petals, he says, are white. When prepared for medicinal use, the flowers are gathered before the seeds are ripe, and whilst some of the flowers are unopened. The bunches are suspended in the sun to dry, and afterwards packed in jars. When sent to this country it is packed in boxes, and the Kosso is contained in leather. It has a very powerful balsamic odour. The following is an analysis of Kosso by Wittstein:—

Fatty oil, Chlorophyle	1·44
Wax	2·02
Bitter acrid resin	6·25
Tasteless resin	0·77
Sugar	1·08
Gum	7·22
Tannin, striking a green colour with iron	8·94
Tannin, striking a blue colour with iron	15·46
Vegetable fibre	40·97
Ashes	15·71
Loss	0·14
	100·00

There is nothing in the botanical structure, or in the chemical composition, or physical character of this plant, that could have led to the conclusion that it would act as an anthelmintic. Yet there is no question on this point. The inhabitants of Abyssinia, from their habit of eating uncooked food, are very liable to the attacks of various forms of tapeworm, and the Kousso is universally employed amongst them as a remedy. Every traveller attests its efficacy. It has also now been employed in France, England, Germany, and Switzerland with the same success.

The mode of administering it in Abyssinia consists in taking a handful of the flowers and infusing them in hot water. In England, 240 grains or half an ounce is regarded as a full dose, children from 7 to 12 years of age may take 160 grains; from 3 to 7, 120 grains; and not exceeding 3 years of age, 80 grains. This dose should be taken in the morning fasting, the previous meal at night having been slight. The flowers are infused in from 6 to 10 ounces of luke-warm water for about a quarter of an hour. A little lemon-juice is then to be swallowed, and the infusion being stirred up, the whole is taken, liquid and powder at two or three draughts at short intervals, being washed down by cold water and lemon-juice. In three or four hours, if the remedy has not operated, a dose of castor oil should be taken.

The great barrier to the use of this remedy at first was its high price. When first brought to Paris it was sold as high as 1*l.* 15*s.* per ounce. It is now (1858), however, sold at a moderate price. The most recent notice of this remedy is in the first volume of Dr. Kuchenmeister's work on Animal Parasites,' translated for the Sydenham Society by Dr. Lankester (1857). The following is his account of Kousso:—

"This remedy, which is making a great noise at present, is adulterated in many ways. J. Clarus found Kousso obtained from Jobst to be adulterated with sawdust. I have already indicated that the sawdust might be probably the dust of a medicine for tape-worms, and, indeed, of the coarser stalks and twigs of the *Brayera*. It is still more probable, however, that these woody fibres or chips might come from the root of *Verbascum Ternacha*, which, as well as the leaves of *Jasminum floribundum* (*Herba Zelim*), is, as is well known, often added to Kousso, and is even administered alone, in doses of 70 grains, as a remedy against *Tæniæ*. In other respects, it acts as a pretty strong narcotic on lower animals, as, for example, when thrown into water it stupifies fishes. For these reasons I should in this case say, not so much that the agent is adulterated, as that it is often administered in combination with other Abyssinian remedies for tape-worm. According to my experiments, even the thick *T. crassicollis* of the cat died very soon in white of egg mixed with a decoction of Kousso flowers. The *Tæniæ* were dead within an hour. The dose of the powder of Kousso is ʒvj to ℥j. For my own part, I have always been more or less unlucky with this remedy, which, in the ordinary mode of administration, shares all the defects of the other remedies for tapeworms, and easily produces sickness and violent pains in the intestines. In my own experience, I have generally seen the worm expelled in innumerable fragments after the use of this remedy or its preparations. I have only seen larger or smaller portions of the worm, or, at the utmost, the worm up to the neck expelled by it; but have never found the head. In one case I certainly detected fragments of tapeworm in the evacuations for three months. Once I saw the worm passed up to the neck in the morning, but the head was expelled only after the patient had of his own accord at once taken a second dose of Kousso, and thus brought upon himself no slight pains in the bowels.

"Very recently Professor Martius, of Erlangen, and Professor von Raimann, of Vienna, have done particularly good service with regard to the mode of employing Kousso. According to Martius, the powder of Kousso always killed the worm, but in no case did the head pass away. He therefore endeavoured to isolate the active constituents of the resin. A red resin obtained from Kousso had no action. It was otherwise with a soft resin of the Kousso, of which ℈ij were obtained from ʒvj of Kousso, but in which there was certainly still some red resin and a waxy substance. This soft resin, or, more correctly, resinous mixture, was dissolved in alcohol at 36° R. (=113° F.), and filtered; the alcoholic solution was dropped upon sugar. As soon as the alcohol was evaporated, the solution was again poured upon the sugar, the whole was well dried, and reduced with sugar to the finest powder, sugar being added until with ℈ij of soft resin the whole quantity weighed ℥ss. This very finely divided resin was mixed with ℥j of honey, and the whole administered in a period of 12 to 16 hours, commencing at four o'clock in the afternoon. The next morning an aperient was given (castor oil or a salt). In this way, with this resin most kindly sent to me by Martius, I treated three patients in September, 1854; one of them being a very weakly boy of 14 years old. In all three cases the worm was expelled up to the neck, but in such a fragmentary condition that it was impossible to find the head. This will be the more easy to believe when I mention that the smallest of the expelled fragments towards the neck were scarcely two to three lines in length. One of the patients again passed segments of tapeworms at the end of December.

"Perhaps the more favorable result depends upon some small practical precaution, of which I am not yet aware; but although I must admit the efficacy of the remedy, and the more willingly from the ease with which Martius's resin is taken and endured—as I have never seen any bad secondary effects,—at the same time, the extremely fragmentary state in which the worm passes prevents me from giving the remedy a preference over turpentine and pomegranate root. Quite recently, Professor Raimann, of Vienna, has employed the following method:—ʒvj of Kousso are macerated for 24 hours in cold water, and then boiled for half-an-hour. This infuso-decoction is then taken whilst fasting in two portions, without straining, and, therefore, with the flowers in it; and 2 hours afterwards, ℥j to ℥ij of castor oil. From the report in Hebra's 'Zeitschrift' for 1854, it appears that the remedy was very well borne, and acted with certainty.

NARTHEX ASSAFŒTIDA (Falconer), is the name of the plant which is now known to yield a portion of the assafœtida of commerce. This is the plant which was originally described by Kæmpfer as *Assafœtida disgunensis*, or Hingisch. Dr. Falconer discovered this plant in Astore one hundred and fifty years after it had been described by Kæmpfer. The botanical characters of the genus Narthex are as follows:—

Umbels, compound; involucres, absent; calyx, obsolete; fruit, thin, compressed at the back with a dilated border;

ridges 3, only dorsal; vittæ, one to each dorsal furrow, and two to the laterals; albumen, thin flat.

N. Assafœtida, Falconer: Radical leaves 3-parted; segments, bipinnatifid with oblong-lanceolate, obtuse, decurrent lobes. The root is perennial, tapering, ponderous, increasing to the size of a man's arm or leg, covered with a blackish coloured bark beset near the top with many strong rigid fibres; its internal substance white, fleshy, abounding with a thick milky juice, which has an excessively strong fœtid alliaceous smell. Stem, two or three yards high or more, six or seven inches in circumference at the base, smooth, radical leaves nearly two feet long. The fruit is flat, thin, reddish brown, like that of a parsnip, only rather larger and darker.

"Narthex," says Dr. Falconer, in 'Royle's Materia Medica,' "both in the character of the flowers and fruit, and in its 'Pæony-leaved' habit, differs widely from any known species of Ferula, and appears to constitute a distinct and well-marked genus. In the Dardoh or Daugree language, (the Dardolus being the Daradi of Arrian), the plant is called 'sep' or 'sup.' The young roots of the stem in spring are prized as an excellent and delicate vegetable.

"The species would appear to occur in the greatest abundance in the provinces of Khorassan and Luar in Persia, and thence to extend on the one hand into the plains of Toorkestan on the Oxus, north of the Hindoo Khoosh Mountains, where it seems to have been met with by Sir Alexander Burnes, and on the other to stretch across from Beloochistan, through Candahar, and other provinces of Affghanistan, to the eastern side of the valley of the Indus, where it stops in Astore, and does not occur in great abundance. The whole of this region, which constitutes the head-quarters of the gum-bearing Umbelliferæ, possesses the common character of an excessively dry climate, indicated in 'Berghaus's Hygrometric Map' in 'Johnston's Physical Atlas,' by a belt of white.

"Besides the gum-resin, the fruit of Narthex Assafœtida is imported into India from Persia and Affghanistan, under the name of 'Anjoodan,' being extensively employed by the native physicians in India: 'Anjoodan' being the epithet applied to the seed of the 'Heengseh,' or 'Hulleet,' by Avicenna, also quoted by Kæmpfer, and used by the Indo-Persian and Arabic writers generally in describing the Assafœtida plant.

"Another Umbelliferous fruit is also imported with it, and sold under the name of 'Doogoo,' (a word evidently connected with (the δαυκος of the Greeks), being recommended as an excellent substitute for 'Anjoodan,' which it closely resembles in its general appearance. This I found to be the fruit of a species of true Ferula; it is one of the two Assafœtida-like fruits mentioned by Dr. Royle as occurring in the bazaars of Northern India. The species of Ferula yielding this fruit may furnish some one of the obscurely known gum-resins resembling Assafœtida produced in Persia. I have examined another kind of Umbelliferous fruit in the collection of Dr. Royle, labelled as 'the seed of the wild Assafœtida plant, collected and brought to England by Sir J. Macneill, from Persia,' which differs widely from the fruit both of Narthex and Ferula, and belongs to another tribe of the order."

Podophyllin, a resin obtained from the root of the *Podophyllum peltatum*. [Podophyllæ.] This substance was first obtained by Dr. Merrell of Cincinnati, who has administered it in various cases and recommends it in doses of two grains as a safe and active purgative.

"It has been found of great service, more especially in biliary fevers, determination of blood to the brain, and, indeed, in all cases in which the liver and stomach were primarily affected. It has also been found eminently useful as an alterative, as testified by Beach, Comfort, King, and other practitioners.

"The podophyllin when pure is quite insoluble in cold water, nor is it acted on by diluted nitric acid nor alkalies. It is not, therefore, an acid like tannin, nor an alkaloid, but a neutral proximate vegetable principle of a resinous character. It is insoluble in oil of turpentine, but readily soluble in alcohol and ether. In all respects, its chemical characteristics are like the resin of jalapa. It is very important in administering it that it should be finely pulverised." ('Record of Pharmacy and Therapeutics,' No. III).

Quinoidine. In the preparation of quinine from Cinchona bark, there is left in the mother liquor a substance which is called quinoidine. At one time this substance was regarded as amorphous quinine, and was sold under this name. The substance thus procured was found to possess more active antiperiodic and febrifugal properties than quinine itself. It has, however, been since found that the matters remaining after the crystallisation of the sulphate of quinine are of a complicated character, and probably consist of uninvestigated forms of alkaloids, similar to and more powerful in their action than sulphate of quinine. Whatever may be the nature of these substances, they are now sold under the name of sulphate of quinoidine.

"The most recent publications on the medicinal efficacy of quinoidine are a paper by Dr. Harting, in Smidt's *Jahrt*, 1853, and Dr. da Costa, in the *Philadelphia Medical Examiner* for May, 1855.

"Dr. Harting states that, from 12 years' experience in the treatment of agues, he finds it to be superior to the common sulphate of quinine. Dr. da Costa gives a summary of 53 cases of intermittent fever treated by quinoidine. In many of these the disease was of long standing. The rigors were arrested in 49 cases by the first administration of the medicine, only 4 requiring a repetition. The quantity given varied from 16 to 40 grains; the average was 20 grains. Six grains were given a short time before the expected accession of the paroxysm, the rest at intervals during the intermission. The quinoidine did not give rise to headache, singing or boring in the ears, nor to sickness, the ordinary effects of large doses of sulphate of quinine. The advantages of sulphate of quinoidine are, therefore, very considerable. Its superior medical efficacy depends, first, on its containing, associated with amorphous quinine, very energetic bases derived from the bark; second, its uncrystalline state, which renders it more readily assimilated. Drs. Prout and Daubeney have shown, on physiological grounds, that uncrystallised substances are more congenial to the animal economy than crystalline. Indeed, it is a fact, although little noticed, that sulphate of quinine often passes through the system undecomposed, and may be found in the urine; and this fact explains one cause of its frequent failure to arrest intermittent fevers." ('Record of Pharmacy and Therapeutics').

Sanguinaria Canadensis, the Puccoon or Canadian Blood-root, so called from the red colour of its juice. This plant is a native of America, and has long been used by the Indians on account of its acrid narcotic properties. It has lately been introduced into European practice as a remedy for cancer.

The genus Sanguinaria has the following characters. Petals 8—12: stamens, 24; stigmas, 2; capsule oblong 2-valved, ventricose, acute at each end with deciduous valves, and 2 permanent placentæ.

S. Canadensis is an early spring flower, and grows in most parts of the United States and Canada in woods. It is a smooth plant with a creeping root-stock, which emits a bright orange juice when cut. The leaves are radical, solitary or long, channelled petioles reniform or heart-shaped, with large roundish lobes separated by obtuse sinuses. The underside strongly reticulated with veins paler than the upper, and at length glaucous. Peduncles solitary, axillary round, one-flowered, infolded by the young leaf. Sepals, 2; petals, 8; stamens numerous, with yellow anthers. Ovary, oblong; style, none; seeds numerous, of a dark shining red colour. In their report on Dr. Fell's method of curing cancer, the surgeons of the Middlesex Hospital thus speak of this remedy:—

"Whilst avowing our present judgment of the inefficacy of blood-root in the management of cancerous diathesis, we see no objection to further and much more extended observations of its effects in that disease. It is evidently a powerful remedy, and as an emmenagogue is, perhaps, equal to any drug now employed in England. But our hope of its usefulness in cancer is very small; and that becomes less still, when we remember that Dr. Fell himself never suggested that patients should continue the constitutional treatment after the extirpation of the local disease and the healing of the wound, and never advised the use of the sanguinaria pill in cases of internal cancer, or of those external malignant tumours which were rejected as unfit for local treatment."

It is probable that the use of this remedy in the cases alluded to, will lead to further trials of its properties, and it may yet be a valuable remedy in the list of Materia Medica.

THIERRY, JACQUES-NICHOLAS-AUGUSTIN, the distinguished historian, was born at Blois on May 19, 1795. In 1805 he commenced his studies in the college of his native town; in 1811 he entered the normal school; and in 1813 he became a teacher in a provincial school. In 1814 he went to Paris, enlisting himself as an adherent of the socialist principles of the Count St. Simon, of whom he became the friend and assistant; and in 1816 published 'Des Nations et de leurs Rapports mutuels.' He however shortly penetrated the fallacy and shallowness of his master's doctrines, abjured them, and became with Comte and Dunoyer the editor, in 1817, of the 'Censeur Européen,' a liberal political journal. It was at this time that he first formed the theory of the continued existence of two classes in England—the Norman masters and the Saxon servants,—whose successive struggles he traced down to the time of Charles I. in an essay in this paper, and which, with much perverted ingenuity, but with perfect honesty, and a rare and conscientious industry and perseverance in historical investigations which he then commenced, he has supported in all his subsequent works. On the suppression of the 'Censeur Européen' in 1820 he proposed to the editors of the 'Courrier Français' a series of letters on the history of France, for he says of himself that he had then found that history was his true vocation, and he was accepted as a contributor. With the second letter commenced the official attacks on his writings. Much was erased, still he pursued his course; but on receiving several other letters of disapproval, the editors wished him to vary his subjects. This he declined doing, and he ceased his contributions in January 1821. He then returned to his historical studies, which however he had to pursue under increased difficulties as approaching blindness rendered him unable to read, but he bore the deprivation with philosophical calmness. In 1825 he published his 'Histoire de la Conquête de l'Angleterre par les Normands,' a work which, despite his false theory of the ever-enduring difference of classification of the two races, is of a high merit, as displaying great power of acute discrimination, the result of vast labour digested by a well-regulated mind, with pleasing and animated descriptions grouping the peculiarities of the time, and an animated style. It has gone through many editions and has been translated into English and German. In 1827 he issued his letters from the 'Courrier Français' in an extended and collected form under the title of 'Lettres sur l'Histoire de France,' which have also been translated into English. In 1828 a nervous disorder, added to his now rapidly failing sight, occasioned his being sent by his medical adviser to Hyères, near Toulon, for the benefit of the sea-air of the Mediterranean. While residing here for nearly two years, he was elected a member of the Académie des Inscriptions et Belles-Lettres, and was created a member of the Legion of Honour, of which subsequently he was made an officer. The years 1831 to 1835 he passed partly at the warm baths of Luxeuil and partly at Vesoul in Haute-Saône, during which time, with the assistance of his brother, he composed his 'Dix Ans d'Études historiques,' a series of excellent essays, the product of his previous investigations, which was published in 1835. At this time, he was called to Paris by Guizot, who was then minister of public instruction, who confided to him the editing of a 'Recueil des Documents inédits de l'Histoire du Tiers-Etats,' which forms a part of the 'Collection des Documents inédits de l'Histoire de France.' In 1840 he published his 'Récits des Temps Mérovingiens, précédés des Considérations sur l'Histoire de France,' to which the Academy awarded their prize, and of which also there is an English translation. A collected edition of his works was published in 1853. He died May 21, 1856.

As an historian Thierry takes rank with Michelet and Guizot. Less profound in philosophical disquisition than Guizot, less eloquent and imaginative than Michelet, he excels both in the power of grouping large masses of detail, and of seeing and presenting every point of interest or importance; he combines picturesque effects with minute knowledge; and his style is earnest and lucid though not always elegant. He has also the merit of remaining consistently devoted to his vocation. While nearly every French writer of eminence looked forward to political influence or employment as his reward—and many contrived to attain them, too often by a sacrifice of their previous principles or opinions—Thierry held on his way undeviatingly. His consolation under various afflictions he has himself stated: "Blind and suffering, without hope and without intermission, I will give this testimony which from me no one will disbelieve: there is something in the world better than physical enjoyments, better than property, better even than health; it is a devoted attachment to a science."

JULIE THIERRY, whose maiden name was Quérangal, became the wife of Thierry in 1831, and was of essential service to him in his then state of total blindness. In 1836 she published 'Scènes de Mœurs aux 18me et 19me Siècles,' for which her husband wrote an introduction. She was also the author of a number of clever essays in the 'Revue des Deux Mondes.' She died on June 10, 1844.

THIOSINNAMINE. [CHEMISTRY, *S.* 2.]

THOM, JAMES, who acquired considerable temporary celebrity as a sculptor, was born in Ayrshire in 1799. He was brought up as a stone-mason, and taught himself the art of sculpture. Some small figures which he carved illustrative of the poetry of Burns secured him a local fame, and he was tempted to try his chisel on others of life-size. He accordingly produced in sandstone statues of Tam O'Shanter and Souter Johnnie, which had a surprising run of popularity. After being successfully exhibited in Scotland they were brought to London, where they proved equally attractive, and the self-taught sculptor found himself for a time 'a lion.' He was commissioned to carve more than one repetition of these figures, and small plaster models of them were produced in great numbers. There is undoubtedly a good deal of humour and spirit in the figures, but they are rude and inartistical in conception and execution, and their excessive popularity was of evil influence upon the sculptor himself. He afterwards executed a statue of 'Old Mortality,' and several other works; but he appeared to be falling into comparative obscurity when, about 1836, the misconduct of an agent whom he had employed to manage an itinerant exhibition of his 'Tam O'Shanter' and 'Old Mortality' in the United States, led Thom to proceed to America. Eventually he determined to remain in New York, where he found considerable professional employment. He also devoted some time to architecture; took a farm, on which he erected a house from his own designs, and became a tolerably prosperous man; but he seems to have gradually abandoned the use of his chisel. He died at New York on the 24th of April, 1850. The original figures of Tam O'Shanter and Souter Johnnie, are placed in a building attached to the Burns monument on the banks of the Doon; there are copies of them in England, and at Mr. Colt's, Paterson, New Jersey. His group of 'Old Mortality' stands at the chief entrance of the Laurel Hill Cemetery, near Philadelphia.

THOM, WILLIAM, the weaver-poet of Inverury, was born at Aberdeen in 1799. At ten years of age, with barely the elements of education, he was bound for four years apprentice to a weaver, and during this time, as he narrates himself, "picked up a little reading and writing," trying at the same time to acquire Latin, but being "defeated for want of time." At the end of his apprenticeship he was engaged at another factory, where he worked for seventeen years, learned to play the German flute, and to know "every Scotch song that is worth singing." He married about 1829, had a family, and after some other removals settled for a time at Newtyle, near Cupar-Angus in Forfarshire. He was there when the great commercial failures in America occurred, one consequence of which was the cessation of employment for the poor hand-loom weavers. With a wife and four children, without work, in a neighbourhood where nearly all were as poor as himself, and in a country where the poor-laws were not yet introduced, the sufferings of the family were extreme, and in a cold spring day of 1837 they resolved to set off to walk to Aberdeen, in hopes that there he might procure employment. Of this journey he has given a vivid and pathetic narrative. One child died on the way. To obtain the means of progressing he had recourse to his flute, which sometimes brought him a trifling gift, and he made his first attempt at song-making in an address to his flute. This he had printed, and by presenting a copy of it at the genteeler houses, procured sufficient to enable the family to reach Aberdeen. He obtained work, first in that town, and then at Inverury. In November 1840 his wife, whose health had been weakened by her late sufferings, died in childbed. His new affliction again drove him to poetry, realising Shelley's assertion, that poets "learn in suffering what they teach in song."

He sent one of his compositions, 'The Blind Boy's Pranks', to the 'Aberdeen Herald,' where it was inserted with much commendation. It attracted the notice of Mr. Gordon, of Knockespoch, a gentleman in the neighbourhood, who relieved and patronised him. He had other poems by him, which were produced and admired, and he was brought to London, feasted at a public dinner, and received that sort of patronage which had so injurious an influence in the case of Burns, a patronage that only enhances the bitterness of the fate to which its objects are almost inevitably consigned. Thom returned to Inverury, resolving, he said, not to be too much elated by the applause he had received, but it is difficult to withstand the seductions to which it leads. He published in 1841 at Aberdeen, a small volume of poems, 'Rhymes and Recollections of a Hand-Loom Weaver,' which had but a moderate success. His poetical powers were not great: the chief merit of his verses consists in the exact reproductions of feelings he had himself experienced, with a melody of versification and a correctness of taste remarkable in one of so extremely limited an education. He married a second wife, was often subjected to the extremest need, and at last died in great poverty in March 1850. His widow died in the July following, and a subscription was raised of about 250*l.* for his destitute children.

THOMPSON, WILLIAM, a celebrated Irish naturalist. His father was an Irish linen merchant at Belfast, and William, his eldest son, was born on the 2nd of November, 1805. As his father destined him for a commercial life, he received such an education as was supposed to fit him for that pursuit. In 1821 he was apprenticed to a firm in the linen-business at Belfast. Although at this time he had acquired no taste for natural history, he soon took an interest in this subject from making excursions with a fellow apprentice who possessed a copy of Bewick's 'British Birds,' and a passion for collecting and stuffing birds. For several years he was hardly more than an amateur; but in 1832 circumstances occurred which induced him to give up business, and from that time he devoted himself in earnest to natural history. Although birds were his favourite study, he took an interest in all kinds of animals and plants, and eventually there were few Irish minerals, plants, and animals, with which he was not cognisant. He first became known as a naturalist by his contributions to the 'Proceedings' of the Zoological Society of London, on the natural history of Ireland. The names of some of these early contributions indicate the direction of his mind: 'Catalogue of Birds new to the Irish Fauna;' 'On some Vertebrata new to the Irish Fauna;' 'On some rare Irish Birds;' 'On the Natural History of Ireland, with a description of a new Genus of Fishes;' 'On the Irish Hare.' He also prepared to lay before the meeting of the British Association for the Advancement of Science, held at Glasgow in 1840, a 'Report on the Fauna of Ireland, Division Vertebrata.' This was not a mere enumeration of the vertebrate animals of Ireland, or an account of their comparative scarcity and abundance, but an exposition of the number of species in Ireland, the most western land of Europe, compared with other British and European species. In 1841 Mr. Thompson accompanied the late Professor Edward Forbes on a voyage in the Ægean in H.M.S. Beacon, commanded by the late Captain Graves, R.N., during which he made a large number of observations on the natural history of the countries which he visited. Some of these he subsequently made use of in his works on the natural history of Ireland. From 1841 to 1843 he was a frequent contributor to the 'Annals of Natural History,' and also engaged in collecting materials for his further report to the British Association on the Invertebrate Fauna of Ireland. This report was read at the meeting of the association at Cork in 1843, and is remarkable for the large amount of minute information it contains on the natural history of Ireland. From this time his papers on Irish natural history became more numerous; a list of above seventy is given in the Ray Society's 'Bibliography,' and these were preparations for a great work which he had projected on the natural history of his native country. The first volume of this work appeared in 1849, the second in 1850, the third in 1851. These three were devoted to the birds. He did not live to complete his work. He had been mainly instrumental in inducing the British Association to meet in 1852 in Belfast. In promoting this object he came to London in the January of that year, when he was seized with paralysis, and died in the course of a few hours. The manuscript of another volume on the 'Natural History of Ireland' was found after his death in a sufficiently advanced state to be given to the public, and this was published with a short memoir of the author in 1856. He took an active interest in all the local institutions of his native town. He was president of the Natural History and Philosophical Society of Belfast, member of the Royal Irish Academy, and honorary fellow and member of several foreign scientific societies. William Thompson is a remarkable instance of a man who, by the devotion of average talents to one great object, succeeded in his work on the natural history of Ireland in achieving for himself a lasting reputation, and giving to science one of its most valuable monographs on the distribution of animals in Europe.

THOMSON, ANTHONY TODD, was born in Edinburgh on the 7th of January, 1778. His father, by birth a Scotchman, had settled in America, where he held two lucrative appointments under the British government, being Postmaster-General for the province of Georgia, and Collector of Customs for the town of Savannah. Having refused to take the oath of allegiance to the American government, on the breaking out of the Revolution he was compelled to relinquish his appointments, and returned to Edinburgh. Anthony Todd was born previous to this, whilst his mother was on a visit to Edinburgh. He received his education at the High School, Edinburgh. When a boy he formed an intimacy with Henry, afterwards Lord Cockburn, which lasted till his death. His father destined him for business, but having obtained a clerkship in the Post-office, he was enabled by the leisure it afforded him to gratify a wish he had always entertained to study medicine. He attended the lectures of Munro, Gregory, Black, and Dugald Stewart. In 1798 he became a member of the Speculative Society, and the companion of Jeffrey, Horner, Brougham, and Lord Lansdowne. In 1799 he became a member of the Royal Medical Society. Having graduated in 1799, he left Edinburgh, and established himself in London about the year 1800. He commenced the practice of his profession in Sloane-street, Chelsea, as a general practitioner. His progress was at first slow, but when once commenced it was never interrupted. In the midst of a large general practice, he found time to cultivate science and literature. He was mainly instrumental in procuring the enactment of the Apothecaries' Act in 1814. His first literary work was published in 1810, and entitled 'Conspectus Pharmacopiæ.' He sold the copyright of this book for twenty pounds. In 1833 it was bought by the Messrs. Longman for two hundred pounds. It has gone through fourteen editions. In 1811 he published the 'London Dispensatory,' which was a work of great labour. It contained a critical account of all the medicines and their compounds which were in use in Great Britain. It has been translated into several European languages, and ten editions have been published in England. During his researches into the materia medica he was impressed with the importance of the study of botany, and he was one of the first to give a course of lectures on this subject in London. In 1821 he published a first volume of his 'Lectures on Botany.' This work contained many very valuable observations on the structure and functions of plants which have since become a part of the science of botany. In his observations, he made extensive use of the microscope, and may fairly claim to be one of those who appreciated the value of this instrument when its use was generally neglected. In 1826 he became a member of the Royal College of Physicians of London, and commenced practice as a consulting physician. In 1828 he was elected professor of Materia Medica to the then London University, now University College. In this position he worked with great ardour at the subject of Therapeutics, and was one of the first to introduce the new substances discovered by the chemist into the practice of medicine. He formed here a very fine collection of specimens of materia medica, but the college had not the means of purchasing it after his death, and it has been lost to the country. In 1832 he was appointed professor of Medical Jurisprudence. The lectures delivered from this chair were published in the 'Lancet' in 1836-7. In 1832 Dr. Thomson published his 'Elements of Materia Medica,' a work of a more scientific character than his 'London Dispensatory,' and entering more fully into the subject of Therapeutics. Three editions of this work had been published at the time of his death. In 1839 he edited 'Bateman on Cutaneous Diseases,' and at the time of his death, he was engaged in preparing 'A practical Treatise on Diseases affecting the Skin,' which has since been completed and edited by Dr. Parkes. In 1848 his health first began to fail. He continued to give his lectures, with considerable interruptions, till the following summer, when he was obliged to retire into the country, and died of bronchitis at Ealing on the 3rd of July, 1849.

Dr. Thomson was a man of unwearied industry, and throughout his long career, pursued his labours with few or no interruptions. He was a man of varied attainments, cultivating literature as well as science, and was not an unfrequent contributor of literary articles to the Magazines and Reviews. He translated from the French, and edited, a work by Mons. Salvarte, entitled 'The Philosophy of Magic, Omens, and apparent Miracles.' His notes to this work are full of curious and interesting matter. He edited also an edition of Thomson's 'Seasons;' to which he appended a large number of notes, and a life of the author. He contributed many articles to the 'Cyclopædia of Practical Medicine.' He was for many years editor of the 'Medical Repository;' to which journal he also extensively contributed. One of his last works was entitled 'Domestic Management of the Sick-room,' of which several editions have been printed. A sketch of his life, from which the materials of this notice have been principally obtained, is published with his posthumous work on 'Diseases of the Skin.'

THOMSON, THOMAS, M.D., a celebrated chemist, was born April 12, 1773, at Crieff, Perthshire, and received his early education at the parish school of that place. He afterwards studied at St. Andrew's and Edinburgh, and was a pupil of the celebrated Dr. Black. In 1802 he delivered a course of lectures on chemistry, and continued to lecture on this science for nearly fifty years. He was one of the editors of the 'Encyclopædia Britannica,' from 1796 to 1800, and wrote the articles 'Chemistry,' 'Mineralogy,' &c. in that work. In 1802 he published his 'System of Chemistry.' He first suggested the use of symbols in chemistry, which have since become so generally employed. He was one of the first chemists who recognised the value of Dalton's atomic theory, and devoted himself to its elucidation. He also at this time conducted for the Board of Excise a series of investigations on brewing, which formed the basis of Scottish legislation on that subject. In 1813 Dr. Thomson came to London, and started the 'Annals of Philosophy,' a scientific journal, which he edited till the year 1822, when he resigned it to his friend Mr. Richard Phillips. In 1827 this journal became merged in the 'Philosophical Magazine.' In 1817 he was elected lecturer on chemistry in the University of Glasgow, and the following year received the title of professor. This chair he held till his death, assisted in his later years by his nephew and son-in-law Dr. R. D. Thomson. In 1835 he published a work, entitled 'Outlines of Mineralogy, Geology, and Mineral Analysis,' and in 1849 a work on 'Brewing and Distillation.' He died on the 2nd of July, 1852. His son, Dr. Thomas Thomson, is celebrated for his botanical knowledge; he has published an account of his travels in Thibet, and is now the superintendent of the East India Company's botanic gardens at Calcutta.

THREE RIVERS. [Canada, *S.* 2.]

THRIFT, the common name of the *Statice Armeria*, Smith, now *Armeria maritima*. *Armeria* belongs to the natural order *Plumbaginaceæ*. It is distinguished by the flowers being in a head contained in an inverted cylindrical sheath, and the capsular fruit not bursting.

A. maritima, Thrift, is a common British plant, growing on muddy and rocky sea-shores and on the banks of salt-water æstuaries. It bears transportation to gardens, where it is a favourite in forming the borders of flower-beds. It may be easily distinguished from other species by its linear 1-nerved leaves. It has rose-coloured flowers. Several varieties are described.

THUREA. [Boswellia.]

TICKS. [Trachearea, *S.* 2.]

TIECK, CHRISTIAN FRIEDRICH, a celebrated sculptor, brother of Ludwig Tieck, was born in Berlin on the 14th of August, 1776. Having studied awhile under Schadow, he in 1798 proceeded to Paris, where he became a pupil of David. In 1801 he returned to Berlin, and afterwards went to Weimar, then a great centre of literary and artistic activity. Here he found Göthe a warm and most valuable friend and adviser, and whilst here he not only assisted in the execution of the sculptural decorations of the new palace, but executed busts of Göthe, Voss, and Wolff, besides many of members of princely and noble families. In 1805 he went with his brother Ludwig to Italy, and carefully studied the great works of art there, maintaining at the same time by his numerous busts, &c., his manual dexterity. Here he found friends and patrons in Madame de Staël, and the crown-prince, afterwards King Ludwig, of Bavaria. For the former he executed a rilievo for the family sepulchre at Coppet, and subsequently a life-size statue of Necker, and busts of herself, the Duc de Broglie, Augustus Schlegel, and M. Rocca. For Ludwig of Bavaria he executed at various times busts of Ludwig himself, Jacobi, Schelling, Ludwig Tieck, Lessing, Erasmus, Grotius, Herder, Wallenstein, and several others, chiefly for the Walhalla. On his second visit to Italy (1812) he became acquainted with Rauch, and the two great sculptors ever after remained fast friends. He returned in 1819 to Berlin, where he established his atelier, and was elected a member of the academy. During the remainder of his life he was employed upon many of the public works, and was a prominent actor in the artistic movements in the Prussian capital. Among his productions were the friezes, the sculptures in the pediment, and other external decorations of the Theatre Royal, the gates, and the statue of the angel in the porch of the Cathedral in Berlin; a series of fifteen seated marble statues of classical personages for the royal palace; a bronze equestrian statue of Frederick William at Ruppin, besides several monumental works and numerous busts and rilievi. He was also during many years extensively employed on the restoration of ancient works for the Royal Museum, in which institution he was director of the department of sculpture. He died at Berlin on the 14th of June, 1851. Tieck was not possessed of much imaginative power; he executed some good statues and rilievi, but his chief strength lay in his memorial busts, many of which display great elevation of style and admirable chiselling. In his studio several eminent sculptors have been formed, among whom perhaps the best known is Kiss, the sculptor of the Amazon. There are casts of some of Tieck's works in the Crystal Palace at Sydenham.

TIECK, LUDWIG, one of the most influential actors upon the modern literature of Germany, was born in Berlin, on May 31, 1773. At the universities of Halle, Göttingen, and Erlangen, he studied with great ardour; history and the poetical literature of both the ancients and the moderns being his favourite pursuits. His poetical powers developed themselves early, but they took a direction opposite to the usual classical models, and exercised themselves on the feelings and opinions of what may be termed the Christian chivalry or romance of the Middle Ages, although his first efforts, 'Almansur,' a prose idyll, in 1790, and 'Alla Moddin,' a prose play, in three acts, in 1790-1, assumed an eastern locality. Both displayed great poetical ability, but he did not attempt verse, except in a few short pieces introduced amid the prose. In 1792 he produced the tragedy of 'Der Abschied' (The Parting), also in prose, which, like most of his other dramatic pieces, is more fitted for the closet than the stage. He probably himself began to perceive that his true strength lay in narrative, and in the same year he produced 'Das grüne Band,' a mediæval tale of considerable pathos, with great truth of characterisation and much interest; and 'Abdallah,' an oriental tale, with little of oriental colouring, and of a ghastly terror-inspiring character. He had made much progress in the study of English literature, particularly the drama, and the result was, in 1793, a compressed translation, or rather paraphrase, of Ben Jonson's 'Volpone,' in three acts, in which it is remarkable how carefully he has omitted all the more poetical passages which ornament the original, and in which, for the scene where Volpone plays the mountebank, he substitutes a satirical one between an Englishman and a German author come to England for a few weeks to write volumes on the character of the country and its inhabitants. To the same period belongs also his novel of 'William Lovell,' of which the characters and scenery are intended to be English, but they have a very foreign air, and the tone of the whole is more gloomy than most of Tieck's productions.

The six years, from 1795 to 1800, both inclusive, was a period of incessant activity. During it he travelled; visited Jena, where he formed an intimate friendship with the two Schlegels, Novalis, and Schelling; Weimar, where he became acquainted with Herder; and Hamburg, where he married the daughter of a clergyman named Alberti. The intercourse with the above-named literary celebrities had much influence on his future course. While still adhering to the romantic school, his productions embraced a wider field. He continued to write tales, novels, tragedies, and comedies; but in embodying nursery tales, as in his 'Blaubart,' a play in five acts, 'Die Sieben Weiber des Blaubarts' (Seven Wives of Bluebeard), a tale, and the 'Leben und Tod des kleinen Rothkäppchen' (Life and Death of Little Red Riding Hood), a tragedy in three acts, he united much of the simplicity of the old traditions, with the added interest of poetical conception, a close adherence to the story, and occasional passages of pathos or of humour. Occasionally he took for his subject legends of a higher character, as in his 'Leben und Tod der heiligen Genoveva;' and in 1804, in 'Kaiser Octavianus,' a work which had been long expected, and which his countrymen consider as one of the most successful of his romantic productions. To this he has prefixed a long prologue, in which various characters are introduced to display the prosaic element, and a poet, to whom comes Romance, a female, who describes herself as infusing joy throughout the world, and says that her father is Faith, and Love her mother. In this prologue, and in the following play, which is partly in prose, is found the most favourable specimen of Tieck's versification. It is not of the most careful construction; and it is singular that though his conceptions were highly poetical, the best examples of them are found in his prose. This line was followed out in subsequent works, as in 'Fortunät,' which however embodies a considerable amount of good-humoured satire on the various conditions of the existing state of society. Another class comprises, what are styled by the Germans Art-Novels, to which belong 'Franz Sternbald's Wanderungen,' 'Phantasien über die Kunst,' and 'Herzensergiessungen eines Kunstliebenden Klosterbruders' (Heart-outpourings of an Art-loving Monk), written in conjunction with his friend Wackenroder, in all of which he displays a love and knowledge of the beautiful and elevated in art, a contempt for the self-complacency of affected connoisseurship, and a manifestation of Roman Catholic feeling, to which faith he for some time adhered about this period. Perhaps less distinctive as a class, as his previous tales had much of a similar character, were his 'Volksmährchen' (Popular Legends), such as the history of Heymon's Children, the Fair Magelone, Melusina, &c., legends which are European, and the 'Denkwürdige Geschichtschronik der Schildbürger' (Memorable History of the Simpletons), a sort of German version of our Men of Gotham; tales in prose, abounding in pleasant fancy, interspersed with picturesque descriptions or strokes of broad humour, and told with a simplicity and an apparent childish belief in the wonders related that give an indescribable charm to the whole. Upon yet another class he evidently bestowed more thought and labour. In the dramas, for they assume that form, 'Der gestiefelter Kater' (Puss in Boots); in 'Prinz Zerbino, oder die Reise nach dem guten Geschmacke' (Travels in search of Good Taste); 'Die verkehrte Welt' (The World turned upside down); and 'Leben und Thaten des Kleinen Thomas, genannt Däumchen' (Tom Thumb); in all of which he attacked with keen irony the low, material, anti-poetical notions of poetry advocated by learned pedants, and defended by implication, by example, and by occasional parodies on the classicists, the theory of the romantic school. A key to 'Zerbino,' by one thoroughly acquainted with the peculiarities of all the authors alluded to in that drama, would possess much interest for the English student. These pieces, independent of their critical merits, have an interest of their own from the wit and humour of the dialogue. Many of the productions of this period, including most of those above-mentioned, were subsequently published together, under the title of 'Phantasus,' in a frame-work of a conversational party, to whom or by whom they are related. An excellent translation of 'Don Quixote,' a very good one of Ben Jonson's 'Epicœne, or the Silent Woman,' and a remarkably successful one of Shakspere's 'Tempest,' also belong to this period.

In 1801-2, while residing in Dresden, he assisted F. Schlegel in bringing out the 'Musen-Almanach,' to which he contributed some of his tales. He then lived for a time at Berlin, and next at Ziebingen near Frankfurt-on-the-Oder, seeming to enjoy a poetical leisure, during which he produced nothing but 'Kaiser Octavianus' of which we have already spoken, in 1804; and in the same year he made a journey to Italy, returning from thence in 1806 to Munich, where he had the first attack of gout, from which he was ever after an extreme sufferer. This attack was so violent, that he produced little for several years. He occupied himself, when able, in revising and adding to his previous works, publishing the 'Phantasus' as above stated, and a collection of his poems; in studying and collecting the early poetry of his own country, of which in 1803 he had published 'Minnelieder aus dem Schwäbischen Zeitalter' (Love songs of the Swabian period), and in 1815 'Ulrich's von Lichtenstein Frauendienst' (Worth of Woman); and in extending his acquaintance with the English drama. In 1812 he published the 'Alt-Englisches Theater,' containing translations of the old King John, the Pindar of Wakefield, Pericles, Locrine, the Merry Devil of Edmonton, and the old Lear, all of which he contends are the genuine, though chiefly early, productions of Shakspere. In 1817 he published two volumes of specimens of the early German drama, and in the same year visited England for the purpose of acquainting himself with the literature connected with the drama which he could not procure in Germany. He laboured diligently; the treasures of the British Museum as well as those of many private collections were opened to him; and it is probable that no foreigner ever attained so wide and so exact an acquaintance as Tieck with the English literature of the great Elizabethan period, or so just an appreciation of Shakspere, although his enthusiasm has led him to the discovery of beauties hidden from Englishmen in the apocryphal or rejected works attributed to Shakspere, in the genuineness of nearly all of which he is a stedfast believer, but of which his countryman and follower Ulrici has formed a more sober judgment. On his return to Germany he settled at Dresden, and for some time his literary publications were chiefly novels and tales for the pocket-books and similar annuals. In 1823 he published the first volume of 'Shakspere's Vorschule' containing translations of Green's 'Friar Bacon,' 'Arden of Feversham,' of which he has doubts whether it is a production of Green's or an early work of Shakspere, and Heywood's 'Lancashire Witches;' this was followed by a second volume in 1829 containing 'Fair Em,' 'The second Maid's Tragedy,' by Mussingen, translated from one of the three manuscript plays saved from the fire by Warburton the herald, and 'The Birth of Merlin:' the first he considers to be more probably an early effort of Shakspere's than of any of the other names to which it has been assigned, grounding his opinion of this and other of the doubtful plays on the belief that Shakspere commenced writing for the stage many years earlier than had at that time been admitted; a belief which the investigations of Mr. C. Knight in his 'Pictorial Shakspere' has shown to be very probable, though not leading always to the conclusions at which Tieck has arrived regarding the particular plays. In 1828 he published his 'Dramaturgische Blätter,' chiefly written in 1817, a collection of reviews or criticisms of modern German plays, including notices of Schiller's 'Piccolomini,' and 'Wallenstein's Tod;' Göthe's 'Jery und Bätelei,' and 'Clavigo;' and Shakspere's 'Romeo and Juliet,' 'Lear,' 'Henry VIII.,' 'Macbeth,' and 'Hamlet;' all containing much genial criticism, with a delicate and true apprehension of their poetical feeling and harmony; with notices of the acting of Kemble and Kean; and Appendices on the German and English stage. About the same time he took an active part in the continuation and completion of the translation of Shakspere's acknowledged plays, which had been begun by Schlegel, and of which the first volume appeared in 1825. The merits of this translation, of which many were entirely from his own hands, and all were subjected to his revision, are universally acknowledged. Less literal, but more spirited and equally true to the sense of the author, than the previous translation by the Vosses, they are illustrated by a number of notes which display a vast amount of reading, and many ingenious conjectures as to various disputed readings, and they now form the recognised text of Shakspere's plays in Germany. The work was completed in 1829. But his labours were not confined to this work; he continued to write tales for periodical publications, and in 1828 he produced his novel of 'Dichtersleben,' (Life of a Poet) in which Shakspere and several of his contemporaries are introduced, and in which the death of Marlow is vividly described. In 1829 he published 'Der Tod des Dichters,' (the Poet's Death) in which the unhappy fate of Camoens is pathetically related. In 1826 he also produced one of his most picturesque narratives, 'Der Aufruhr in den Cevennes,' in which the insurrection in the Cevennes is graphically told, but unfortunately was left incomplete. While residing at Dresden his evening circles became celebrated, at which his readings and the relation of his tales formed a principal charm, and which were attended by all the literary celebrities who were in the vicinity and could gain admission. In 1836 and 1840 he published his two latest novels—'Der Tischlermeister' (The Cabinet-maker) and 'Victoria Accorombona,' both of which are very inferior to most of his previous works of a similar character. He also took an active part in the management of the Dresden theatres. In 1840, on the accession of Friedrich Wilhelm IV. to the throne of Prussia, Tieck was invited to Berlin, an invitation which he accepted. He was then created a privy-councillor, and passed the remainder of his life partly in Berlin and partly at Potsdam, occupied chiefly with some theatrical productions, and in revising and correcting his works, which were published in 20 volumes at Berlin between 1828 and 1846. At various times he also edited Novalis's 'Schriften,' in conjunction with Friedrich Schlegel, 1802; Heinrich von Kleist's 'Nachgelassenen Schriften' (Posthumous Works), 1826; Solger's 'Nachlass und Briefwechsel' (Remains and Correspondence) with Friedrich von Raumer, 1826; and Reinhard Lenz's 'Gesammelte Schriften,' (Collected Works) in 1828. After suffering for some years from continued illness, borne with wonderful patience and cheerfulness, he died at Berlin, April 28, 1853, leaving a name which may rank with the highest in his native country, and which Englishmen may reverence as that which in Germany is most connected with the popularising of the fame of the great dramatic poet of England.

TILLÆA, a genus of Plants belonging to the natural order *Crassulaceæ*. It has a 3- or 4-parted calyx; petals 3 or 4, oblong acuminated; scales none, or very small; carpels 3 or 4, somewhat constricted in the middle; 2-seeded. The species are small glabrous annual herbs, inhabitants of exposed subhumid places. The leaves are opposite. Flowers small, white, for the most part axillary.

T. muscosa is a native of Europe in many places, in dry, barren, sandy, and gravelly soil; plentiful in Britain on the most barren sandy heaths, and frequent in Norfolk and Suffolk. It has a stem branched and decumbent at the base; flowers axillary, sessile, and trifid. The plant is very minute, and of a reddish colour. The leaves are opposite, oblong, obtuse, concave above, connate; sepals ovate or lanceolate acute, bristle-pointed. Petals nearly subulate, white, tipped with red. There are several other species, natives of North and South America and Australia.

TINCAL. [BORACIC ACID.]

TINEIDÆ, a family of small Moths, which are remarkable for depositing their eggs among animal substances, on which their larvæ afterwards feed. They are thus constantly found upon clothing made of hair or fur, and are called Clothes-Moths. The family is thus defined:—Antennæ moderate, slender, simple, pubescent beneath in the males; proboscis short; thorax rarely crested; body long and slender; wings entire, often narrow, mostly convoluted in repose. The caterpillars live in portable cases formed of various materials.

These moths are often ornamented with very brilliant colours, the upper wings having gold or silver spots. The caterpillars make their cases of the substances on which they feed. The *Adelæ* make their nests of bits of leaves. The true *Tineæ* clothe themselves with the hair of the skins of animals and bits of silk. When too small, they slit their cases and make them larger. Many of them burrow into skins, silk garments, &c., making cases as they proceed. The genera and species are very numerous.

(Westwood, *Entomologist's Textbook.*)

TIPTON. [STAFFORDSHIRE.]

TIPULIDÆ, a family of Dipterous Insects belonging to the tribe *Nemocera*. They have the antennæ longer than the head, simple, not plumose, rarely pectinated; eyes entire, ocelli obsolete; front of head beaked; proboscis short, ending in two large fleshy lips; body elongated; wings long, nervures numerous; legs long.

The types of this family are the species of *Ctenophora*, *Pedicia*, and the species of *Tipulæ* which are usually known by the name of Daddy-Long-Legs.

Latreille divides this family into five smaller groups—Culiciformes, Gallicoles, Terricoles, Fungivores, and Florales.

The Culiciformes (*Chironomides*, Macquaart) include those forms the pupæ of which mostly dwell in the water, respiring by means of external tubes or filaments situated in front of the body. They have also the power of swimming. Many of them are transparent, and form exceedingly beautiful objects for the microscope. The larvæ of *Chironomus plumosus* are vermiform, and of a blood-red colour, whence they are called Blood-Worms. [CHIRONOMUS.]

The Gallicoles (*Cecidomyides*) include those species which form galls by depositing their eggs upon plants. [CECIDOMYIA.]

The Fungivores (*Mycetophilides*, Macquaart) embrace an extremely active group of these insects, which are capable of leaping by means of their hind legs. They are found in damp situations amongst various plants. They enter houses, and are found upon window-panes. They are also very partial to *Fungi*, hence their name; and they are generally found in the interior of *Boleti* and *Fungi*.

The Terricoles (*Tipulides*, Macquaart) are the true Crane-Flies. The species of the genus *Tipula* are found in damp meadows in great numbers, especially in the autumn. The larvæ are found in the soil, and feed upon the roots of grass, &c., and occasionally they do much harm. Mr. Westwood remarks that the male Daddy-Long-Legs is very quarrelsome, and often fights with his brethren of the same species.

The Florales (*Bibionides*, Macquaart) are distinguished by having the body and legs shorter and more robust than the other forms. The species are small, and their flight is slow and heavy.

(Westwood, *Families of Insects.*)

TODMORDEN. [LANCASHIRE.]

TOLLENS, HENDRIK CORNELISZOON, long the most popular living poet of Holland, was born at Rotterdam on the 24th of September 1780. His father carried on a thriving business, founded by his grandfather, as a dealer in colours, and Hendrik was taken from school at the age of fourteen to assist behind the counter. The year after was that of the French entry into Holland, when many of the Dutch were disposed to look on them as deliverers, and young Tollens became the secretary of a "Vaderlandsche Bijeenkomst," or Patriotic Society, to whose purposes he soon contributed some songs, which had a run of success. His father, who had at first been pleased at his son's reputation, soon became alarmed lest poetry should lead him away from business, though that alarm might surely have been spared in Holland. When Tollens at the age of seventeen, made the acquaintance of two poets, one of them, Helmers, was a merchant, the other, Loots, a book-keeper in a counting-house, and Uylenbroek, a third, to whom they introduced him, was a respectable bookseller. Tollens had learned some French at school; by Uylenbroek's advice he now studied English and German, and thus enlarged his ideas; but he followed Uylenbroek's example in occupying himself with rendering French tragedies into Dutch verse. He afterwards ventured on original dramas, and his 'Lucretia,' written in 1805, had, at all events, sufficient spirit to be prohibited by the government. Another tragedy, 'De Hoekschen en Kabeljaauwschen' (The Hooks and the Codfish), had at least the merit of a national subject, being founded on the quarrels of the rival factions of these names, the Guelphs and Ghibelines of Dutch mediæval history, whose hostilities, which lasted a century and a half, are said to have arisen in 1350 from a jocose dispute between some nobles at a banquet as to whether the codfish could be said to take the hook, or the hook the codfish. Tollen's powers, however, did not lie in tragedy. In two contests with his friend Loots on subjects offered for prizes, one on the theme Hugo Grotius, and the other the death of Egmont and Hoorn, he won the second prize on the first occasion, and the first on the second; and in 1807 a short poem by him 'To a Fallen Girl,' attracted attention by its simple pathos. From that time his subjects were almost universally taken from national history and from domestic scenes, and though even his admirers did not place him on a level in point of genius with Bilderdijk, he became decidedly the most popular poet of his country, and had the honour of forming a school of poets—'the school of Rotterdam.' In 1817 the third edition of his poems had 10,000 subscribers; not long afterwards his fellow townsmen proposed to erect his bust in a public place, and it was only the reluctance of Tollens himself which prevented the intention from being carried out when the subscription was already full. This popularity increased as he grew more advanced in life. On his seventieth birthday, the 24th of September 1850, the minister of justice, Mr. Nedermeijer van Rosenthal, waited on him at his house at Rijswijk, to bring him the congratulations of the King of Holland, and present to him the insignia of commander of the order of the Dutch Lion, a very unusual honour for a literary man. A committee waited on him the same day to offer him a gold medal struck in his honour, with the inscription "Nederland zijnen geliefden Volksdichter' (Netherland to its beloved national poet), and to inform him that a subscription had been organised, without his knowledge, for the formation of a 'Tollens Fund,' to commemorate his name by a charitable institution, the nature of which was to be left to his own choice. He died in 1856, surrounded by universal respect.

The shorter poems of Tollens, lyrical and narrative, are his chief title to remembrance. One narrative poem, 'De Overwintering der Hollanders op Nova Zembla' (The Wintering of the Hollanders at Nova Zembla), commemorative of the celebrated voyage of Barends in 1596-97, is very popular and has often been reprinted, on one occasion in an illustrated edition. His 'Vierdaagsche Zeeslag,' or Four Days' Sea-Fight, commemorative of one of the desperate contests between the Dutch and English in the reign of Charles II., may be compared for spirit to his friend Loots's 'Overwinning bij Chattam' (Victory at Chatham), a favourite subject of allusion with the Dutch poets. Tollens is a fertile author of ballads on subjects of Dutch history, among which his 'Jan Van Schaffelaar,' 'Kenau Hasselaar,' &c., are conspicuous. His 'Wapenkreet' (Call to Arms), written on occasion of Napoleon's return from Elba, is one of his best productions. Tollens translated much from the German and English as well as the French, but often adapted the pieces he borrowed to Dutch subjects or history. An English reader would hardly suspect before reading it that his 'Jonker van 't Sticht' was taken from Scott's 'Young Lochinvar,' which has also been done into Dutch by Van Lennep, under the title of 'De Heer van Culemborg.' Tollen's works, of which a new edition is now publishing, are of some extent: his shorter poems alone occupy about ten 8vo. volumes, not very closely printed.

TOLUOLE. [CHEMISTRY, *S.* 2.]

TOOKE, THOMAS, one of the two sons of the Rev. William Tooke, was born in 1773. He published in 1838 'A History of Prices and of the State of the Circulation from 1793 to 1837, preceded by a brief sketch of the State of the Corn-Trade in the last two Centuries,' 2 vols. 8vo. The treatise comprised in these two volumes, though apparently an enlargement and continuation of one published about fifteen years previously under the title of 'Thoughts and Details on the High and Low Prices of the last Thirty Years,' embracing, as it does, the same line of argument and establishing the same conclusions, is yet essentially different both in its arrangement and details, and is, in fact, with slight exceptions, entirely new. It forms the first two volumes of the valuable work now well known to political economists as the 'History of Prices,' perhaps the first really scientific attempt to elucidate by inferences legitimately deduced from actual experience the complicated facts of this branch of political economy. The first two volumes were followed in 1840 by another volume in continuation of the two former, to which were added 'Remarks on the Corn Laws and on some of the Alterations proposed in our Banking System.' The fourth volume was entitled 'A History of Prices and the State of the Circulation from 1839 to 1847 inclusive; with a General Review of the Currency Question, and Remarks on the Operation of the Act 7 & 8 Vict., c. 32,' 8vo. 1848. Mr. Tooke afterwards published a tract, in which he was assisted by Mr. Newmarch, 'On the Bank-Charter of 1844, its Principles and Operation, with Suggestions for an Improved Administration of the Bank of England,' 8vo. The last two volumes of his great work are entitled 'A History of Prices and the State of the Circulation during the Nine Years 1848-1856, in Two Volumes, forming the Fifth and Sixth Volumes of the History of Prices from 1792 to the Present Time, by Thomas Tooke, F.R.S., Corresponding Member of the Institute of France, and William Newmarch,' 8vo., 1857. The 5th and 6th volumes, besides being a continuation and completion of the work, arranged under the heads Prices of Corn, Prices of Produce other than Corn, and the State of the Circulation, contains discussions on the connected topics of Railways and the Railway System, the origin and progress of the Free-Trade Movement, the State of Finance and Banking in France, and the New Discoveries of Gold. Mr. Tooke died in London, Feb. 26, 1858, being then within a few days of the completion of his 85th year. His younger brother, William Tooke, F.R.S., is still living.

TOOTH-TISSUE. [TISSUES, ORGANIC, *S.* 1.]

TOOTING. [SURREY.]

TORENO, DON JOSE MARIA QUEIPO DE LLANO, COUNT OF, a Spanish statesman and writer, was born at Oviedo on the 26th of November 1786, of one of the first families of the Asturias. In 1797 his parents, of whom he was the only son, fixed their residence at Madrid, where he received an excellent education of a character very uncommon at that time in Spain, as it included the study of English and even German, as well as French and Italian. After the national insurrection of the 2nd of May, 1808, in which he took a part, he returned to Oviedo, where, as Viscount of Matarrosa, he held an hereditary seat in the Junta, and when the city rose against Napoleon, he was selected, from his knowledge of English, to make his way to London to ask the assistance of England. In company with Don Angel de la Vega he got on board of a Jersey privateer, and was received at London with open arms by Canning. After spending some months in England, where he made the acquaintance of Wilberforce, Windham, and Sheridan, he returned to Spain in December, and, having lost his father in the interval, he succeeded to the title of Count of Toreno. He was sent to the Cortes as a member for the Asturias when a year too young to be able legally to take his seat, but by a vote of the Cortes on the 11th of February, 1811, he enjoyed the distinction of being specially exempted from the operation of the law. Young as he was he took a prominent part in the discussions on the constitution of 1812, and advocated with success two of the measures which most contributed to its subsequent downfall—one, that the Cortes should consist of a single chamber instead of two, and the other that the power of the king should be so restricted that all legislation should depend on the decision of the Cortes only. On the return of Ferdinand he was a marked man; when the celebrated decree of Valencia came forth, by which the Cortes was dissolved and many of its members thrown into prison, he was fortunately on his estates in the country, and had time to escape to Portugal. As he found there was no hope of resistance in Spain, he came to London, where he was the first emigrant from the tyranny of Ferdinand, as he had been the herald of resistance to Napoleon I. He received in London the intelligence that his estates had been confiscated and himself condemned to death. His brother-in-law, Porlier, who had married one of his four sisters, made an ineffectual attempt at insurrection, and was taken and executed. Toreno, who in 1816 was living in France, was thrown into prison for a time on suspicion, by the Decazes ministry, who interrogated him if he was not in habits of intercourse with the Duke of Wellington and General Álava, two persons whom it appears that the king of Spain then regarded as enemies. The Spanish revolution of 1820, recalled Toreno to Madrid, but he was now older and cooler than he had been, and saw with disapprobation many of the measures of the liberal party. His life was in consequence threatened in the Cortes, his house, in which his sister, the widow of Porlier, resided, was attacked, and, says Cueto, his biographer, "levelled to the ground." The king, on the other hand, pressed him to become prime-minister, and when he declined, named his friend, Martinez de la Rosa, whom Toreno had recommended. Finally, when the second French invasion had re-established the absolute king, Toreno found himself again a banished man, in favour with neither party, and this time his exile lasted nearly ten years. Most of it was passed in France and England, some in Germany and Switzerland, in the execution of a plan he had conceived of writing the history of the war of independence, for which he had begun collecting materials during his first emigration. He commenced the composition in 1827, at Paris, and finished the tenth book in the same city on the night of the 28th of July, 1830, in the midst of the insurrection which raged around.

The amnesty of 1832 restored him to Spain, but he was not permitted to reside in Madrid till after the death of King Ferdinand. In 1834, on the promulgation of the 'Estatuto Real,' by Queen Christina, on the recommendation of his friend, Martinez de la Rosa, he was named minister of finance. The measures he proposed for liquidating the foreign debt occupied his attention almost exclusively for some time, and prevented his sharing the unpopularity of his chief, so that, when in 1835 Martinez de la Rosa was compelled to retire, Toreno succeeded to his place as minister of foreign affairs and president of the council. Unfortunately for himself he admitted to his own post of minister of finance Mendizabal, who, with his dazzling schemes, soon threw him into the shade. Toreno, who was now decidedly a 'Moderado,' grew more and more unpopular; insurrections burst forth, which he wished to repress by forcible means, but his colleague thwarted him, and the country was not with him. In September 1835 he was driven to resign, and Mendizabal succeeded as head of the cabinet. On a dissolution of the Cortes, Mendizabal was returned by the electors of seven different places, and Toreno and Martinez de la Rosa were left without a seat. The disgraceful revolution of La Granja followed, the constitution of 1812 was proclaimed, and Toreno, now its declared opponent, found it expedient to resume his historical studies in Paris and London, where he brought his history to a conclusion, at the time that in Madrid he was sentenced to forfeit all his honours and estates. In a few months, however, he was again allowed to return to Spain, and in the Cortes of subsequent years he vindicated his character against an accusation of corruption brought against him by General Seoane. The revolution of Barcelona drove him into banishment yet another time, and it was the last. Toreno, after a tour in Germany and Italy, was in Paris, on his return, it is said, to Spain, when seized with a cerebral disease, which carried him off in a few days. He died at Paris on the 16th of September, 1843; but his remains were conveyed to his country, and deposited in the church of St. Isidro, at Madrid.

Toreno's 'History of the Insurrection, War, and Revolution of Spain' ('Historia del Levantamiento, Guerra, y Revolucion de España'), is the great Spanish work on that interesting subject. That it is a model of Spanish composition is affirmed by the best critics of that country. Its merits as a narrative are more liable to question, for there appears a languor and general want of spirit in its details, which surprise the reader who is aware that its author was not only an eye-witness of many of the events he describes, but also an actor in some of them. The editor of the edition of 1848, published after the author's death, speaks of the "carefulness and preciseness" of the history, "in which," he remarks, "the most insignificant French detachment is never mentioned without specifying the name of the chief who commanded it." A merit of more importance which Toreno's history possesses is that of a calm judicial tone, which favourably contrasts with the arrogant impetuosity of some English historians of that memorable contest. On the whole, it can only be considered like Southey's 'History of the Peninsular War,' as a temporary substitute and a collection of materials for the great work on the subject, with which it may be hoped that some future historian will enrich the literature of his country. The 'Historia del Levantamiento' has been translated into French and German, and a Spanish edition of it was printed by Baudry of Paris in his collection of the Spanish classics. The best edition of it is that published in four octavo volumes at Madrid in 1848, after the author's death, with his additions and corrections.

TORQUAY, Devonshire, a small sea-port and watering-place on the coast of the English Channel, in the parish of Tor-Moham, or Tor-Mohun, and hundred of Haytor, is situated in 50° 28′ N. lat., 3° 33′ W. long., distant about 30 miles S. from Exeter, 194 miles W.S.W. from London by road, and 219 miles by the Great Western and South Devon railways. The population of the town of Torquay in 1851 was 7903. The living is a perpetual curacy in the archdeaconry of Totnes and diocese of Exeter.

About fifty years ago Torquay consisted only of a few mean huts inhabited by fishermen. The mildness of the climate, and the favourable position and picturesque character of Torquay, induced many eminent physicians to recommend it as a winter residence for invalids. The abundance of building stone, which is found in the vicinity, presents great facilities for building. The town has consequently very much increased. Torquay lies in a small sheltered recess at the north-eastern extremity of Torbay. On all sides landward it is inclosed by lofty hills, on the sides of which the houses are built. The town is lighted with gas and paved, but the supply of water is insufficient. There are two chapels of the Establishment, a Free Episcopal church, chapels for Independents and Baptists, and National schools. Torquay contains assembly-rooms, a club-house, subscription and reading-rooms, a museum, and baths. The pier, which is used also as a promenade, incloses a small but convenient tidal harbour. The rise of tide at spring-tides is about 18 feet. The imports consist chiefly of American timber, coals and culm, Portland stone, corn, bricks, slates, and general goods: the exports include earthenware, cider, elm and oak timber, and yellow-ochre.

TRACHEARIA, a subdivision of the great class *Arachnida*. It includes those forms of this class which carry on their respiration by means of ramifying tracheal tubes. They have two or four eyes. This division includes the various forms of Mites, Ticks, Shepherd-Spiders, and Sea-Spiders. The following is a synopsis of the families of this sub-class from the 'Manual of Natural History,' by Messrs. Adams, Baikie, and Barron:—

Order I.—*Monomerosomata.*

Body without division, the head, trunk, and abdomen being united into a single mass; abdomen not annulated.

Sub-Order I.—*Errantia.*

Mouth with distinct mandibles; palpi always present, animals free.

Family 1. *Acaridæ.*—This includes the True Mites. [ACARIDÆ.]

Family 2. *Trombiidæ*, Garden-Mites.—Palpi jointed, with a moveable appendage below the tip; feet formed for walking; eyes latero-anterior; chelicerae ending in a moveable claw.

Trombidium holosericeum is of a blood-red colour, and is very common in gardens during the spring.

Family 3. *Gamasidæ*, Spider-Mites.—Palpi filiform, incurved, short, free; mouth with two didactyle chelicerae; body depressed; skin soft or scaly; legs formed for walking; tarsi unguiculate. The Red Spider of our hot-houses belongs to this family.

Family 4. *Orbitidæ*, Wood-Mites.—Palpi fusiform, hid under the head, without hooks; mouth with didactyle chelicerae; eyes not distinct; body hairy or scaly, produced and rostrate in front; legs formed for walking.

Sub-Order II.—*Suctoria.*

Mouth in form of a sucker, with or without palpi; no apparent mandibles; animal attached.

Family 5. *Ixodidæ*, True Ticks.

Family 6. *Bdellidæ*, Plant-Ticks.—Palpi antenniform; mandibles unguiculate or cheliform; eyes distinct; suckers in form of an elongated beak; body with a caselet; legs formed for walking.

Family 7. *Hydrachnidæ*, Water-Ticks.—Palpi with the last joint armed with points, the third and fouth joints larger than the others; body simple, oval, or rounded; eyes supero-anterior; legs ciliated, formed for swimming, parasitic in the young state; aquatic.

The species are found in fresh-waters. *Hydrachna* has the mouth composed of plates forming a projecting sucker.

Family 8. *Leptidæ*, Harvest-Ticks.—Palpi short; suckers porrected; body depressed, coriaceous, ovately rotund, legs six, two being undeveloped.

Leptus autumnalis is very common in autumn upon grass and other herbage. They crawl upon the human body, and insinuate themselves into the skin, producing great irritation. They are called Harvest Bugs.

Order II. *Adelarthrosomata.*

Body divided into three or four distinct segments, abdomen distinct, annulated; mouth with conspicuous didactyle pincers or chelicerae.

Family 1. *Solpugidæ*, False Scorpions.—Mandibles in the form of large compressed claws, with a moveable finger; palpi large, in the form of feet, or of cheliferous arms, body oblong, soft; abdomen hairy.

Family 2. *Cheliferidæ*, Book-Scorpions.—Mandibles short; didactyle at the end; palpi very large, awn-like, with a pincer at the end; body ovate, depressed, narrowed in front; legs of equal size, short, ending in two hooks. *Chelifer cancroides* is found in herbariums, old books, &c., where it feeds upon the minute insects which frequent such situations.

Family 3. *Phalangidæ*, Shepherd-Spiders.—Mandibles very conspicuous, composed of two or three pieces, free, ending in a didactyle pincer; palpi filiform, ending in a hook; body short, rounded; abdomen segmented; legs elongated. This family comprises the well-known forms called Harvest-Men.

Sub-Class III. *Aprobranchiata.*

This sub-class includes the genera *Nymphon* and *Pycnogonum*, which are the types of two families, *Nymphonidæ*, the Sea-Spiders, and *Pycnogonidæ*, Parasitic Sea-Spiders. These are often referred to the class *Crustacea.*

TRACHYPHONUS. [WOODPECKERS.]

TRACHYPTERUS, a genus of Fishes belonging to the riband-shaped forms of *Acanthopterygii.* The body is elongated and compressed; dorsal fin extending the whole length of the back, a few of the anterior rays sometimes elongated; ventral fins fragile, if not worn or broken, rather long; no anal fin; caudal fin-rays rising almost vertically from the horizontal line of the vertebral column; a row of small spines along the lateral line.

T. Bogmarus, the Vaagmaer, or Deal Fish, is described by Dr. Fleming in the 'Magazine of Natural History.' He was the first British naturalist who has made known its occurrence in Scotland. The species found in the north of Europe differ from those of the Mediterranean. One specimen only has been recently caught alive at Sanda in Orkney. It is thus described:—Length, three feet; body excessively compressed, particularly towards the back, where it does not exceed a table-knife in thickness; breadth nearly five inches, tapering to the tail; colour silvery, with minute scales, the dorsal fin of an orange colour, occupying the whole ridge from the head to the tail, with the rays of unequal size; head four inches and a half long, compressed like the body, with a groove on the top; eyes one inch and a quarter in diameter: both jaws armed with small teeth. Various specimens, probably to the number of twelve or more, appear to have been obtained on the island of Sanda between 1817 and 1829. The Vaagmaer is rare in Iceland. It differs from the two species found in the Mediterranean, *T. falx* and *T. iris*, and also from *T. leiopterus.*

TRADE, BOARD OF. The functions of this branch of the Privy Council have been of late years considerably extended, its duties being some of them of a ministerial, and others of a judicial character. It has the general superintendence of matters relating to merchant ships and seamen, and the carrying into execution the statutes in force relating to them. For that purpose it has to require and receive various kinds of returns as to trade and navigation, and originate and consider reports made to it by its inspectors and other officers. It has also a partial control over local marine boards, and may lay down rules as to the conduct of examinations, and as to the qualification of applicants for the posts of masters and mates of foreign-going as well as of home-trade passenger-ships. [SHIPS, *S.* 2.] It grants licences to persons to engage or supply seamen or apprentices for merchant ships in the United Kingdom, adjudicates on claims for wages, and investigates cases of alleged incompetency and misconduct (17 & 18 Vict. c. 104). The Board also appoints officers to report on the condition of steam-vessels and their machinery (14 & 15 Vict. c. 79).

The Board of Trade exercises a supervision over railways and railway companies, not only with respect to their original formation, but also as to their subsequent working. Railways were first placed under this control by the statute 3 & 4 Vict. c. 97. A few years afterwards the powers of the Board in this respect were transferred to a Board of Commissioners of Railways; but in 1851 all the powers of this latter board were transferred to the Board of Trade (14 & 15 Vict. c. 64). Notices of application for Railway Acts, accompanied by plans, must be deposited with the Board, before any bill can be introduced into Parliament; and before a line can be opened for traffic, notice must be given to the Board, and its permission obtained, on the report of an inspector, appointed by the Board for those and other general purposes. So, when accidents occur, notice must be given to the Board, and an inspector is generally sent to inquire into the circumstances, and on his report the Board may cause alterations to be made for the greater safety of the public.

The Board of Trade, through the medium of its registrar, is also charged with the registration of all Joint-Stock Companies (19 & 20 Vict. c. 47). By the statute giving a copyright in designs, their registration is effected by the Registrar of the Board of Trade (5 & 6 Vict. c. 100; 6 & 7 Vict. c. 65; 13 & 14 Vict. c. 104; 14 & 15 Vict. c. 8; 15 & 16 Vict. c. 6). The schools of design now established in almost all large towns are also under its immediate control, the appointments connected with them being made by the president. The Board also controls the proceedings of the Commissioners for regulating the employment of coal-whippers and the discharge of coal-laden vessels in the port of London (6 & 7 Vict. c. ci. (local and personal); 9 & 10 Vict. c. xxxvi.; 14 & 15 Vict. c. lxxviii.). Lastly, a department of the Board of Trade is charged with the collection and publication of tables, containing information with respect to the revenue, trade, commerce, wealth, population, and other statistics of the United Kingdom and its dependencies, as well as of foreign countries. The officers of another department collect and prepare the tables of the prices of corn, which formerly, and before the abolition of the corn-laws, regulated the amount of duty, and still govern the rent-charge in lieu of tithe under the Tithe Commutation Act. (Blackst. 'Comm.,' Mr. Kerr's edit. v. i. p. 268.)

TRADE, SHIPPING, AND CURRENCY. In the article GREAT BRITAIN [vol. xi. p. 417-18] we gave the official and declared value of the imports and exports, with the number of ships and amount of tonnage engaged in the trade of the country, down to the year 1836. The value of imported merchandise was only shown in the official valuation, which was very fallacious. The extent of our commerce has been constantly increasing, but without going through the details of each year, we shall give only summaries of 1854, 1855, and 1856, for which the materials are afforded in a report from the Board of Trade in a highly improved form; and for 1857, which is only a preliminary return, and somewhat less complete.

Trade. The real value of the total imports into the United Kingdom in 1854 was 152,389,053*l.*; in 1855 it was 143,542,850*l.*, and in 1856 it was 172,544,154*l.* These values are computed from the average prices fixed for the articles, which are chiefly entered by quantities at the Custom House. The value of the exports is obtained from the declared value set on the articles, except in the case of foreign and colonial produce, of which the price is computed in the same way as with the imports. In 1854 the total value of exports amounted to 115,821,092*l.*, of which 97,184,726*l.* were for the produce or manufacture of the United Kingdom, the remainder being for foreign or colonial produce. In 1855 the total value was 116,691,300*l.* of which 95,688,085*l.* were for the produce or manufactures of the United Kingdom; and in 1856 the total value amounted to 139,220,353*l.*, of which 115,826,948*l.* were for home productions; the official values of the exports show a singular contrast to the real values; they are for the three years respectively, 29,808,044*l.*, 31,494,391*l.*, and 33,423,724*l.* The official values of the imports for the three years show less discrepancy; they were 124,136,018*l.*, 117,284,881*l.*, and 131,937,763*l.*

Our largest importations in 1856 were from the United States of America; they amounted to 36,047,773*l.*; from Russia they were 11,561,924*l.*; from France, 10,386,522*l.*; from China, including Hong Kong, 9,421,648*l.*; from Turkey, including the Principalities, Syria, Egypt, and Tripoli, 8,960,900*l.*; from Holland, 7,433,442*l.*; from the Hanse Towns, 5,302,739*l.*; from Prussia, 4,534,815*l.*; from Spain, 3,645,083*l.*; from Belgium, 2,936,796*l.*; from Spanish West Indies, 2,654,580*l.*; from Denmark, 2,201,831*l.*; from Portugal, 2,164,090*l.*; from Sweden, 2,031,861*l.*; from various states of South America, Central America, and Mexico, 9,738,381*l.*; from the Western Coast of Africa, exclusive of British and French possessions, 1,657,375*l.* (this commerce has doubled itself within four years); from the Two Sicilies, 1,505,582*l.*; from Greece, 1,427,289*l.* The imports from other countries are each under a million. The total of imports from foreign countries was 129,517,568*l.* From British possessions the largest amount of importation was from the East Indies, 17,262,851*l.*; the other principal amounts were,—the North American Colonies, including Newfoundland, 6,535,770*l.*; the Australian Colonies, including New Zealand, 5,736,043*l.*;

the West Indies, 4,157,098*l.*; Mauritius, 2,427,007*l.*; Cape of Good Hope, 1,502,828*l.*; British Guiana, 1,418,264*l.*; Ceylon, 1,304,174; the other amounts make the total imports from British possessions of the value of 43,026,586*l.*

Of the exports, the total value taken by foreign countries in 1856 was, 82,526,509*l.*, and by British possessions, 33,300,439*l.* The United States (including California) was our largest customer, to the value of 21,918,105*l.*; then follow the Hanse Towns, 10,134,813*l.*; Turkey, including Syria and Egypt, 6,904,449*l.*; France, 6,432,650*l.*; Holland, 5,728,253*l.*; Brazil, 4,084,537*l.*; Spain, 1,734,483*l.*; Belgium, 1,689,975*l.*; Russia, 1,595,247*l.*; Portugal, 1,455,754*l.*; China (exclusive of Hong Kong), 1,415,478*l.*; Chili, 1,396,446*l.*; Cuba, 1,317,062*l.*; Two Sicilies, 1,202,183*l.*; Sardinia, 1,143,689*l.*; Sweden and Norway, 1,118,186*l.*; Denmark (including Holstein, &c.), 1,034,914*l.*; Peru, 1,046,010*l.*; Hanover, 1,021,485*l.*; and no other place above a million. Of the British possessions receiving exports, the largest amount was by the East Indies (including Ceylon and Singapore), 11,807,439*l.*; Australia (including New Zealand), 10,713,220*l.*; North American Colonies (including Newfoundland), 4,010,328*l.*; British West Indies (including Guiana), 1,873,397*l.*; Cape of Good Hope and South Africa, 1,344,338*l.*; these are the only places that exceed a million, but Gibraltar takes to the amount of 866,479*l.*; and Hong Kong to that of 800,645*l.*

The principal articles imported were—living animals (including horses) to the value of 1,488,691*l.*; bacon and hams, 1,078,908*l.*; butter, 2,635,182*l.*; cheese, 1,094,280*l.*; clocks and watches, 359,275*l.*; coffee, 1,498,108*l.*; copper and lead, 2,497,717*l.*; corn of all kinds, flour and meal, 23,039,422*l.*; cotton, raw and manufactured, 27,112,225*l.*; flax and tow, 3,633,194*l.*; fruit, including almonds, raisins, currants, &c., and oranges, apples, &c., 2,609.047*l.*; guano, 2,136,431*l.*; hemp, 1,984,907*l.*; hides, 2,814,743*l.*; indigo, 2,453,633*l.*; olive-oil, 1,124,755*l.*; palm-oil, 1,691,407*l.*; train and spermaceti-oil, 1,165,410*l.*; oil-seed cake, 716,001*l.*; rice, 2,031,647*l.*; flax and linseed, 3,195,634*l.*; silk, raw and manufactured, 11,467,603*l.*; skins and furs, 1,436,969*l.*; spices, 482,169*l.*; spirits, including brandy, rum, and geneva, 2,190,249*l.*; sugar and molasses, 12,504,218*l.*; tallow, 2,926,275*l.*; tea, 5,248,934*l.*; tobacco, raw and manufactured, 2,224,162*l.*; wine, 3,740,767*l.*: wood and timber of all kinds, 9,777,731*l.*; dyewoods, 504,260*l.*; ornamental woods—boxwood, cedar, mahogany, and rosewood, 487,612*l.*; wool, including sheep, lamb, alpaca, and llama, 8,664,420*l.*; woollen manufactures and yarn, 1,444,162*l.* No other article exceeded a million. The scale adopted for the estimated value is published by the Board of Trade, and varies every year according to the actual rates in the market, and the sum stated is exclusive of duty. Thus, in 1855, tobacco from the United States was estimated at 8¾*d.* per lb.; in 1856, at 1*s.* 0⅜*d.*; and from Cuba in 1855, at 2*s.* 2¾*d.*; in 1856, at 2*s.* 6½*d.* The gross amount of Customs' duties received was 24,206,844*l.*

The chief articles exported, the produce or manufacture of the United Kingdom, were—apparel, old and new, including slops and negro clothing, to the value of 1,816,310*l.*; beer and ale, 1,455,043*l.*; coals, coke, and cinders, 2,826,582*l.*; copper, wrought and unwrought, 2,527,053*l.*; cotton manufactures, 30,204,166*l.*; cotton twist and yarn, 8,028,575*l.*; earthenware and porcelain, 1,334,118*l.*; haberdashery and millinery, 3,638,358*l.*; hardware and cutlery, 3,747,598*l.*; iron, pig, wrought, wire, hoops, nails, &c., 12,230,286*l.*; leather, wrought and unwrought, 1,756.451*l.*; linen yarn, 1,365,980*l.*; linen manufactures, 4,887,780*l.*; machinery, including steam-engines, 2,716,443*l.*; linseed-oil, 1,079,748*l.*; salt, 401,202*l.*; silk, thrown and manufactured, 2,962,056*l.*; British spirits, 998,445*l.*; stationery, 720,390*l.*; steel, unwrought, 735,823*l.*; sugar, refined, 806,445*l.*; tin, unwrought and in plates, 1,646,842*l.*; wool, 950,193*l.*; woollen manufactures, 9,500,428*l.*; woollen and worsted yarn, 5,331,870*l.* No other article amounted to a million. The foreign and colonial produce re-exported amounted to 22,393,405*l.*; the largest items being raw cotton to the amount of 3,345,770*l.*; indigo to 1,593,692*l.*; sugar and molasses to 1,250,446*l.*; wine to 959,135*l.*; and wool to 1,949,323*l.*

In 1857 the total declared value of articles of British produce and manufacture exported was 122,155,237*l.* Of foreign and colonial merchandise re-exported, the value is not given, only the quantities. Compared with 1856, there was less re-exported of coffee by 12,000,000 lbs.; less cocoa, guano, hides, seeds, spices, spirits, sugar, and wine; and more leather, metals, oils, quicksilver, rice, silk, tallow; and of tea, to the extent of 8,000,000 lbs.; and of wool, to 10,000,000 lbs. Tobacco was nearly the same, and in the other items the differences were not large. If we take the amount of re-exportations as the same as in 1856 it will give an increase of exports to the value of 6,328,289*l.* for the year, and this in despite of the commercial crisis which, commencing in the United States in September, spread rapidly to Great Britain and every other civilised state, and in this country caused a falling-off in the month of December only to the amount of 2,174,922*l.* in articles of British production and manufacture as compared with December 1856.

The importations for the year are likewise only given in quantities. The differences are not large, but on the whole they were less, and the Customs' Duties, in which there had been additional duties on tea, coffee, and sugar, produced only 22,956,371*l.*, or 1,250,473*l.* less than in 1856.

Shipping.—In the year 1855 there were 22,787 British ships entered inwards, of which the burthen was 5,270,792 tons; in 1856 the number entered was 26,029, with a burthen of 6,390,715 tons, an increase in the year of 3242 ships, and of 1,119,923 tons. In 1855 the number of foreign ships entered was 18,193, tonnage 3,680,447; in 1856 the number of ships was 19,371, tonnage 4,162,419, an increase of 1188 ships and 481,972 tons of burthen, considerably less than a half of the British increase. Of the total amounts also in 1856 there were 7768 British ships, with a tonnage of 1,304,453 entered in ballast; and 2027 of the foreign ships, with a tonnage of 1,007,017. In 1855 there were 20,816 British ships cleared outwards with cargoes, of 5,036,926 tons burthen, and 2279 ships, of 612,014 tons burthen in ballast; in 1856 the numbers were 23,970 ships, of 5,883,861 tons burthen with cargoes, and 2145 ships, of 671,195 tons burthen in ballast. The foreign ships cleared out in 1855 were 16,167 ships, of 3,311,738 tons, with cargoes, and 3335 ships, of 577,553 tons burthen in ballast; and in 1856 there were 17,383 ships, of 3,777,473 tons burthen with cargoes, and 3361 ships, of 703,384 tons burthen in ballast; all the items showing a great preponderance in the increase of the British trade in their own ports, notwithstanding the greater facilities offered to foreigners by the repeal of the old navigation laws. These returns include both steam and sailing vessels. Of the foreign vessels with cargoes, the greatest number in 1856 was from Norway, 2259 ships, of 468,744 tons burthen; the next highest number was from Denmark, 2055 ships, but of only 194,686 tons burthen, or less than 200 tons for each ship. Prussia sent 1238 ships, and the Netherlands 1210, the united tonnage being only 465,460; the size of the ships being suited to the low shores of Holland and the shallows of the North Sea: but, crossing the Atlantic, the United States sends, it is true, only 1447 ships, but the tonnage is 1,378,631, approximating to a thousand tons for each vessel. The burthen of the whole number of 18,281 British ships was 5,086,262 tons, an average of very nearly 280 tons for each. The total number of registered British vessels, sailing and steam, was 36,012 on Dec. 31, 1856, of which the tonnage was 5,312,436, and the crews numbered 267,573 men, but this included the Channel Islands, and colonial possessions. In the British islands there were 6479 sailing vessels not exceeding 50 tons, and 12,027 above 50 tons; 529 steam vessels not exceeding 50 tons; and 743 above 50 tons. In the Home Trade (which signifies the coasts of the United Kingdom, or to ports between the limits of the river Elbe and Brest, but does not include river-steamers and transports), there were employed 9390 sailing vessels, of 719,864 tons burthen, with 33,879 men, and 317 steam vessels, of 67,616 tons burthen, and 4786 men. Partly in the Home and partly in the Foreign Trade there were employed 976 sailing vessels, of 162,488 tons burthen, and 6483 men; and 42 steam vessels, of 16,102 tons burthen, and 965 men. In the Foreign Trade there were employed 8059 sailing vessels, of 2,942,674 tons burthen, and 110,718 men; and 492 steam vessels, of 247,337 tons burthen, and 17,165 men. In 1856 there were built and registered 1150 ships in the United Kingdom, of which 921 were sailing vessels, and of these 33 were of iron, of an aggregate tonnage of 187,005; and 229 steam vessels, of which 175 were of iron, with an aggregate tonnage of 57,573. In the Channel Islands, Isle of Man, and in the colonies, 726 ships were built and registered, of which the tonnage was 179,016, and there were 57 foreign-built vessels, tonnage 11,656, registered at various ports of the United Kingdom. There were also 69 steamers and 6 sailing vessels built during the year for foreigners, the tonnage of which amounted to 34,061. There were 754 vessels wrecked during the year, 110 broken up, and 149 sold to foreigners, the tonnage of the whole, 249,459.

In the Coasting Trade in 1856 there were entered with cargoes (in ballast are omitted) 150,598 British vessels, tonnage 15,163,755, and 307 foreign vessels, tonnage 53,489; there were cleared, likewise with cargoes, in the same period, 155,006 British vessels, tonnage 15,248,329, and 370 foreign vessels, tonnage 65,355. For the United Kingdom there entered 127,739 sailing vessels, and 24,752 steamers; and there cleared 131,704 sailing vessels, and 24,735 steamers. The foreign sailing vessels entered numbered 288, the steamers 19; the number cleared was 315 sailing vessels, and 29 steamers.

In 1857 the number of British ships, including sailing vessels and steamers, entered inwards with cargoes, was 19,091, the tonnage 5,418,090; the foreign vessels, 13,602, tonnage 3,314,090. Cleared outwards, there were 24,834 British vessels, tonnage 6,204,198; the foreign vessels 19,570, tonnage 4,136,201. The number of ships in ballast is not stated. Of the ships entered inwards Norway and Denmark still have the greatest number, Norway 2080, and Denmark 2511, while the United States sent only 1250 ships, nearly 200 less than in 1856, and the tonnage declined to 1,214,464, a decrease of 164,167 tons. But though France only entered inwards 1122 ships, tonnage 90,038, she cleared out 4410 vessels, tonnage 473,859; Denmark cleared out 3141 ships, tonnage 316,625; Norway 1696 ships, tonnage 330,078; and the United States 1334 ships, tonnage 1,295,934. The number of ships employed in the Coasting Trade was 129,401 entered inwards, tonnage 12,979,066, of which 316 were foreign vessels, tonnage 48,619; cleared outwards, 144,955 vessels, tonnage 14,096,429, of which 247 were foreign vessels, tonnage 38,414.

Currency. At Michaelmas, 1837, the amount of Bank of England notes and post bills in circulation, was 17,086,610*l.*; the value of coin and bullion in hand was 3,856,000*l.* on October 17. At Michaelmas, 1837, the total amount of the notes of Private Banks and Joint Stock Banks of England and Wales was 10,142,049*l.*; of which 3,701,996*l.* were those of Private Banks, and 3,440,053*l.* those of Joint Stock Banks. In the year gold to the value of 1,253,088*l.*, silver to that of 76,111*l.*, and copper to that of 5096*l.*, had been coined. In July, 1844, Sir R. Peel's Bank Restriction Act (7 & 8 Vict. cap. 32) was passed for regulating the issue of paper money. By this act, the Banking Department of the Bank of England was separated from an Issue Department, then created. The Government debt of 14,000,000*l.* was to be taken by the Issue Department as security for a like amount of notes, and any further upply could only be obtained by a deposit of the value in bullion; and any withdrawal of bullion was to be followed by a return of notes to an equal amount. The bullion to be valued either in receipt or payment at 3*l.* 17*s.* 9*d.* per z., at which rate all persons may demand notes for bullion f the Bank of England. Private Banks, not previously ssuing notes, were restricted from commencing, and those which had done so, were prescribed as to the amount to be sued, and were required to furnish returns monthly. ankers ceasing to issue were not allowed to resume, ut the Bank of England, under certain regulations, ere permitted to increase their issue beyond the fourten millions by an amount not more than two-thirds the private issue that had been discontinued. On anuary 4, 1845, the amount of notes issued to the Bank England was 28,087,055*l.*, of which 8,418,125*l.* remained its possession; and the bullion in both departments mounted to 14,801,621*l.* The notes of Private Banks in ngland amounted to 4,427,711*l.*, of Joint Stock Banks to ,059,434*l.*; of the various banks of Scotland to 3,159,450*l.*; nd of Ireland to 6,983,551*l.* In the autumn of 1847 a reat monetary pressure was experienced, and on October 3, the temporary suspension of the Act was ordered by ie First Lord of the Treasury and the Chancellor of the xchequer (Lord John Russell and Sir C. Wood). The ank rate of interest for discount had risen to 8 per cent., ie suspension relieved the pressure, and the order was ithdrawn on November 23. The act worked smoothly ntil the American failures, in the autumn of 1857, occaoned a pressure in the United Kingdom. The rate of discount was rapidly raised to 10 per cent., and on November 12 the restriction was again suspended. An issue of 2,000,000*l.* of notes, of which not more than a quarter were used, was sufficient to restore confidence, and by February, 1858, money had sunk to its ordinary value. We subjoin the following returns to show the contrast. On November 11 the notes issued to the Bank of England amounted to 21,141,065*l.*, and those in circulation to 20,183,354*l.*; so that there only remained 957,711*l.* in notes in its coffers; and the amount of bullion was reduced to 7,170,508*l.* In the return for November 18, the additional issue of the two millions was included; the notes issued amounted to 22,554,555*l.*, those in circulation to 21,406,410*l.*; the notes unemployed to 1,148,185*l.*; while the bullion had sunk to 6,484,096*l.* The note issue of the Private and Joint Stock Banks varied but little during this period. The two millions were returned by the Banking Department of the Bank of England to the Issue Department by December 30, and on February 17 the notes from the Issue Department amounted to 31,294,910*l.*; those in circulation to 19,453,515*l.*; those unemployed to 11,841,395*l.*; and the bullion to 17,623,251*l.*

The coinage, particularly that of gold, has been very large for several years. The following are the amounts of each description of metal for the respective years:—

	Gold.	Silver.	Copper.
1846	£4,334,697	£559,548	£6496
1847	5,158,440	125,730	4960
1848	2,451,998	35,454	2692
1849	1,977,955	119 636	1792
1850	1,491,836	129,245	448
1851	4,400 411	87,866	3584
1852	8,742,276	189,594	3882
1853	11,912,391	701,544	9073
1854	4,152,183	139,480	61,538
1855	9,008,663	189,511	63,928
1856	6,001,115	462,528	11,418

Commercial bills form a large part of the Currency of the kingdom; the average amount held under discount by the Bank of England is about 16,000,000*l.*; those discounted by other banks, by discount firms, and by private individuals, cannot be ascertained with any precision, but they must amount to an enormous sum. In the autumn of 1857 the commercial panic, beginning in America, caused the rate of discount to rise from 5¼ per cent. in July, by rapid steps to 10 per cent. in November. By February, 1858, the rate of discount had fallen to 3 per cent.

The value of the gold and silver bullion exported in 1857 was 33,566,968*l.*; of which 15,061,500*l.* was in gold, and 18,505,468*l.* in silver. Of the gross sum 10,863,818*l.* in gold was sent to France, and 17,295,432*l.* in silver to Egypt in transit to India and China. To no other country was so much as a million sent in both metals, except Brazil, to which was forwarded 958,014*l.* in gold, and 54,901*l.* in silver, a total of 1,012,915*l.* The Hanse Towns received a total of 935,886*l.*, the greater part in silver; and the United States, 859,110*l.*, all but 15,980*l.* in gold.

TRANSPORTATION. [Servitude, Penal, *S.* 2.]

TRAVNIK. [Bosnia.]

TREE-FERN. [Cyathea, *S.* 1.]

TRIÆNODON. [Squalidæ.]

TRIAKIS. [Squalidæ.]

TRIGLOCHIS. [Squalidæ.]

TRILLIACEÆ, a small natural order of Plants belonging to the class Dictyogens. They are distinguished by their bisexual tripetaloideous flowers, half-consolidated carpels, and axile placentæ. Lindley gives the relations of this order with *Smilaceæ*, *Roxburghiaceæ*, *Commelynaceæ*, and *Melanthaceæ*. It contains 4 genera—*Paris*, *Demidovia*, *Trillium*, and *Medeola*. The species are found in thickets in the temperate parts of Europe, Asia, and North America.

TRIPTOLOMEA, a genus of Plants belonging to the natural order *Fabaceæ*, or *Leguminosæ*, and to the suborder *Papilionaceæ*. The species are natives of warm climates, and yield the Rose-Wood of commerce.

TRITHEN, FREDERICK HENRY, a distinguished Sanscrit and Slavonic scholar, was born in February 1820 in Switzerland, from whence he was removed when a few years old to Odessa, his father having accepted the situation of professor at a Russian college in that city. At Odessa he received an excellent education and had ample opportunities for making himself acquainted with the modern languages, of which French, English, and German were as familiar to him as Russian. At the university of Berlin, where he continued his studies, and took his degree of doctor of philosophy, he was distinguished for his knowledge of Greek, and he studied Sanscrit under Bopp. After passing some time in Poland, where he made himself master of Polish, he came to England, where, in 1841, he was teacher of modern languages at Rugby, under Dr. Tait, the present bishop of London. He then began to contribute articles, chiefly on subjects connected with Sanscrit literature, to the 'Penny Cyclopædia' and the 'Biographical Dictionary' of the Society for the Diffusion of Useful Knowledge.

In 1844 he was appointed one of the assistants in the Printed Book department in the British Museum, and was partly employed in cataloguing the Sanscrit and Arabic works, and those in the Slavonic languages, of which a large stock had then recently been added to the Museum library. In coming to the Museum he had indulged in expectations that his talents and acquirements would probably attract the notice of the Trustees with the effect of bringing encouragement and promotion, and he was deeply disappointed to find that such expectations were futile. He accepted in 1845 the post of private tutor in the family of Prince Chernichev, the Russian minister of war, and left London for St. Petersburg. He returned to England after an absence of about two years, part of which he had passed at Constantinople and Cairo, and in 1848 published at London an edition of the 'Maha Vira Charita,' or History of Rama, a Sanscrit drama, by Bhavabhuti. His friends suggested to him to offer himself as a candidate for the professorship of modern European languages in the Taylor Institution at Oxford, which was then on the point of being set in action. The professor, it was decided, was to be appointed at first for five years only, but with the capability of being re-elected; his post was to be one of influence and authority, the rest of the officials of the institution being placed under his directions, and his salary was to be 400*l.* a year. Dr. Trithen was elected to this post in 1848 in preference to some very able competitors, and contrary to his own expectations, and entered upon his duties with a lecture 'On the position occupied by the Slavonic dialects among the other languages of the Indo-European family,' which he afterwards printed as an essay in the 'Proceedings of the Philological Society of London,' of which he had been a member since 1843. The career of usefulness and honour which now seemed to lie before him was suddenly cut short about the middle of 1850 by an attack of mental aberration in so violent a form that his friends found it necessary to put him under restraint. It was reported at the time that the immediate cause of the disorder was, that a lady to whom he had paid his addresses had married a rival, but a tinge of eccentricity had on some previous occasions been remarked in his conduct. His father came to England, and in 1851 removed him to Odessa, where he remained in a hopeless state till April 1854, when the city was under apprehensions of bombardment from the English. Trithen was then removed to a village at a few miles distance, where an unexpected change in his disorder took place, and he recovered his mental powers as suddenly as he had lost them, but this was only a "lightning before death." After expressing a strong desire to return to England, it became evident that his bodily strength was failing, and he expired on the 27th of April 1854. He left behind him no adequate monument of the extent of the powers which his friends knew him to possess, but his contributions to biographical literature in the Cyclopædia and Dictionary are of a sound and solid character, and his scholarship was not only accurate but remarkably ready. The power which he possessed of conversing with ease in more than one of the Teutonic, the Romanic, and the Slavonic languages qualified him in an eminent degree for the professorship to which he was chosen.

TRIURIDACEÆ, *Tailworts*, a small natural order of Plants belonging to Lindley's class Dictyogens. They have the dictyogenous structure, unisexual flowers, a free perianth, and numerous 1-seeded carpels. There are only two genera, *Triuris* and *Peltophyllum*. The species of these plants were discovered by Mr. Miers and Mr. Gardner in the woods of Brazil, where they delight in moist shady places. Their relations are with *Smilaceæ*, *Menispermaceæ*, and *Trilliaceæ*.

TROOSTITE. [MINERALOGY, *S.* 1.]

TROWBRIDGE. [WILTSHIRE.]

TRUMPET-FISH. [CENTRISCUS.]

TRUMPET-FLOWER. [TECOMA, *S.* 1.]

TRURO, THOMAS WILDE, FIRST LORD, the son of a respectable solicitor in Warwick-square, London, and Saffron Walden, Essex, was born in 1782, and received his early education at St. Paul's School. He was articled as a clerk in his father's office, and having been admitted an attorney in 1805, practised for some years as partner in the firm of Wilde and Knight, in Castle-street, Falcon-square. In 1817 he was called to the bar, and went the Western Circuit. Good fortune attended him: he speedily rose to eminence as an advocate, and became leader of his circuit. In 1824 he was made a serjeant-at-law, and three years later a king's serjeant, and a vast accession of business was the consequence. Under Lords Denman and Brougham he was engaged as a junior in the defence of Queen Caroline, which tended materially to increase his professional reputation, though it retarded his advancement during the reign of George IV. In 1831 he was elected member for Newark, against the influence of the late Duke of Newcastle, and though thrown out in December 1832, he regained his seat in January 1835, and retained it, as colleague with Mr. W. E. Gladstone, until 1841, when he was elected for Worcester. In 1839 he succeeded Sir R. M. Rolfe, now Lord Cranworth, as solicitor-general, and became attorney-general in 1841. In 1846, on the return of the Liberal party to power under Lord John Russell, Sir Thomas Wilde was again nominated attorney-general, but within a week afterwards was raised to the bench as chief-justice of the Common Pleas on the death of Sir N. Tindal. In July 1850 he received the great seal, and was at the same time elevated to the peerage as Lord Truro. He resigned the chancellorship on the retirement of his party from office in February 1852. The most memorable causes in which he was professionally engaged before his elevation to the judicial bench were the trial of Queen Caroline, alluded to above, and the trial of the late Mr. O'Connell in 1844, to whom he gave his services without fee or retainer to obtain a reversal of the decision of the law courts of Dublin. In Parliament his name is most permanently connected with the great case of Stockdale *v.* Hansard, which involved the constitutional question as to whether the House of Commons had the right of publishing its reports without rendering its officers thereby liable to proceedings in the courts of law. On this question Sir Thomas Wilde took the affirmative side, and supported it by a speech of more than three hours' duration, which Dr. Lushington pronounced to be "the most consummate and masterly triumph of legal reasoning ever known." The matter at issue, as is well known, was eventually compromised by the introduction of a bill by Lord John Russell, formally conferring upon the House that power which it had hitherto claimed as a right. As a judge, the reputation of Sir Thomas Wilde stood high: he was patient, painstaking, and impartial in the highest degree. As lord chancellor, his judgments were regarded with respect; and though most of the cases brought before him were appeals from the vice-chancellors' courts, whose decisions he frequently reversed, yet of his own decisions as a judge only one was reversed on appeal. The chief fault laid to his charge as lord chancellor was an over-anxious and too elaborate dwelling on all the points in an argument, without due regard to their relative importance. Among other important public questions which were decided by him in this capacity was that of the Braintree Church-rates. Lord Truro was also eminent as a legal reformer. Whilst holding the chancellorship he appointed a commission to inquire into the jurisdiction, pleading, and practice of the court, the result of which was that a bill was introduced and carried for the abolition of the twelve masterships, a step which reduced the annual fees of the court by 20,000*l.* By another act also, mainly promoted by Lord Truro, some other offices were consolidated or abolished, and the practice of receiving fees by various individuals was suppressed to such an extent that the estimated saving to suitors is 60,000*l.* a-year. Among the other legal reforms effected by Lord Truro was the appointment of the lords-justices to relieve the chancellor of some of his judicial labours, and so to enable him to give his attention to his duties in the House of Lords, and as a member of the Cabinet without interruption to the law courts. To him also the legal profession owes the reform of the Common Law procedure, the professed object of which is to sweep away the antiquated technicalities upon which legal decisions were too frequently based, and to insure that they shall henceforth be given according to their own respective merits, "according to the very right and justice of each case," as is more fully explained in Finlason's 'Summary of the Common Law Procedure Act,' 1854. Lord Truro was twice married: his second wife, who survives him, was Mademoiselle Augusta Emma d'Este, daughter of H.R.H. the late Duke of Sussex. He died at his seat, Bowes Manor, Southgate, Middlesex, on the 11th of November 1855, and was buried by the side of the late Sir Augustus d'Este, in the Old Minster Church at Ramsgate.

TRUSTEES. Owing to the inadequacy of the existing law to meet the case of the defalcations and frauds of trustees, bankers, and other persons entrusted with the care and management of the property of others, a statute was passed in 1857 (20 & 21 Vict. c. 54) whereby the following offences were made a misdemeanour punishable with penal servitude for three years, or imprisonment, not exceeding two years, with or without hard labour:—

1. The appropriation or disposal, with intent to defraud, by a trustee of any property held for the benefit of some other person, or for any public or charitable purpose.

2. A banker, merchant, broker, attorney, or agent, selling, pledging, or in any manner appropriating, with intent to defraud, the property of any other person intrusted to him for safe custody.

3. Any person entrusted with a power of attorney for the sale or transfer of any property, fraudulently selling or transferring it.

4. A director, member, or public officer of any body corporate or public company, fraudulently taking or applying, for his own use, any of its money or other property.

5. Any director, public officer, or manager of any body corporate or public company, receiving or possessing himself of any of its money or other property, otherwise than in payment of a just debt or demand, and with intent to defraud, omitting to make, or to cause or direct to be made a full and true entry thereof in the books and accounts of such body corporate or public company.

6. Any director, manager, public officer, or member of any body corporate or public company, who, with intent to defraud, destroys, alters, mutilates, or falsifies any of the books, papers, writings, or securities belonging to it, or makes, or concurs in the making of any false entry or any material omission in any book of account or other document.

7. Any director, manager, or public officer of any body corporate or public company, who makes, circulates, or publishes, or concurs in making, circulating, or publishing any written statement or account which he knows to be false in any material particular, with intent to deceive or defraud any member, shareholder, or creditor of such body corporate or public company, or with intent to induce any person to become a shareholder or partner therein, or to intrust or advance any money or property to such body corporate or public company, or to enter into any security for the benefit thereof.

8. Any person knowingly receiving any chattel, money, or valuable security, which has been fraudulently disposed of, under any of the above provisions.

The statute further enacts that a bailee of any property fraudulently taking or converting it to his own use, or to the use of any other person than the owner thereof, although he shall not break bulk or otherwise determine the bailment, shall be guilty of larceny.

TRUSTS, CHARITABLE. The sovereign, as *parens patriæ*, has the general superintendence of all *charities:* which he exercises by the keeper of his conscience, the Chancellor; and, therefore, whenever it is necessary, the Attorney-General files *ex officio* an information in the Court of Chancery to have the charity properly established.

Until the passing of Sir Samuel Romilly's Act, in 1812, this was the only ordinary mode of redressing a breach of trust by the trustees of a charity. Sir Samuel Romilly's Act (52 Geo. III. c. 101) was passed, in order to provide a more summary and efficient remedy for such breaches of trust. For this purpose any two or more persons were enabled, with the permission of the Attorney or Solicitor-General, to present a petition in Chancery, praying such relief as the nature of the law might require; and it was directed that such petition should be heard in a summary way upon affidavit, or such other evidence as should be produced, the order thus made to be final, unless appealed against to the House of Lords within two years. This Act led to the appointment of Commissioners, who were to report upon cases of neglect, abuse, or breach of trust; and the reports of this body, which now extend to 38 volumes, form a valuable collection of information on the subject of existing charities. Additional powers were given by the statute 3 & 4 Vict. c. 77 to the Court of Chancery with respect to grammar schools, but the latest and most important piece of legislation on this subject is 'The Charitable Trusts Act, 1853,' of which the professed object is to secure the due administration of charitable trusts; and in certain cases a more beneficial application of charitable funds than that previously in operation. For these purposes a permanent board of commissioners is constituted, called 'The Charity Commissioners for England and Wales,' who are to inquire into all or any charities, their nature, objects, and administration, and the condition of the estates and funds belonging to them. This board is empowered to require all trustees of charities to render in writing to the board or its inspectors, accounts, explanations, and answers, to any inquiries, and to produce any documents in their custody.

When the income of any charity exceeds 30*l.*, and in the case of a London charity even when the income is below that sum, the Master of the Rolls and the Vice-Chancellors are to entertain any suit which may be brought for its administration. In the administration of charities where the income does not exceed 30*l.*, jurisdiction is given to the county court and court of bankruptcy of the district where the charity is situated. The decision of any district court of bankruptcy or county court may, however, be brought by the commissioners before a judge of the Court of Chancery, for re-consideration. [COUNTY COURTS, *S.* 2.] Application may be made to the Commissioners by the Attorney-General, by any one or more of the trustees or managers of the charity, by any one interested in it, or by any two or more inhabitants of the place where it is administered; and as the courts are prohibited from entertaining any legal proceedings (except *ex officio* informations by the Attorney-General) unless upon the certificate of the board, the first proceeding is, in almost all cases, to communicate with that body and obtain its sanction and advice. The powers which it possesses of extracting information on the subject of charities, enable it to afford the most efficient assistance to individual informants. The statute does not extend to Scotland or Ireland; and from its operation are excepted the Universities of Oxford and Cambridge, and certain other institutions. A report of the proceedings of the commissioners must be annually laid before Parliament. (Blackst. 'Comm.', Mr. Kerr's edition, v. iii., p. 483.)

TRYPHILINE. [MINERALOGY, *S.* 1.]

TUNSTALL. [STOKE-UPON-TRENT.]

TURKEY. The Turkish Empire is divided into Eyalets or general governments, each administered by a pasha, who is generally styled Vali, or vice-roy. The Eyalets are divided into Livas, governed by Kaimakans, or lieutenant-governors. The Livas are subdivided into Cazas, or districts, and these again into Nahiges, or communes, containing villages and hamlets.

Turkey in Europe contains 15 Eyalets, divided into 43 Livas, and 376 Cazas. Turkey in Asia is divided into 18 Eyalets, 78 Livas, and 858 Cazas; Turkey in Africa into 3 Eyalets, 17 Livas, and 86 Cazas. The following table gives the names of the Eyalets, with the chief town of each, extracted from M. Ubicini's recent work upon Turkey:—

TURKEY IN EUROPE.

Eyalets.	Capitals.
Tchirmen (Edirné)	Adrianople
Silistra . . .	Silistria
Boghdan, or Moldavia . . .	Jassy
Eflak, or Wallachia	Bucharest
Widdin . . .	Widdin
Nisch (Nissa) . .	Nissa
Uskup . . .	Uskup
Syrp (Servia) . .	Belgrade
Belgrade fortress	
Bosnia . . .	Serajevo
Rumili . . .	Monastir
Yania . . .	Janina
Selanik . . .	Seloniki
Jizair (islands) .	Rhodes
Cryt or Crete . .	Candia

TURKEY IN ASIA.

Eyalets.	Capitals.
Kastamuni . .	Kastamuni
Quadavendigular .	Brussa
Aydin . . .	Smyrna

TURKEY IN ASIA (*continued*).

Eyalets.	Capitals.
Karaman . . .	Koniah
Adana . . .	Adana
Bozoq	Angora
Sivas . . .	Sivas
Tharabezun . .	Trebizond
Erzerum . . .	Erzerum
Mosul	Mosul
Kurdistan . .	Van
Khartrout . . .	Kharput
Haleb . . .	Aleppo
Saida	Beirout
Sham . . .	Damascus
Baghdad . . .	Baghdad
Habesh . . .	Jidda
Haremi-Nahevi . .	Medina

TURKEY IN AFRICA.

Eyalets.	Capitals.
Misser, or Egypt .	Cairo
Tarabloust Gharb, or African Tripoli	Tripoli
Tunis	Tunis

A general estimate of the population in 1844 made the inhabitants amount in round numbers to 35,350,000, distributed as follows among the great popular divisions of the empire :—

TURKEY IN EUROPE.		TURKEY IN ASIA.	
Thrace	1,800,000	Asia Minor	10,700,000
Bulgaria	3,000,000	Syria Mesopotamia Kurdistan	4,450,000
Moldavia	1,400,000		
Wallachia	2,600,000		
Bosnia	1,100,000	Arabia	900,000
Rumili	2,700,000	TURKEY IN AFRICA.	
Albania	1,200,000		
Servia	1,000,000	Egypt	2,000,000
Islands	700,000	Tripoli, Fez, Tunis	1,800,000

The numbers of the different races of which the population is composed are given as follows :—

Races.	In Europe	In Asia.	In Africa.	Total.
Ottomans	2,100,000	10,700,000	——	12,800,000
Greeks	1,000,000	1,000,000	——	2,000,000
Armenians	400,000	2,000,000	——	2,400,000
Jews	70,000	80,000	——	150,000
Slaves	6,200,000	——	——	6,200,000
Rumani	4,000,000	——	——	4,000,000
Albanians	1,500,000	——	——	1,500,000
Tartars	16,000	20,000	——	36,000
Arabs	——	900,000	3,800,000	4,700,000
Syrians	——	235,000	——	235,000
Druses	——	30,000	——	30,000
Kurds	——	1,000,000	——	1,000,000
Turkomans	——	85,000	——	85,000
Gipsies	214,000	——	——	214,000
Total	15,500,000	16,050,000	3,800,000	35,350,000

With regard to religion the classification is as follows :—

Religion.	In Europe.	In Asia.	In Africa.	Total.
Musulmans	4,550,000	12,650,000	3,800,000	21,000,000
Greek Church	10,000,000	3,000,000	——	13,000,000
Catholics	640,000	260,000	——	900,000
Jews	70,000	80,000	——	150,000
Different Sects	——	——	——	300,000
Total	15,260,000	15,990,000	3,800,000	35,350,000

The total area of the Ottoman empire, including the tributary provinces, is estimated at 1,220,000 square miles, of which about 300,000 are in Europe, 560,000 in Asia, and 360,000 are in Africa.

With regard to the administrative division of the empire it must be observed that neither the eyalets nor the sanjaks, or livas, have such invariable limits as provinces in Europe usually have: and with regard to the population, it is clear that, deducting the numbers placed opposite the tributary but almost independent states of Servia, Moldavia, Wallachia, Egypt, Tripoli, and Tunis, the inhabitants subject to the Porte do not much exceed 26 millions.

Abdu-l-Mejid, son of Mahmud II., ascended the throne of Osman in 1839, in his 16th year. The loss of the battle of Nezib, the treachery of the Capudan pasha, who deserted to Mehemet Ali with the whole of the Turkish fleet, and the advance of the victorious Ibráhím, seemed to foreshadow the immediate dissolution of the Turkish empire. This disaster was prevented however by the treaty of London (July 15, 1840), in fulfilment of which an Austro-English fleet bombarded and took Acre, Sidon, and several other towns on the coast of Syria, which Ibráhím Pasha was obliged to evacuate. Negotiations for peace soon followed, which terminated in the restoration of Syria to the Porte, and the recognition of Mehemet Ali as hereditary pasha of Egypt and its dependencies, upon payment of an annual tribute.

On the death of Mahmud II., the old Turkish party, opposed to all innovations, and especially to all imitations of the polity of Christian states, hoped that no more would be heard of reform. But their hopes were blasted by the appearance of the Hattisherif of Gulhané, dated Nov. 3, 1839, and countersigned by Reschid Pasha, which contained guarantees for the life, property, and honour of all the subjects of the Sultan, irrespective of person or religion, and promised the abolition of the arbitrary recruiting system, and the introduction of an impartial system of taxation. The issue of this charter threw the empire into commotion; the old Turks, headed by Risa Pasha in the capital (who was accused of being under the influence of Russia), made a formidable opposition to the execution of the decree; the Turkish subjects of the Sultan, brought up in principles of ascendancy and contempt for Christians, rose in insurrection to defend their privileges. The Christians of European Turkey, by far the most numerous class of the subjects of the Sultan in that part of the empire, long groaning under oppression, were accustomed (and taught) to look for protection and deliverance to Russia. France had to interpose frequently (but never offensively to the Porte) to protect the Christians of the east; and the English and Austrian ambassadors at the Sublime Porte embraced every opportunity of keeping up the influence of their several governments. Thus, not only did foreign nations interfere in the internal administration of the empire, but their ambassadors seemed to be a set of players with Turkey for a chessboard. The fair execution and firm establishment of the system mooted in the Hattisherif, would have put an end to this state of things, by giving the Christian subjects of the Porte the protection of law, and depriving them of all excuse and desire for seeking foreign protection. Russia could never coax a people to take shelter behind her shield who lived secure under the ægis of law. The Sultan's government, it is true, has given many indications of perseverance in reform, and has issued many orders in furtherance of the system (among others one in 1855 for the reception of Christian evidence in the courts of justice), but the fact is undeniable, that the central government is not able to enforce the tanzimat in the provinces.

A fine instance of the noble generosity that lies at the bottom of the Turkish character was exhibited to the world in the refusal of the Sultan Abdu-l-Mejid to surrender the Hungarian refugees to the imperious demands of Austria and Russia in 1849. Nevertheless the influence of Russia, however it might diminish at court, was rapidly extending among the Christian population of the Porte. Indeed, from the mere terms of the treaties of Kainarji, Adrianople, and Unkiar-Skelessi, it is clear that Russia was ever drawing the noose of political dependence closer and tighter round the neck of Turkey. The crisis seemed to arrive, when in 1853 the Czar Nicolas, through his minister Menzikoff, demanded openly the protectorate of the Christian subjects of the Sultan, and even the right to adjudicate in certain cases of dispute; and insolently occupied Moldavia and Wallachia, as a 'material guarantee' for compliance with his demands. In consequence of this, a Turkish army under Omar Pasha occupied the Balkan and the fortresses of the Danube; and French and English fleets cast anchor in Besika Bay. In October following the Porte declared war against Russia, and appealed to France and England for aid. In the campaign that followed in Little Wallachia the Russians were on every occasion defeated by the Turks; but in November the Russian fleet, issuing from the harbour of Sevastopol, attacked and utterly destroyed the Turkish fleet in the roads of Sinope. In the following March (1854) the Russians crossed the Danube, and seized the fortresses in the Dobrudscha; and about the same time England and France declared war, and the fleets entered the Black Sea. On the 15th of June the Russians, after great efforts and a vast loss of men, raised the siege of Silistria (French and English armies now appearing in Turkey, encamped at Varna), and retreated across the Danube. The Turks also crossed the Danube. The Russians were defeated at Giurgevo, and soon after evacuated the principalities, which, in accordance with the terms of a treaty with the Porte, were occupied by Austrian forces. Meanwhile the French and English fleets entered the Black Sea, bombarded Odessa, and forced the Russian fleet to take refuge in the harbour of Sevastopol. An Anglo-French army landed in the Crimea on September 14, 1854, under the command of Marshal St. Arnaud and Lord Raglan. The battle of Alma followed on the 20th, in which the Russians under Prince Menzikoff were utterly defeated by the allies, and the road was open to Sevastopol. To secure ready communication with their fleets, however, the allied army, by a flank march, seized upon the harbours of Balaklava and Kamiesch, and the southern side of Sevastopol was invested on the 26th of September, the Russians having, in the interim, by sinking seven men-of-war at the mouth of the harbour, blocked up the entrance by sea to this great naval and military arsenal. Here, on the dreary heights of Sevastopol, throughout the terrible winter of 1854-5, the allies maintained the hard struggle and obstinate siege against a skilful foe within and a countless Russian army without, humbling the name and prestige of Russia by the victories of Inkermann and Balaklava; and kept the eyes of the world fixed upon the spot where the whole interest of the war was now concentrated throughout the entire spring and summer of 1855, electric agency flashing to all parts of Europe tidings of losses and sufferings often, of defeat never, and of many a brilliant success (not least of which was the victory of Tchernaya, August 16, in which the Sardinians, then numbered among the allies, fought with great skill and courage); until at last, after a long bombardment, the French captured the Malakoff fortress on the 8th of September, and the allies occupied Sevastopol.

TURNER, JOSEPH MALLORD WILLIAM, was born at No. 26, Maiden-lane, Covent Garden, where his father carried on business as a hair dresser. The year, as well as the month of Turner's birth has been differently given: all that is certainly known respecting either is, that his baptism is entered on the register of the parish church of St. Paul's, Covent Garden, as having taken place on the 14th of May, 1775; and it is most probable that his baptism followed pretty close upon his birth. Of his boyhood and youth little is told. His father, a tradesman in a small way, did not attempt to make his son a scholar, and the great painter never advanced far beyond the rudiments of an ordinary English education. Of his primary training in art, or what led him to think of painting as a profession, we have no precise information. Probably his own strong inclination first stimulated him to overcome the initiatory difficulties of the study of drawing, and some casual occurrence or association aroused or directed his ambition. It does not appear that the elder Turner thwarted his son's inclination, though, perhaps from poverty, perhaps from indifference, he did not procure him the instruction which might have smoothed his early path.

Turner was essentially a self-made painter. It is said in a brief notice of him published in 1805—when, though only in his thirtieth year, he was already recognised as the first of living landscape painters—"Turner may be considered as a striking instance of how much may be gained by industry, if accompanied by perseverance, even without the assistance of a master. The way he acquired his professional powers was by borrowing when he could a drawing or picture to copy; or by making a sketch of any one in the Exhibition early in the morning, and finishing it up at home. By such practices, and by a patient perseverance, he has overcome all the difficulties of the art." (Dayes' 'Professional Sketches of Modern Artists,' Works, p. 352.) This passage was written by one eminent in his day as an instructor of young landscape painters, and the teacher and friend of Girtin, Turner's earliest and closest artistic associate, and it coincides with what other authorities, both written and traditionary, have always related of his career. But he was certainly still very young when he had opened to him the means of obtaining professional instruction, he having been admitted as a student in the Royal Academy in 1789, when consequently he was only fourteen years old. It is hardly probable, however, that he received much direct instruction in the Academy schools, or that he followed their prescribed course. If he studied in the antique, or later in the life-school, he certainly never acquired mastery over the human form, and no instruction was given the student in landscape drawing or painting. Still it is not likely that a young enthusiast, as he certainly was, would attend the schools and form acquaintance with professors and students, without acquiring from them much technical information, even if he received no systematic instruction. But his best academy, he was accustomed to say, was "the fields and Dr. Monro's parlour." Dr. Monro, who was a warm-hearted patron of young artists, had an excellent collection of water-colour drawings and engravings at his residence in the Adelphi, and he not only gave his two favourite protegés, Turner and Girtin, free access to his treasures, with permission to copy them, but directed their studies, and encouraged them to make coloured sketches of the scenery around London, which he readily purchased at prices satisfactory to the modest students. In these sketching rambles, Turner and Girtin were constant companions, and they formed for themselves a style of water-colour painting very different from that of any of their predecessors—unless indeed it be Cozens, a man of some genius and a friend of Dr. Monro, from whose drawings and conversation much was probably learned by the two young painters. Girtin was Turner's senior by a year or two, and as he was the more regularly educated artist, it is not unlikely that he was to some extent his companion's tutor; certain it is that their drawings were very similar in style—the chief difference being that Turner made out his details more carefully—and some have fancied that had Girtin lived he would have been as great a painter as his friend. He gave way, however, to intemperance, and died (Nov. 1802) at the early age of twenty-seven. Turner, with more self-control and perseverance, laboured steadily on, and rose in good time to the undisputed supremacy in his branch of art.

Two years before he entered the academy as a student, in 1787, when only twelve years of age (supposing his baptismal year was the year of his birth), Turner made his bow to the public as an exhibitor at the Royal Academy (under the name of W. Turner) of two drawings, 'Dover Castle' and 'Wanstead House;' his next appearance being in 1790, the year following his admission as a student, when he sent a 'View of the Archbishop's Palace, Lambeth.' From this time till his death—a period of sixty-years—he regularly contributed to every exhibition of the Royal Academy, with the exception of the years 1821, 1824, and 1848, sending in all 259 pictures, a very large proportion of them being paintings of considerable magnitude. But these alone would give a very inadequate notion of his remarkable facility and industry, as during that period he also sent to the British Institution some twenty oil paintings which had not been exhibited at the Academy, and painted a large number, and some of them his chief works, which were never exhibited at all, besides many hundreds of water-colour drawings and designs for engraving.

For some ten or twelve years he painted chiefly, if not exclusively, in water-colours, his pictures—with the exception of two or three fancy subjects, such as 'The Battle of the Nile,' 1799; 'The Fifth Plague of Egypt,' 1800—being confined to the representation of English and Welsh scenery. But already it was felt that there was a degree of brilliancy of execution united with close observation of nature which placed his works quite apart from those of any of his contemporaries, and justified the highest anticipations of his future success. The popular opinion received professional confirmation by his election in 1799 as an associate of the Royal Academy; in 1802 he became an academician. He now visited Scotland, France, Switzerland, and the Rhine; launched boldly into oil painting on canvasses of large size, and began to look into the Greek and Roman poets—or their substitute Lempriere—for subjects for his pencil. This year, 1802, the exhibition afforded a fair illustration of the wide and daring range his pencil was taking, his contributions being 'The Falls of the Clyde;' 'Kilchurn Castle;' 'Edinburgh from the Water of Leith;' 'Ben Lomond Mountains—the Traveller;' 'Jason;' 'The Tenth Plague of Egypt;' 'Fishermen upon a Lee-Shore in Squally Weather;' and 'Ships bearing up for Anchorage.' He evidently felt his strength; yet year after year, while showing himself sufficiently conscious that he knew his proper walk, he kept on putting forth strange experiments in subjects and methods: thus one year (1803) saw his 'Holy Family,' another (1807) 'A Country Blacksmith disputing upon the price charged to the Butcher for shoeing his Pony,' another (1808) 'The Unpaid Bill, or the Dentist reproving his Son's Prodigality,' and another (1809) 'The Gazetteer's Petition;' but even from these strange whims he seemed to gather new strength. At this time however he appears to have studied with most earnestness the stormy ocean, and never yet has the sea in its wildest fury been represented on canvas with such wondrous might and majesty as in his noble 'Shipwreck: Fishing-boats endeavouring to rescue the Crew,' now at Marlborough House; the 'Gale at Sea,' belonging to the Earl of Ellesmere; and the 'Wreck of the Minotaur,' the property of Lord Yarborough. But even alongside of these the poetic treatment of views of places, such as his 'Edinburgh from Calton Hill,' 1804; 'Fall of the Rhine at Schaffhausen,' 1805, and 'Sun Rising through Vapour,' 1806, not only enabled them to hold their place, but obtained for him perhaps even a wider popularity, while with the connoisseurs his 'Narcissus and Echo,' 1814, 'Mercury and Hersé,' and 'Apollo and Python,' 1811, his 'Dido and Æneas,' 'Apuleia,' and a long list of other mythological themes, won him fame as a poetic painter, though now, despite their pictorial richness and daring, they are generally felt to be in truth the least poetical of his works, and infinitely inferior to his other and more purely imaginative productions of this period, 'Snow-storm—Hannibal crossing the Alps,' and the like, in which he almost for the first time portrayed with some approach to the vastness and sublimity of nature the fierce encounter of the elements, the splendour of the rarer phenomena of the atmosphere, and the beauty and glory of the mountains.

In 1807 Turner was elected professor in perspective to the Royal Academy, and for several years he continued to give courses of lectures to the students, in which he spoke of the systems of pictorial composition adopted by the great landscape painters of earlier times, of their principles of effect and of colour, and compared them though sparingly with the teaching of nature; but the lectures were never printed, and as far as we know no record of them is left. Report has always spoken of them however as ill-arranged and ill-delivered, confused in style, and obscure in illustration. They never succeeded in securing the attention of the students, and for many years before he resigned his professorship he had ceased to deliver any lectures.

An important circumstance in the earlier career of Turner was the publication of his 'Liber Studiorum,' which was commenced in 1808. This now famous work was undertaken in rivalry of the book of sketches known as the 'Liber Veritatis' of Claude, in the possession of the Duke of Devonshire, of which a series of fac-simile aqua-tinta engravings was made by Earlom and others. Turner's series, engraved in a similar style, some of them by Turner himself, embraced examples of all the principal forms of landscape composition, and displayed a fertility of resource and an intimate observance of nature such as the publication of no previous landscape painter had approached. The work has long been extremely rare, and when brought to sale commands a very high price: two republications of it have been announced. From this time to his death Turner remained the most in request with publishers and engravers of any English landscape-painter, both for the landscape illustration of books and for series of engravings; and even where his 'eccentricities of colour,' as they are called, repel, his engraved designs are with few exceptions received with unmitigated delight. Among the most famous of these engraved works may be mentioned the 'Scenery of the Southern Coast,' 'England and Wales,' 'Rivers of England,' 'Rivers of France,' Rogers's 'Italy' and 'Poems,' of all his vignette engravings the most exquisite, the poems of Byron, Scott, &c. From his paintings likewise some very noble line-engravings of large size have been made by Pye, Willmore, Miller, Prior, &c.; while Turner's grand engraving of 'The Shipwreck' is one of the richest specimens of mezzotinto.

We cannot in a sketch like this trace the progress of the painter by the only really important events recorded of his life—the production of his chief pictures. He made three visits to Italy in 1819, 1829, and 1840, and after each his style underwent a remarkable change. The usual division of his style, and on the whole it is the most convenient one, does not however exactly coincide with his Italian visits. Turner's career, it is said, comprises three distinct periods; the first reaches to about his twenty-seventh year, when he was elected into the Academy, and during which he was chiefly noticeable as a water-colour painter diligently occupied in drawing from nature, and at the same time forming for himself a style, by carefully studying (and imitating) the methods of his English predecessors, Wilson, Loutherbourg, and, in a less degree, Gainsborough, the influence of whose works is very apparent in his earliest oil-paintings: the second period ranges from 1802 to 1830, in which he is seen at first a follower of Claude, and, in a less degree, of Gaspar Poussin, but rapidly disencumbering himself from the trammels of every kind of pupilage to great names, and striking out a style of landscape-painting entirely original and wholly unrivalled for brilliancy of colouring and effect: while the third period, dating from his second visit to Rome in 1830, is one in which everything else was sacrificed in the effort to attain the utmost splendour of light and colour—to make (in the strange language of his own 'MS. Fallacies of Hope')

> "the sun
> Exhale earth's humid bubbles, and, emulous of light,
> Reflect her forms each in prismatic guise."

But while such a division is convenient it must not be regarded as anything more. Like every great artist, his conceptions were always advancing and expanding, and in each period were painted pictures that would seem justly to belong to another. At which period he painted best it is difficult to say, and judges of art pronounce widely different opinions. It is quite certain that up to some ten or twelve years before his death, his knowledge of the phenomena of nature and of the resources of art continued to grow and expand, even when his hand failed to express faithfully his intentions, or his impatience prevented him setting them forth with due elaboration. Any one who has carefully studied Turner's works chronologically, and who has at the same time diligently studied nature, will sympathise if he cannot entirely concur in the strong statement of Turner's most ardent admirer, Ruskin:—"There has been marked and constant progress in his mind; he has not been, like some few artists, without childhood; his course of study has been as evidently as it has been swiftly progressive, and in different stages of the struggle, sometimes one order of truth, sometimes another, has been aimed at or omitted. . . . . As he advanced, the previous knowledge or attainment was absorbed in what succeeded, or abandoned only if incompatible, and never abandoned without a gain; and his latest works present the sum and perfection of his accumulated knowledge, delivered with the impatience and passion of one who feels too much and knows too much, and has too little time to say it in, to pause for expression, or to ponder over his syllables." ('Modern Painters,' i. 407.)

It would be easy to refer to examples illustrative of Turner's different periods, but so large a number of his best works—thanks to his munificence—are now public property, and through the care of Mr. Wornum have been so well arranged, dated, and catalogued, and rendered so easy of reference, that a special mention of any is needless. A cursory examination (with attention to the dates) of that collection, and of the other examples of Turner's pencil in the public galleries, will sufficiently illustrate what has been said of the progressive and, as it were, tentative character of his mind; and a studious consideration will convince the visitor that even in what seem Turner's wildest aberrations from the sobriety of nature, there is a foundation of truth for the idea he has endeavoured to work out, and that his failures, while they arise sometimes from wilfulness, arise more often from his attempting to represent unusual phenomena by materials utterly inadequate for the purpose. Turner in fact seems never to have understood the limits of his art, and in seeking to accomplish what is impracticable with such means as he possessed, and with such necessarily imperfect skill, he became extravagant and bizarre. Although eccentricity of colour and indefiniteness of form were at all times charged upon his paintings, the extreme development of this fault is chiefly urged against the works executed during the last twenty years of his life, and unquestionably with all there is of unfailing suggestiveness, to an artistic eye, in every one of them, it is upon these works that censure will eventually rest. Yet it is remarkable that to this period belongs the work in which, by general consent, his unrivalled powers as a landscape-painter are seen in their fullest developement, his 'Childe Harold, or Modern Italy,' (now at Marlborough House) which was painted in 1832; and to this period also belong some of his most poetic efforts, including 'The Fighting Temeraire tugged to her last Berth' (1839), and the 'Slaves throwing overboard the dead and dying—Typhon coming on' (1840).

Turner died on the 19th of December 1851, in humble lodgings, which he had taken in an assumed name, by the river-side at Chelsea. He was buried with some state in the crypt of St. Paul's Cathedral by the side of Reynolds, Wilkie, Fuseli, and others of our eminent painters. Turner was a man of unsocial and reserved manners, and many gossiping stories are related of his coarseness and love of money: but they bear on their face a coloured and exaggerated character. It is certain that he had hoarded his money for no selfish purpose. For many years he had refused to sell some of his best pictures, and when any such, painted and sold in his earlier years, were offered for sale, he if possible purchased them. On his death it was found that he had by his will bequeathed to the nation all the pictures and drawings then collected in his residence, No. 47, Queen Anne-street West, on condition that a suitable gallery was erected for them within ten years; and his funded property to found an asylum at Twickenham for decayed artists. Unfortunately the will was unskilfully drawn, and a suit in chancery ensued, but it was compromised by the engravings and the other property being transferred to the next of kin, who disputed the will, while the paintings and drawings were held by the nation. The oil paintings, one hundred in number, include many of his finest works as well as examples of his pencil from the very outset to the termination of his career; they are for the present exhibited at Marlborough House. The finished drawings, which number several hundreds, and the sketches, which amount to some thousands, have been (or are being) arranged, cleaned, and mounted with rare skill and patience by Mr. Ruskin, who volunteered his services to the government; and a choice selection of them is now hung on screens at Marlborough-House. Among those now exhibited are many admirable drawings in colours, and numerous sepia drawings made for the 'Liber Studiorum,' the Rivers, &c., some of which are of an exquisite beauty and brilliancy of effect, probably unequalled among drawings of that character. The nation also possesses in the collections presented by Mr. Vernon and Mr. Sheepshanks several other choice examples of Turner's pencil.

There is no need to add anything to what has been said respecting the rank which Turner holds among the landscape painters either of his own or an earlier time. But as his merits are still sometimes contemptuously denied—perhaps in part owing to the indiscriminate eulogy which has of late years been heaped upon him—and as it is sometimes said that, if he were the great painter so strongly affirmed, foreign artists and writers on art would not be slow to acknowledge his superiority—it may be well to quote the calm judgment of a German writer whose authority is admitted, and whose opinion is the result of a repeated consideration of his works. Dr. Waagen says—"In point of fact no landscape painter has yet appeared with such versatility of talent. His historical landscapes exhibit the most exquisite feeling for beauty of lines and effect of lighting: at the same time he has the power of making them express the most varied moods of nature—a lofty grandeur, a deep and gloomy melancholy, a sunny cheerfulness and peace, or an uproar of all the elements. Buildings he also treats with peculiar felicity; while the sea in its most varied aspect, is equally subservient to his magic brush. His views of certain cities and localities inspire the spectator with poetic feelings such as no other painter ever excited in the same degree, and which is principally attributable to the exceeding picturesqueness of the point of view chosen, and to the beauty of the lighting. Finally, he treats the most common little subjects, such as a group of trees, a meadow, a shaded stream, with such art as to impart to them the most picturesque charm. I should, therefore, not hesitate to recognise Turner as the greatest landscape-painter of all times, but for his deficiency in one indispensable element in every work of art, namely, a sound technical basis." — ('Treasures of Art in Great Britain,' 1854, vol. i., p. 383-4.)

TURNER, SHARON, was born in London on September 24, 1768. He was educated at Pentonville, at a school kept by the rector of St. James's, Clerkenwell, and at the age of fifteen he was articled to an attorney. On the death of his master, before his clerkship had expired, he succeeded him in his business. Even during his clerkship he had felt the promptings of a literary taste, and had occupied his leisure by studious reading and composition. While in business for himself he began to collect materials for his 'History of the Anglo-Saxons,' of which the first volume was published in 1799, and the third in 1805. It is on this work that his reputation chiefly rests. He was the first English author who had taken the pains, or had had sufficient knowledge, to investigate the valuable remains left to us in Anglo-Saxon records. He consulted the original manuscripts with great industry and intelligence, and the result has been that, though his views have been more than once assailed, they have been generally sustained now that the study of Saxon literature has been more appreciated, and the authenticity of his materials more completely understood. The work soon took a permanent place in the historical literature of the country, and, encouraged by his success, he continued his history from the Norman conquest to the death of Elizabeth, publishing at different times the volumes of a distinct period; the three subdivisions being republished together under the title of 'The History of England from the earliest period to the Death of Elizabeth,' 6th ed., 2 vols. 8vo, 1839. This portion, though distinguished by a large amount of industry, and the discovery in consequence of a few hitherto unknown facts, was not equal to the previous portion. Where the field was less new he had no advantage over previous writers; his views had little originality, and his treatment of his subject had no superior merit. In 1829, after suffering from illness for some years, he retired to Winchmore-Hill, where he prepared and published in 1832 the first volume of his 'Sacred History of the World, as displayed in the Creation, and subsequent events to the Deluge. Attempted to be philosophically considered in a series of Letters to a Son.' Two other volumes completed it, the object being, from temporal history, to establish the principle of minute providential agency or supervision. In 1843 the death of his wife occasioned him much distress, and increased his illness. At length he was compelled to return to London, where, in his old residence in Red Lion-square, he died on February 13, 1847. Besides the works above-mentioned, he published a volume of essays and poems under the title of 'Sacred Meditations, by a Layman,' a 'Prolusion on the Greatness of Britain, and other Subjects;' 'Richard III., a Poem;' and he contributed two or three articles to the 'Quarterly Review.' Some letters which he addressed to the Royal Society of Literature, of which he was an associate, on the affinities of the various languages of the world, have been added to the last edition of his 'Anglo-Saxons.'

TURNER, THOMAS HUDSON, was born in London in 1815. His father was a printer in the employment of Mr. Bulmer in Pall-Mall, but dying young and in difficulties, his family was assisted by Mr. W. Nicol, the nephew and successor of Mr. Bulmer, who placed young Turner at school at Chelsea, where he early distinguished himself by a love for antiquarian research, and formed a friendship with the two sons of the late Allan Cunningham. With the younger, Peter, his friendship continued until his death. In 1831 he was taken into the printing-office of Mr. W. Nicol to learn the business. While here he employed all his leisure in pursuing his antiquarian and historical studies, and on seeing an advertisement for a young man at the Record Office in the Tower who could read and translate records, he applied for and obtained the situation. He devoted himself with great diligence to the study of the records, and his knowledge increased rapidly. He projected many historical works, but his labours in acquiring constantly fresh information prevented his carrying his many plans into execution. From this employment he was taken by Mr. Tyrrell, the Remembrancer of the City of London, to assist him in collecting materials for a history of London, at which he most assiduously laboured, but the information thus collected remains yet in manuscript. When this was completed he edited with remarkable care a volume of 'Early Household Expenses,' to which he prefixed a valuable introduction; the work being presented to the Roxburghe Club by Mr. Beriah Botfield. After the publication of this volume he was made secretary to the Archæological Institute. While he held this office his readiness in imparting information respecting antiquities was remarkable; he wrote some valuable papers for the 'Journal' of the Society, and communicated several records to the Society of Antiquaries at Newcastle, which are printed in the 'Archæologia Æliana.' On his retirement from this office, he continued his studies, but commenced his work, 'Some Account of Domestic Architecture in England, from the Conquest to the End of the Thirteenth Century, with numerous Illustrations,' which was published in 1851. This work, and his papers in the 'Archæological Journal' published between 1846 and 1851, formed the groundwork of his fame. The papers only amount to five, and one of them is on the dining-customs of the Middle Ages, a subject similar to that of his book. His 'Domestic Architecture' is noticeable for the exactitude and wide extent of his knowledge, and is a valuable contribution for the student of English antiquities. It does not confine itself to the mere building, but includes a large amount of subsidiary information and illustration mainly collected from our national records, and comprises an account of the furniture; the implements used in the processes of cooking, brewing, baking, &c.; the state of horticulture at the time; with disquisitions on the manufactures connected with the household economy, such as glass, linen, cutlery, &c. Mr. Turner's severe and constant application to his studies had for many years greatly impaired his health, and on June 17, 1852, he died, having produced far less than from his great accomplishments could have been wished and might have been expected. His vast store of knowledge was freely scattered in conversation; he had constant applications for information, and few were sent away unsatisfied; but his ardour for accumulation prevented his application to composition, so that of his many projected works the one above-named was the only one he executed, and that was in a manner but a fragment: at any rate, Mr. Turner promised to carry down the subject to a more recent period, a promise he did not live to fulfil. A second volume has however been prepared and published by Mr. Parker of Oxford.

TURTONIA, a genus of Conchiferous *Mollusca*, named by Mr. Hanley after Dr. Turton. There is but one species, *T. minuta*, which has been separated from the genus *Kellia*. The shell is oblong, inequilateral, anterior side very short; ligament concealed between the valves; hinge-teeth 2—2. Animal with the mantle open in front; foot large, keeled; siphon, single, slender, elongated, protruded from the long end of the shell. It is found in Great Britain; also in Norway and Greenland. (Forbes and Hanley, *British Mollusca.*)

TUSCANY. The territory of Lucca fell to Tuscany in 1847. [Lucca.] The Grand-Duchy is divided into compartimenti, or provinces, as in the following table:—

Provinces.	Area in Square Miles.	Population in 1864.
Florence . . .	2,246	715,701
Lucca	510	265,304
Pisa	1,174	231,473
Siena	1,455	190,159
Arezzo	1,265	221,090
Grosseto	1,710	80,980
Livorno . . .	38	89,420
Isle of Elba . . .	96	21,559
Total . .	8,494	1,815,686

TWICKENHAM. [Middlesex.]

TYPHUS FEVER, TYPHOID FEVER. [Physic, Practice of (*Blood, Diseases of*), *S.* 2.]

TYTLER, PATRICK FRASER, was born at Edinburgh on the 30th of August, 1791, the fourth son of Alexander Fraser Tytler, Lord Woodhouselee. He was destined to increase the literary reputation of a family in which literary taste and talent seemed hereditary. After having been educated at the High School and the University of Edinburgh, he became a member of the Scottish Faculty of Advocates in 1813, but he soon abandoned practice for authorship. On the peace of 1814 he accompanied Mr. (now Sir Archibald) Alison and the present Lord-Justice Clerk of Scotland on a visit to the Continent. His first literary efforts were as a contributor to 'Blackwood's Magazine;' but in 1819 he published in Edinburgh an independent work entitled 'Life of James Crichton of Cluny, commonly called Admirable Crichton.' The work reached a second edition in 1823, when an 'Appendix of Original Papers' was added to it. In 1823 he published also at Edinburgh, 'An Account of the Life and Writings of Sir Thomas Craig of Riccarton; including biographical sketches of the most eminent legal characters from the institution of the Court of Session by James V. till the period of the Union of the Crowns;' and this was followed in 1826 by a 'Life of John Wicklyff,' published anonymously. It was about this time that, on the earnest suggestion of Sir Walter Scott, who had at one time thought of undertaking the task himself, he began his great work, 'The History of Scotland.' The first volume was published in 1828, and the work was completed in nine volumes in 1843. It has since then passed through several editions, and is recognised everywhere as the standard History of Scotland—the only work in which Scottish history is treated at full length on the basis of authentic materials, and in a calm and accurate as distinct from a merely popular manner. It commences with the accession of Alexander III. to the Scottish throne in the 13th century, and brings down the narrative to the union of the crowns in 1603. While writing this work, Mr. Tytler resided sometimes in Edinburgh, sometimes in London, collecting materials in both places. During the time that the work was in progress he threw off other smaller historical works, of which the following is a list:—'Lives of Scottish Worthies,' in 2 vols., 1831-33; 'Historical View of the Progress of Discovery on the more Northern Coasts of America,' published in Edinburgh in 1832, and recently re-edited in America; 'Life of Sir Walter Raleigh,' 1833; 'Life of Henry the Eighth,' 1837; and 'England under the Reigns of Edward VI. and Mary, illustrated in a series of original letters, with historical introductions and notes,' 1839. Mr. Tytler also wrote the article 'Scotland' for the seventh edition of the 'Encyclopædia Britannica,' and the article has since been re-published as a useful abridgment. In recognition of claims so well founded, Sir Robert Peel's government conferred on Mr. Tytler a pension of 200*l.* a year. In politics he was a Conservative. Though an Episcopalian, he took much interest in the Scottish Presbyterian movement of 1834-43. In private life he was much beloved for his social qualities. Towards the close of his life he suffered much from ill-health, and went abroad for a time. He returned to Edinburgh, and died on the 24th of December 1849. He was twice married, and left two sons and a daughter by his first wife.

U

UDORA, a genus of Plants belonging to the natural order *Hydrocharidaceæ*. A probable species of this genus has been recently introduced into England, and described by Babington under the name of *Anacharis alsinastrum*. The following is his description in the 'Manual of British Botany':—

> It has its leaves 3 in a whorl, oval-oblong, obtuse, serrulate (the male flower is unknown), the female flower with a tubular bifid spathe, many times longer than the sessile germen: sepals, and petals, broad, nearly equal; stigmas reflexed. The stem is long, branching; whorls of leaves many and close together. Flowers subtended by a leaf-like bract placed within the whorl of leaves. Flowers very small. The sepals tinged with green and pink externally, incurved, hooded, with a narrow diaphanous margin. The petals are flat, diaphanous, recurved, and oblong. Filaments at first curved outwards, their points placed under the hood of the sepals, afterwards erect, linear, blunt, diaphanous; stigmas recurved, linear, or deeply bifid; sepals, petals, and stigmas, of about equal length; the style adnate on three sides to the tube.

This plant was first observed in Great Britain by the late Dr. Johnston of Berwick-upon-Tweed, in the river Whiteadder, in Berwickshire. It was afterwards discovered in a canal near Nottingham, and subsequently in many other places. Although at first not known, yet late inquiries have led to the conclusion that this plant is the *Udora Canadensis* of American botanists, and that it has been introduced into this country by means of the timber that is brought from the New World. Its power of retaining its vitality adapts it to bear so long a journey without destruction. The pistilliferous plants have alone been seen in Great Britain. Its power however of reproducing itself by buds is so great that it has already become a serious pest in the rivers, canals, lakes, and ponds, to which it has had access.

Anacharis alsinastrum is one of those plants in which a circulation can be seen, and has afforded to several observers the means of more closely watching these vegetable movements than any other plant which has yet been examined. It has been inferred by Dr. Branson and others, that the movements of the cell-contents of this plant are produced by cilia. Mr. Wenham however regards this movement as originating in the molecular activity of the proteinaceous endoplast.

(Babington, *Manual of Botany;* Marshall, *On the new Water-Weed;* Branson and Wenham, *On the Sap-Circulation of Anacharis alsinastrum*, in vol. iii. of the *Quarterly Journal of Microscopical Science.*)

ULSTER, NEW. [Zealand, New, *S.* 2.]

UMPIRE. [Arbitration, *S.* 2.]

UNITED STATES OF NORTH AMERICA, a Republic, formed by the federal union of States and Territories.

It occupies the middle portion of North America; and extends between 25° and 49° N. lat., 67° and 125° W. long.; from the Atlantic Ocean on the east to the Pacific Ocean on the west. It is bounded N. by British America, S.W. by the republic of Mexico, and S. by the Gulf of Mexico. The boundary line between the United States and British America is stated under United States, *S.* 1. The greatest width of the United States from east to west is 2900 miles, the greatest length from north to south is 1730 miles. The entire area of the United States has been very differently estimated. As estimated by the United States authorities for the Census office in 1850, it amounted to 3,306,865 square miles. But a more elaborate and careful estimate made by the United States 'Topographical Bureau,' January 1854, reduces the area to 2,936,166 square miles, and if to this be added the additional territory of 27,500 square miles, ceded by Mexico by treaty in July 1854, the total area at the present time will be 2,963.666 square miles. The population in 1850 was 23,191,876, or 7·90 to a square mile: but this does not include the native Indians, who were estimated by the Indian Commissioner in 1853 at 400,764. The following table shows the States and Territories comprised in the Union, with the extent of each, the number and character of its population in 1850, and other particulars.

The areas of several of the States and Territories in this table are given from the new computations made by the United States 'Topographical Bureau,' and recently made public in the 'Statistical View of the United States,' drawn up and printed by order of Congress.

The physical geography of the United States has been given generally under America; and more particularly under the heads of the several States and Territories; of the rivers Columbia; Mississippi; Missouri, &c.; the Alleghany, and Rocky Mountains, &c.; the lakes Erie; Ontario, &c. The total area of the United States, as already stated according to the revised calculations of Colonel Abert, of the United States Topographical Engineers, is 2,963,666 square miles, which he thus apportions:—Area of the Pacific Slope, or of the region watered by rivers falling into the Pacific, 793,702 square miles; the Mississippi Valley, 1,217,562 square miles; and the region whose waters fail into the Atlantic, 952,602 square miles, of which 514,416 square miles belong to the Atlantic slope proper, 112,649 square miles to the Northern Lake region, and 325,537 square miles to the region whose waters fall into the Gulf of Mexico, east and west of the Mississippi. The main shore line of the United States on the Atlantic coast amounts to 6861 statute miles, on the Pacific to 2281 miles, on the Gulf of Mexico to 3467 miles; the island shore on the Atlantic to 6328 miles, on the Pacific to 702 miles, and on the Gulf of Mexico to 2217 miles, giving a main shore line of 12,609 miles, and an island shore line of 9247 miles.

Area and Population of the United States and Territories.

STATES AND TERRITORIES.	Area in Square Miles.	Whites.	Free Coloured Persons.	Slaves.	Total.	Inhabitants to a Square Mile.	No. of Representatives in Congress.
Alabama	50,722	426,514	2,265	342,844	771,623	15·21	7
Arkansas	52,198	162,189	608	47,100	209,897	4·02	2
California	155,980	91,635	962	—	92,597	0·59	2
Carolina, North	50,704	553,028	27,463	288,548	869,039	17·14	8
„ South	29,385	274,563	8,960	384,984	668,507	22·75	6
Columbia, District of	60	37,941	10,059	3,687	51,687	861·45	—
Connecticut	4,674	363,099	7,693	—	370,792	79·33	4
Delaware	2,120	71,169	18,073	2,290	91,532	43·18	1
Florida	59,268	47,203	932	39,310	87,445	1·48	1
Georgia	58,000	521,572	2,931	381,682	906,185	15·62	8
Illinois	55,405	846,034	5,436	—	851,470	15·37	9
Indiana	33,809	977,154	11,262	—	988,416	29·24	11
Indian Territory	71,127	—	—	—	—	—	—
Iowa	50,914	191,881	333	—	192,214	3·78	2
Kansas Territory	114,798	—	—	—	—	—	—
Kentucky	37,680	761,413	10,011	210,981	982,405	26·07	10
Louisiana	41,255	255,491	17,462	244,809	517,762	12·55	4
Maine	31,766	581,813	1,356	—	583,169	18·36	6
Maryland	11,124	417,943	74,723	90,368	583,034	52·41	6
Massachusetts	7,800	985,450	9,064	—	994,514	127·50	11
Michigan	56,243	395,071	2,583	—	397,654	7·07	4
Minnesota Territory	166,025	6,038	39	—	6,077	0·04	—
Mississippi	47,156	295,718	930	309,878	606,526	12·86	5
Missouri	67,380	592,004	2,618	87,422	682,044	10·12	7
Nebraska Territory	335,882	—	—	—	—	—	—
New Hampshire	9,280	317,456	520	—	317,976	34·26	3
New Mexico Territory	234,507	61,525	22	—	61,547	0·30	—
New York	47,000	3,048,325	49,069	—	3,097,394	65·90	33
New Jersey	8,320	465,509	23,810	236	489,555	58·84	5
Ohio	39,964	1,955,050	25,279	—	1,980,329	49·55	21
Oregon Territory	185,030	13,087	207	—	13,294	0·07	—
Pennsylvania	46,000	2,258,160	53,626	—	2,311,786	50·26	25
Rhode Island	1,306	143,875	3,670	—	147,545	122·97	2
Tennessee	45,600	756,836	6,422	239,459	1,002,717	21·99	10
Texas	237,504	154,034	397	58,161	212,592	0·89	2
Utah Territory	269,170	11,330	24	26	11,380	0·04	—
Vermont	10,212	313,402	718	—	314,120	30·76	3
Virginia	61,352	894,800	54,333	472,528	1,421,661	23·17	13
Washington Territory	123,022	—	—	—	—	—	—
Wisconsin	53,924	304,756	635	—	305,391	5·66	3
Total United States	2,963,666	19,553,068	434,495	3,204,313	23,191,876	7·90	234

The following table taken, with a few slight changes to render it more readily understood by English readers, from the official 'Compendium to the Census,' will show at a glance the extent of the territorial acquisitions, and the occasions on which they were made:—

Territorial Increase of the United States.

Territory.	Square Miles.
Area of the United States at the peace of 1783	820,680
Purchase of Louisiana from France, 1803	899,579
Cession of Florida by Spain, 1819	66,900
Admission of Texas [see Texas], 1844	318,000
Territory obtained by Oregon treaty with Great Britain, 1846	308,052
Territory ceded by Mexico [see Mexico], 1848	522,955
„ additional, ceded by Mexico by a new treaty, 1854	27,500
Total	2,963,666

The following table shows the rate of increase of the various classes of the population at the several censuses of the Union, except the census of 1840, which is given under United States.

Classes.	1790	1800	1810	1820	1830	1850
Whites . .	3,172,464	4,304,489	5,862,004	7,861,937	10,537,378	19,553,068
Free Coloured .	59,466	108,395	186,446	238,156	319,599	434,495
Slaves . . .	697,897	893,041	1,191,364	1,538,038	2,009,043	3,204,313
Total . .	3,929,827	5,305,925	7,239,814	9,638,131	12,866,020	23,191,876

The commerce of the United States has gone on rapidly extending, until next to that of Great Britain it is the largest in the world. In the year ending June 30, 1856, the total imports of the United States amounted to 314,639,942 dollars; the exports to 326,964,908 dollars; of which 310,586,330 dollars were of domestic produce, and 16,378,578 dollars of foreign produce. Of the foreign trade, considerably more than half is with Great Britain and its dependencies. The total amount of tonnage engaged in the foreign trade was 4,871,652. The total number of American vessels entered from foreign countries in 1856 was 10,307, of foreign vessels, 11,375; the clearances during the same year were, of American vessels 10,592, of foreign vessels 11,186. The registered tonnage of the commercial navy was 2,491,403. The crews of American vessels cleared out numbered 152,971 men and 1070 boys. There were in 1857 of canals 4798 miles; of railways 24,220 miles completed.

The naval and also the military forces will be found under Military and Naval Forces, *S.* 2.

The revenue of the United States for the year ending June 30, 1857, was 68,631,513 dollars, of which 63,875,905 dollars were raised by customs duties. The expenditure for the same year was 70,822,724 dollars. Of this 5,943,896 dollars was for interest on and redemption of the public debt, which amounted to 30,963,909 dollars.

The following is a list of the Presidents, continued after those previously given (v. xxvi. p. 12):—

10.	John Tyler	1841 to 1845
11.	James Knox Polk . . .	1845 „ 1849
12.	Zachary Taylor (died in office) .	1849 „ 1850
13.	Millard Fillmore . . .	1850 „ 1853
14.	Franklin Pierce	1853 „ 1857
15.	James Buchanan . . .	1857

From the establishment of their position as an independent republic until the present time, the United States have been chiefly occupied in the development of their vast resources. Many questions of internal government and relationship have occurred and excited much interest, but it does not belong to us to notice more than will be found in America, *S.* 2; California, *S.* 2; Oregon, *S.* 2; Texas, *S.* 2; Utah, *S.* 2.

URANOGRAPHY (from οὐρανός, heaven, or the firmament, and γράφειν, to describe.) The article Astronomy, in the 'Penny Cyclopædia,' after explaining generally the processes of observation and reasoning by which the science of physical astronomy has attained its present degree of perfection, gives a series of brief historical notices of the discoverers in astronomical science, and of the most important of their discoveries, brought down to the year 1830. The most important of the instruments by which the processes of astronomical observation are carried on are elaborately described, with the addition of figures accurately drawn, under the heads Circle, Astronomical; Equatorial Instrument; Repeating Circle; and Sextant; and also under Pendulum and Telescope.

The collection of revolving bodies of which the sun is the centre, is described generally under the head Solar System; and the Newtonian theory of that system under the head Gravitation. The sun and each of the large planets are described separately under their respective names, Sun, Mercury, Venus, &c. The earth and the earth's satellite are described separately, Earth, Moon; and the smaller planets discovered previously to 1843, are described under the head Vesta, which includes also notices of *Juno*, *Ceres*, and *Pallas*. There is a general article on comets [Comet], and particular articles on Encke's Comet and Halley's Comet.

So far as to the Solar System. The starry heavens have a distinct article Star, Double Star, Cluster of Stars, Nebula; and there is also an article on the obscure masses of stars called the Milky Way.

The additions made to astronomical science since the completion of the 'Penny Cyclopædia' have been so numerous and important, that a detailed account of them would be scarcely possible except in a work wholly devoted to the subject. It may be sufficient here to indicate broadly some of the leading facts which have a general rather than a purely scientific interest, yet which will serve to illustrate the recent progress of astronomy.

First in rank we may place the determination of the motion, or movement of translation, as it has been termed, of the entire solar system in space. The possibility of such a movement was suggested by Bradley in 1748, and the question was discussed by subsequent astronomers; but the elder Herschel was the first who sought by actual observation to verify or disprove the notion. His observations, which extended over more than twenty years (1783-1806), led him to conclude that such a movement did really exist, and that our solar system is moving towards the constellation Hercules. It remained, however, long a mere hypothesis. [Solar System, vol. xxii., p. 198.] The first important step towards its confirmation was made by Argelander, in a paper published in the 'Mémoires' of the Imperial Academy of St. Petersburg for 1837. By comparison of the proper motions of 390 stars given in his own catalogue of 560 stars observed at Abo, with those of Bradley as given in the 'Fundamenta' of Bessel, Argelander verified the fact of the motion, and found the point towards which the solar system is tending to be situated in the same constellation as Herschel supposed. Other astronomers pursued the enquiry with great zeal and industry, but the decisive step is ascribed to another Russian astronomer, Otto Struve, whose paper ('Bestimmung der Constante der Präcession mit Berücksichtigung der eigenen Bewegung der Sonnensystem'), printed in the St. Petersburg 'Transactions' for 1842, was regarded as having set the question at rest, and was, on account of its importance, awarded the gold medal of the Royal Astronomical Society of London, in 1850. The results of these researches of Argelander and Struve are thus summed up by the elder Struve in his 'Études d'Astronomie Stellaire' p. 105, (see also Grant's 'History of Physical Astronomy,' p. 557):—

"The motion of the solar system in space is directed to a point in the celestial sphere, situate on the right line which joins the two stars of the third magnitude, π and μ Hercules. The velocity of this motion is such, that the sun, with the whole cortége of bodies depending on him, advances annually in the direction indicated, through a space equal to 1·623 radii of the terrestrial orbit, or 154 millions of miles."

The observations which led to this great discovery were all made on stars of the northern hemisphere. It was most desirable therefore to ascertain whether the general movement of the stars of the southern hemisphere would indicate a motion of the solar system towards the same point as that shown by the northern stars. This laborious task was undertaken by Mr. Galloway. Employing the catalogue of 606 stars observed at St. Helena by Mr. Johnson, and the catalogue of 172 stars observed by Mr. Henderson at the Cape of Good Hope, with the older determinations of Bradley and Lacaille, he arrived at almost exactly the same conclusions as Argelander and Otto Struve; the reality of motion being proved, and the point of motion being nearly identical. For this work Mr. Galloway received the gold medal of the Astronomical Society. Finally, to remove all possibility of doubt, if any remained, Mr. Main contributed to the Astronomical Society, in 1852, a paper on the motions of 875 stars observed at Greenwich, in which the accuracy of the investigations of Argelander and Struve was fully established.

The fact of this rapid movement of the entire solar system in space is of great importance in practical astronomy; while in the higher theoretic branch of the science it has set astronomers on the consideration of the question whether there does not exist a general centre of gravity, to which is subjected not only our own solar system, but the whole stellar universe. Some eminent German astronomers have attempted to arrive at conclusions more or less definite on the subject, but as is well said by Sir John Herschel in noticing some of their theories: "In the present defective state of our knowledge respecting the proper motion of the smaller stars, we cannot but regard all attempts of the kind as to a certain extent premature, though by no means to be discouraged as forerunners of something more decisive."

A subject which has long been one of primary interest in astronomy, is that of the constitution of the central body of our solar system. The then actual condition of our knowledge was fully stated under **Sun.** Since that article was written, the spots on the sun have been carefully watched by many skilful observers. The observations and investigations of Dr. Bohm, Mr. Dawes, and others, have been particularly valuable. One of the chief points ascertained was that, by Mr. Dawes (in 1852), of the rotation of the sun's spots. The latest important contribution on this particular subject was that of M. Schwabe of Dessau, which obtained for him the award of the gold medal of the Royal Astronomical Society in 1857. The result of his investigations was thus stated by Dr. Lloyd in his address as president of the British Association, 1857 :—" According to the observations of Schwabe, which have been continued without intermission for more than thirty years, the magnitude of the solar surface obscured by spots increases and decreases *periodically*, the length of the period being 11 years and 40 days. This remarkable fact and the relation which it appears to have to certain phenomena of terrestrial magnetism, have attracted fresh interest to the study of the solar surface ; and upon the suggestion of Sir John Herschel, a photoheliographic apparatus has lately been established at Kew for the purpose of depicting the actual macular state of the sun's surface from time to time." Of the constitution of the sun itself little additional knowledge has been acquired. " Towards the close of the last century," observed Dr. Lloyd in the presidential address just quoted, " many hypotheses were advanced regarding the nature and constitution of the sun, all of which agreed in considering it to be an opaque body, surrounded at some distance by a luminous envelope. But the only certain fact which has been added to science in this department is the proof given by Arago, that the light of the sun emanated (not from an incandescent solid, but) from a gaseous atmosphere, the light of incandescent solid bodies being *polarized by refraction*, while the light of the sun, and that emitted by gaseous bodies, is unpolarized."

Next to the sun, the earth's satellite the Moon has, among the heavenly bodies, always engaged the largest share of the attention of man. Observations of the moon's visible surface have from the earliest use of telescopes been diligently prosecuted ; and while there has been no falling off of late years among astronomers in zeal, there has been a great increase of combination in research, and the instruments they have used have been of a very superior character. Their observations on the moon's surface have recently been directed specially to ascertain whether the old opinion of the existence of lunar seas and a lunar atmosphere is well founded or not. Increased telescopic power showed that the supposed ocean beds were full of inequalities, in fact, as described by Professor Phillips, " the so-called seas, under this more exact scrutiny, appear destitute of water, and the surface, under low angles of incident light, becomes roughened with little points and minute craters, or undulated by long winding ridges of very small elevation : " and though Arago suggested that some of these appearances were not inconsistent with uneven sea-bottoms covered with shallow water, as on our own planet the rocky ocean bed is plainly visible from great heights, he himself, from these and other optical phenomena, acquiesced in the belief, now general among astronomers, that water does not exist on the surface of the moon.

The appearance of the moon's surface, when examined through a powerful telescope, has, as is well known, been long represented in very carefully prepared maps, on which all the leading features—mountains, plains, ridges, " rills," and so-called seas—are not merely laid down, but have names attached, which the astronomers of Europe have agreed to assign them. Such a map will be found under the article **Moon.** The famous lunar map of Beer and Mädler has carried accuracy and beauty of execution as far as it probably can be carried. But the drawings for such a map must be made at the eye-piece of a telescope of great magnifying power, and it is hardly conceivable that, with the eye thus strained, and the mind almost necessarily somewhat excited, perfect accuracy can be attained—though by the comparison of many drawings a surprisingly near approach to it has been made. The most minute and perfect accuracy however is what astronomers always desire in the record of their observations ; and hence the beautiful art of photography has been gladly called in to aid in securing a perfect delineation of the moon. Mr. Bond, the distinguished American astronomer, was the first who so applied it ; but it has since been extensively used in this country. Many difficulties have presented themselves, but by that steady, patient, inventive application which is so characteristic of the astronomer, they have already been to a great extent surmounted. By various ingenious apparatus, including the addition of a clock-work motion to the telescope, and by the use of extremely sensitive collodion, lunar photographs of remarkable beauty have been obtained by Mr. De la Rue and some other gentlemen ; and it is probable that the portrait drawn by the Moon herself will to a great degree supersede that drawn by man. We have already noticed that the Sun is keeping for the perusal of the astronomer a continuous record of the changeful progress of the spots upon his disc. We may add, that by the very refined means now in use, photographs and daguerreotypes are now obtained almost instantaneously, not only of the moon's surface, and of the spots on the sun, but even of Jupiter and his belts, and of numerous astronomical phenomena of a kind which, from their fugitive nature, could only be hitherto described in words or depicted from memory.

With respect to the lunar atmosphere, a negative opinion has likewise been arrived at ; though whenever an instrument of increased power, or a stellar phenomenon, appears likely to afford a new or more precise test, it is carefully brought to bear upon the point. The most delicate test is the exact observation by a telescope of high magnifying power of the occultation of a planet. If the moon were enveloped in an atmosphere, there would be some change of form or brightness in the planet, owing to atmospheric absorption or refraction at the edge of the moon's disc at the moment of its immersion, or disappearance behind the moon, and at its emersion, or reappearance. None such has however been observed with the powerful instruments which have been employed for the purpose of late years. On the contrary, the immersion and emersion have been instantaneous, without the slightest deflection of the planet's light, and in precise accordance with calculation as to time.

Another question of great interest has also been solved : that of the production of heat by the light of the moon. Various experiments had at different times been made with a view to determining whether the lunar rays gave out any appreciable warmth, but without success. At length, in 1846, Signor Melloni, an eminent Italian astronomer, renewed the experiment on the cone of Mount Vesuvius, and succeeded, by means of a large lens of peculiar construction, in obtaining satisfactory indications of elevation of temperature. Some doubt however remained as to the accuracy of the experiment, but it was dissipated by still more distinct evidence of the radiation of heat from the moon being obtained by Professor Piazzi Smyth. To resolve this and some other astronomical, meteorological, and magnetical problems, Mr. Smyth established himself, during the summer of 1856, on the Peak of Teneriffe, at an elevation sufficient to place his instruments beyond the obstructing influence of the earth's grosser atmosphere. His upper station was 10,700 feet, his lower 8840 feet, above the level of the sea, and at the lower, as well as at the upper station, the warmth of the moon's light was distinctly ascertained.

A point of great interest to astronomers—what is known as the long inequality in the moon's epoch—has been satisfactorily elucidated by the labours of Professor Hansen of Gotha and of Mr. Airy, the Astronomer Royal (1846-49) ; the latter of whom has also discovered and explained a new lunar inequality depending upon the action of the planet Venus. The statement of the reasonings of Messrs. Airy and Hansen would be out of place in a non-mathematical notice like the present ; it may be sufficient therefore to say, as indicative of the importance of these discoveries, (in the words of Mr. Grant, ' History of Physical Astronomy,') that they " completely account for the errors in the tables which had so long perplexed the astronomers and mathematicians of Europe. The lunar theory may therefore now be considered as divested of all serious embarrassment."

The discoveries, and the corrections of our previous knowledge, in the world of planets, have been equally grand and surprising. Passing over all that is of secondary consequence, and all that is mainly of interest to the astronomer and the man of science, we may commence with the extraordinary additions made to the group of small planets which revolve in the wide interval between Mars and Jupiter. The discovery of the first of these was made on the 1st of January 1801, so that our knowledge of the entire group belongs to the present century. By March 1807 four had been discovered. The discovery of this fourth minor planet was made by Olbers, the discoverer of the second of the group, not accidentally, but in the course of a laborious examination of that portion of the heavens, undertaken in the full expectation of finding such a body there. For, on the discovery of the second planet, Olbers conceived and published the idea that these two small planets might be fragments of a large planet which had been broken up by some great catastrophe; and if so, that these, and most likely other fragments, were describing round the sun elliptic orbits, the intersection of whose planes must fall nearly at the same point. Impressed with this idea, Olbers, after a search prolonged for nearly five years, discovered, as we have said, a fourth planet—a third had been meanwhile discovered accidentally—but the labours of no other astronomer met with a similar reward, and any systematic search was gradually abandoned. Nearly forty years elapsed before a fifth, Astræa, was added to the group of minor planets. A year and a half later another was discovered; and now, after the lapse of little more than ten years, no less than forty-seven more have been found—making in all fifty-three, of which forty-nine have been discovered from the 1st of July 1847—and all (at least all since the fifth of the series) as the result of a systematic exploration made with telescopes of great power.

Without further reference to the hypothesis of Olbers, that these minor planets are the fragments of a disrupted planet, we may notice the remarkable coincidence or complication of their orbits, respecting which D'Arrest says, (as quoted by Humboldt in his 'Cosmos,' Sabine's translation, vol. iii., p. 374,) "it appears to testify in favour of a real or inherent connection between all the members of the entire group of the small planets, that, if we figure to ourselves the natural dimensions of their orbits as forming actual material rings, these rings are all so interlinked, that by taking hold of any one, all the others would be lifted by, or found suspended on it." The whole of these minor planets are what are termed telescopic planets, being invisible to the naked eye. The diameter of the largest is indeed probably less than 500 miles, but it is scarcely necessary to add, that if the whole 53 at present known—and probably more will yet be found—are fragments of one shattered planet, it must have been a very large one.

The four minor planets which were first discovered are all noticed under VESTA; but we give a full list of them, arranged in the order in which they were discovered, with the names of the discoverers, and the date of their discovery.

1. Ceres	Piazzi	January 1, 1801.
2. Pallas	Olbers	March 28, 1802.
3. Juno	Harding	September 1, 1804.
4. Vesta	Olbers	March 29, 1807
5. Astræa	Hencke	December 8, 1845.
6. Hebe	Hencke	July 1, 1847.
7. Iris	Hind	August 13, 1847.
8. Flora	Hind	October 18, 1847.
9. Metis	Graham	April 26, 1848.
10. Hygeia	De Gasparis	April 24, 1849
11. Parthenope	De Gasparis	May 11, 1850.
12. Victoria	Hind	September 13, 1850.
13. Egeria	De Gasparis	November 2, 1850.
14. Irene.	Hind	May 19, 1851.
15. Eunomia	De Gasparis	July 29, 1851.
16. Psyche	De Gasparis	March 17, 1852.
17. Thetis	Luther	April 17, 1852.
18. Melpomene	Hind	June 24, 1852.
19. Fortuna	Hind	August 22, 1852.
20. Massalia	De Gasparis	September 19, 1852.
21. Lutetia	Goldschmidt	November 15, 1852.
22. Calliope	Hind	November 16, 1852.
23. Thalia	Hind	December 15, 1852.
24. Phocea	Chacornac	April 6, 1853.
25. Themis	De Gasparis	April 6, 1853.
26. Proserpine	Luther	May 5, 1853.
27. Euterpe	Hind	November 8, 1853.
28. Bellona	Luther	March 1, 1854.
29. Amphitrite	Marth	March 1, 1854.
30. Urania	Hind	July 22, 1854.
31. Euphrosyne	Ferguson	September 1, 1854.
32. Pomona	Goldschmidt	October 26, 1854.
33. Polymnia	Chacornac	October 28, 1854.
34. Circe	Chacornac	April 6, 1855.
35. Leucothea	Luther	April 19, 1855.
36. Atalanta	Goldschmidt	October 5, 1855.
37. Fides	Luther	October 5, 1855.
38. Leda	Chacornac	January 12, 1856.
39. Lætitia	Chacornac	February 8, 1856.
40. Harmonia	Goldschmidt	March 31, 1856.
41. Daphne	Goldschmidt	May 22, 1856.
42. Isis	Pogson	May 23, 1856.
43. Ariadne	Pogson	April 15, 1857.
44. Nysa	Goldschmidt	May 27, 1857.
45. Eugenia	Goldschmidt	June 28, 1857.
46. Hestia	Pogson	August 16, 1857.
47. Aglaia	Luther	September 15, 1857.
48. Doris	Goldschmidt	September 19, 1857.
49. Pales	Goldschmidt	September 19, 1857.
50. Virginia	Ferguson	October 4, 1857.
51. Nemausa	Laurent	January 22, 1858.
52.	Goldschmidt	February 5, 1858.
53. Calypso	Luther	April 4, 1858.

The planet Saturn, from the wonderful appendages connected with it, and the general beauty as well as scientific interest which it presents to the telescopic observer, has always been an object of careful examination and study; and it might well have been supposed that little additional information was attainable respecting its external character, did not every increase of telescopic power afford evidence that the field of astronomical discovery is practically inexhaustible. The first of the recent discoveries was made in 1848. During the autumn and winter of that year the ring or rings of Saturn disappeared, and astronomers seized the opportunity to observe the planet with unusual care, in order to obtain more minute and accurate admeasurement, with the view of ascertaining with greater precision the divergence, if any, of his diameter from a true ellipse. In the course of this examination Mr. Bond, of Cambridge, Massachusetts, U. S., and Mr. Lassell, of Liverpool, discovered almost simultaneously an eighth satellite of Saturn—but seventh in distance from the planet. This satellite, to which the name Hyperion has been given, was first seen by Mr. Bond on the 16th of September, 1848, but its true character was not recognised by him till the 19th. It was seen and recognised by Mr. Lassell on the 18th of September. The sidereal revolution of this satellite round the planet is 21 days, 4 hours, 20 minutes, its mean distance in semi-diameters of Saturn is 25·02: the revolutions and mean distances of the other satellites are given under SATURN.

The other discovery—that of an inner dark, dusky, or diaphanous ring, lying between the bright ring and the body of the planet, but unattached to either—was made nearly two years later. On this occasion Mr. Bond was again one of the first discoverers, but several European astronomers detected it very nearly at the same time; and the actual priority is of the less consequence, as it is certain that the inner ring had been observed by Dr. Galle of Berlin in 1838, and described by Encke in the 'Nachrichten' of that year; though somewhat unaccountably it had been suffered to slip entirely out of notice. But the discovery of this inner ring led to a more searching scrutiny of the other rings, and to the detection by our countryman, Mr. Dawes, and by Mr. Bond, of a probable division of the external ring. Otto Struve again was led to the conclusion that the inner edge of the interior bright ring is gradually approaching the body of the planet, while the total breadth of both the bright rings is increasing. Mr. Main, however, having made a very large number of admeasurements of the rings with a double-image micrometer, during the years 1852-55, for the purpose of testing Struve's hypothesis, failed to detect any increase of width, and regards Struve as mistaken.

In the article URANUS, that planet was said to have six satellites, but of which only two had been seen, except by the discoverer of Uranus, Sir William Herschel. In 1847-48 two, perhaps three, of these satellites were again seen, by Otto Struve, and Mr. Lassell; and in October and November 1851 Mr. Lassell discovered two new satellites of Uranus, both apparently nearer to the planet than the first satellite of Sir William Herschel: the periods of revolution of the new satellites are respectively 4 days and 2½ days, while the first of Herschel's is about 5 days 21 hours. After what has been said, it is scarcely necessary to add that none of the satellites of Uranus can be seen except with first-rate telescopes.

But far more remarkable than either of these discoveries is the discovery of Neptune—as Encke expressed it, in a passage quoted by Humboldt, "the most brilliant of all planetary discoveries, because purely theoretical investigations caused the antecedent prediction of the existence and the place of the new and yet unknown planet." In the motion of the planet Uranus, certain irregularities had been for several years observed, which could not be explained by the action of the planets then known to exist. Several astronomers had directed their attention to this enigma, as Bessel termed it; but no real advance had been made towards solving the enigma, when two young men, Adams of Cambridge, and Le Verrier of Paris, devoted themselves, unknown to each other, to the task—one of enormous labour, and requiring great skill in the higher mathematics—of arriving by calculation at the source of the perturbation. Each arrived at the same conclusion, that the cause must be the existence of a new planet outside Uranus, and each succeeded in indicating nearly the same position as the spot near which it would be found. The steps in the discovery are so fairly indicated by Humboldt, that we borrow his summary as that of a judge, free from national or other bias. He says, ('Cosmos,' vol. iii., note 640), "Le Verrier at the instance of Arago, began in the summer of 1845, to work at the theory of Uranus. He laid the results of his investigation before the Institute, on the 10th of November 1845, the 1st of June, 31st of August, and 5th of October, 1846, and published them at once; but his greatest and most important work, which contained the solution of the whole problem, only appeared in the 'Connaissance des Temps pour l'an 1849.' Adams, without printing anything, laid the first results which he had obtained for the perturbing planet, before Professor Challis, in September 1845, and the same, with some modifications, in the following month, October 1845, before the Astronomer Royal,—still without publishing anything. The Astronomer Royal received from Adams his final results, with some fresh corrections relating to a diminution of the distance, in the beginning of September 1846. The young Cambridge geometrician," continues Humboldt, "has expressed himself with noble modesty and self-denial on the subject of this chronological succession of labours, which were all directed to the same great object:—'I mention these earlier dates merely to show that my results were arrived at independently, and previously to the publication of M. Le Verrier, and not with the intention of interfering with his just claims to the honour of the discovery; for there is no doubt that his researches were first published to the world, and led to the actual discovery of the planet by Dr. Galle: so that the facts stated above cannot detract in the slightest degree from the credit due to M. Le Verrier.'"

Le Verrier having communicated to Dr. Galle the results at which he had arrived, and begged him to seek for the predicted planet, Galle at once directed the great telescope of the Berlin Observatory to the spot indicated, and, on the 23rd of September 1846, had the exquisite delight—the greatest perhaps which an astronomer could experience—of discovering there the new planet for which he was looking. The name of Neptune has been given to the planet with the full consent of all parties. At first, several astronomers thought they could perceive the new planet to be surrounded by a ring, but there is little doubt that this was a mistake. On the 10th of October 1846, however, Mr. Lassell perceived what he believed to be a satellite of Neptune, but the planet was then rapidly approaching the end of its visibility for the season, and he was unable to determine the point. On the reappearance of the planet, he again directed to it his great 20-feet reflector, and on July 8-9, 1847, he recognised with certainty, the first of Neptune's satellites. In August 1850, Mr. Lassell believed that he saw a second satellite of Neptune, but the discovery has not been confirmed.

Neptune is the most distant planet of which the existence is known. Its mean distance from the sun is 2864 millions of miles, or above thirty times the mean distance of the earth; and more than 1000 millions of miles farther off than Uranus the next most distant planet (or, the mean distance of the earth being taken as =1, that of Uranus is 19·18263, and that of Neptune 30·03683). Its period of sidereal revolution is 60,126 days 17 hours five minutes, or 164 years and 226 days. Its diameter is 35,000 miles, yet so great is its distance, that it can only be discovered with a very powerful telescope. Its satellite revolves, in 5 days 21 hours 4 minutes, at a mean distance from Neptune of 236,000 miles—or about 2000 miles less than the mean distance of the moon from the earth.

Comets have during the last few years engaged no small share of the attention of astronomers, and not only have the comets, whose return was predicted, appeared at the anticipated periods, but every year some new comets — mostly telescopic — have become visible. But the most astonishing cometary phenomenon, and one wholly unanticipated — one of which the possibility even had never suggested itself to any one—was the separation into two parts of Biela's comet.

This comet, which has a period of revolution of 6¾ years, became visible in November, 1846, and remained visible for several months. On the 19th of December, Mr. Hind noticed a kind of protuberance in the comet; on the 29th, it was seen by astronomers in North America to have separated into two parts, each being in fact a distinct comet, with its own head, nucleus, and tail. The separation was not observed in Europe till January, 1847. The two comets, which were unequal in size but similar in form, moved in the same direction, with an interval between them of empty space, at first equal to about 3, but which afterwards increased to about 6 minutes. The separation continued as long as they were visible, sometimes one, and sometimes the other being the brighter. The smaller comet disappeared towards the end of March, the larger one continued visible till the 20th of April. The phenomenon, of course, excited great interest, and the next periodical appearance of the comet was anxiously looked for by observers, all being desirous to know whether it would re-appear as a single or a twin comet. It re-appeared at the calculated period, and as a twin comet. On the 25th of August, 1852, the first portion was seen at Rome by Signor Secchi; the other portion was first seen on the 15th of the following September. Since they were last seen, in the early part of 1846, the distance between the nuclei had much increased, while the same alternations of brilliancy occurred. So long as they continued visible they continued equally far apart; indeed, the severance of the two portions appears, from a comparison of the various observations, to be complete and permanent. The next appearance of the comet, which will be in April, 1859, will probably go far to settle the question.

The number of comets recorded as having been seen at various times and in different countries amounts, according to the reckoning of Mr. Hind, to 607. Dr. Michelson, in 1847, at a meeting of the Astronomical Society, remarked, that "there are 3 comets whose return is certain (Halley's, Encke's, and Biela's comets), 5 probably periodical, and 19 for which elliptical orbits have been calculated with some degree of probability, making the total number of periodical comets 27." The number of comets whose orbits have been calculated down to December 31, 1853, amounted to 4 periodic comets, and 197 comets the returns of which to the perihelion had not been established with absolute certainty, making altogether 201.

One of the grandest comets mentioned in history is that which made its appearance in the middle of the year 1264. A very brilliant comet which appeared in 1556 is supposed by Mr. Hind to be identical with the former. This comet has been calculated by Mr. Hind to re-appear between August, 1858, and August, 1860, there being an uncertainty of two years in the elements on which the return of the comet is calculated.

In the division of stellar astronomy, beyond the region of the solar system, great activity has been displayed by astronomers. Zones of stars, down to those of the ninth magnitude, double, and multiple, and variable stars, have been with untiring labour and perseverance observed and catalogued by Laland and Lacaille (whose catalogue, and another of great value, have been published by the British Association), Bessel, Argelander, Airy, Lamont, F. G. W. Struve, Chacornac, Rümker, Cooper, and many more men of profound attainments and indefatigable zeal. The value of star-catalogues can hardly be overrated. Of the curious results which their preparation brings to light, it may be sufficient to mention as an illustration, that the great catalogue of Mr. Cooper, made at his observatory, Markree, Ireland, and published by the aid of the parliamentary grant to the Royal Society, shows that "no fewer than 77 stars previously catalogued are now missing." On the other hand new stars have suddenly appeared, and whilst Sir John Herschel was at the Cape of Good Hope, he saw the star η Argus increase from the second to the first magnitude. Connected with the appearance of new and the disappearance of old stars, may be mentioned the hypothesis of F. G. W. Struve, that light in its passage through the boundless regions of space becomes successively weakened and eventually extinguished—a theory which, if it could be established, would open a wide field for reflection and investigation.

One of the most important recent additions to stellar astronomy is Sir John Herschel's 'Results of Astronomical

Observations made during 1834-38, at the Cape of Good Hope; being the completion of a Telescopic Survey of the Whole Surface of the Visible Heavens, commenced in 1825,' which was published in 1847. The first part of this survey was made in the northern hemisphere, as the continuance of his father's 'Sweeps of the Heavens,' which resulted in his famous catalogue. Sir John Herschel's four years' residence at the Cape of Good Hope, in the words of Humboldt ('Cosmos,' iii. 205), "constitutes an epoch in respect to the more exact topographical knowledge of the southern heavens; his perseverance enriched astronomy by upwards of 2100 double stars, which, with a few exceptions, had never been observed before." But double stars formed only one of several departments of astronomy which Sir John enriched by his observations and investigations. So vast, indeed, was the mass of observations made, that it took the author nearly nine years to digest them and prepare the results for publication in a regular form.

Passing to the nebulæ, we find the greatest advances due to the construction of the magnificent telescope which Lord Rosse set up on the lawn in front of his residence, Birr Castle, near Parsonstown, in King's County, Ireland. The lenses of this enormous instrument—which has 6 feet aperture and 54 feet focal length, and is by far the largest telescope hitherto made—were formed, and the whole of the instrument constructed, under his lordship's personal superintendence. As was expected, it was found to possess a far greater amount of space-penetrating power than any previous telescope. By means of it Lord Rosse has succeeded in resolving several nebulæ which had resisted all prior attempts. Besides showing that these hitherto unresolved nebulæ were wholly composed of stars, Lord Rosse's telescope disclosed many unexpected peculiarities of structure—as, for example, a very remarkable but well defined spiral arrangement—in several of the nebulæ which resisted all its powers of penetration. Some of the so-called nebulous stars have also been shown by it to have a central star-like point placed in a nebulous nucleus, beyond which, but distinct from it, is a nebulous ring.

It will perhaps be expected that we should allude, but an allusion will be sufficient, to what "in some measure" (borrowing Mr. Airy's words) "belongs to astronomy"—M. Foucault's "experiment on the rotation of the plane of a simple pendulum's vibration; it being an experiment which excited very great attention both in France and England, as visibly proving, if proof were necessary, the rotation of the earth."

We may perhaps not unaptly conclude this sketch by a brief reference to a few of the labours of Mr. Airy at the Royal Observatory, which may indeed almost be regarded as an epitome of recent astronomical progress. Under his administration the observatory at Greenwich has become second to none in the world. To render the observations made there worthy of the advanced state of the science, new methods and new instruments of greatly increased power, and of the most refined character, have been introduced. The yearly observations are published in a form and with a regularity never before attempted. He has also procured the reduction under his own superintendence of the Greenwich Lunar Observations from 1750 to 1830, and the uniform reduction of all the Observations of the Planets made at Greenwich during the same period—works of enormous labour, but of inestimable importance—the former of which was published in two large quarto volumes in 1848, the latter in a very thick quarto volume in 1846. He also introduced and perfected, in a series of elaborate experiments, the method, first practised in America, of determining the longitudes of distant places by means of the wires of the electric telegraph. By this means he successfully determined the longitudes of the principal observatories in the British Islands and on the Continent; and he in like manner connected the observatory with Deal, and with many other maritime and inland stations, so as to mark by the fall of a time-ball simultaneously with that of the observatory, the true Greenwich mean-time for maritime and other purposes.

We ought also perhaps to notice that, among other good works at the Paris Observatory, M. Le Verrier has completed and laid before the Academy of Sciences, Paris, his great work entitled 'Reduction des Observations faites aux Instrumens Méridiens de l'Observatoire de Paris, depuis 1800 jusqu'à 1829,' a work which he stated that he had performed unassisted by any of the staff of officers employed at the observatory.

URANOTANTALITE. [MINERALOGY, *S.* 1.]

URBAN, D'. [NATAL, *S.* 2.]

URCHIN. [HEDGEHOG.]

URE, ANDREW, M.D., a distinguished chemist, was born at Glasgow in the year 1778. He was educated in the university of his native town, and afterwards studied medicine at Edinburgh, and took his degree of M.D. at Glasgow in 1801. In the following year he was appointed professor of chemistry and natural philosophy in the Andersonian Institution in Glasgow. He also gave the lectures on materia medica in connection with the medical courses of this institution. In the year 1809 he took an active part in the establishment of an observatory in the city of Glasgow, and for this purpose visited London, where he made the acquaintance of many of the distinguished astronomers and chemists of the day. The observatory having been erected, he was appointed astronomer, and lived in the observatory, where he was visited by Sir William Herschel. In the year 1813 he published a 'Systematic Table of the Materia Medica,' with a dissertation on the action of medicines. In 1818 he read a memoir before the Royal Society, entitled 'New Experimental Researches on some of the leading doctrines of Caloric, particularly on the relation between the Elasticity, Temperature, and Latent Heat of Different Vapours, and on Thermometric Admeasurement and Capacity.' This memoir was printed in the 'Philosophical Transactions,' and has obtained for the author a lasting reputation as a natural philosopher. He subsequently wrote several papers on chemical subjects, all remarkable for the accuracy of the experiments on which his views were founded. Amongst these were papers on nitric acid, the constitution of muriatic acid, and on the construction of a new eudiometer. In 1821 he published a 'Dictionary of Chemistry,' which was remarkable for the extent and accuracy of its information on all subjects connected with the science of chemistry. The following year (1822) he published a paper 'On the Ultimate Analysis of Animal and Vegetable Substances,' in the 'Philosophical Transactions.' This paper was remarkable as being one of the first to initiate the brilliant period in the history of chemistry, connected with researches into the composition of organic bodies. In 1824 he published a translation of Berthollet on 'Dyeing.' In 1829 he published his 'System of Geology,' one of the last books on this subject advocating the influence of the Noachian deluge on the surface of the earth. In 1830 Dr. Ure removed to London, and in 1834 was appointed analytical chemist to the Board of Customs. It was in connection with this important office that he obtained materials for many of his subsequent works. In 1835 he produced a work on the 'Philosophy of Manufactures,' and in 1836, 'The Cotton Manufacture of Great Britain compared with that of other countries.' In 1839 he published a great work 'On the Arts and Manufactures.' A second edition of this work was published in 1853. It contains a great mass of useful information of the most accurate kind and conveyed in a most lucid style. He was elected a Fellow of the Royal Society of London in 1822, and was one of the original Fellows of the Geological Society, and a Fellow of the Astronomical and other scientific societies both in this country and abroad. He died at his residence in Gower-street, London, on the 2nd of January 1857.

UREDINACEÆ, a family of *Fungi*, belonging to the sub-order *Sporiferi*. It includes the various forms of *Fungi* which occur on diseased vegetable tissues, and which are hence called Blights. The spores are single, often partitioned on more or less distinct sporophores, flocci of the fruit obsolete or mere peduncles. [FUNGI.]

URUGUAY, REPUBLIC ORIENTAL DEL, formerly known as the BANDA ORIENTAL, South America, (under which head its geography has been described), comprehends the country lying between the southern limit of Brazil and the Rio de la Plata. It extends between 30° 20′ and 35° S. lat. 53° 30′ and 58° 50′ W. long.; and is bounded E. by the Atlantic Ocean, N. by the empire of Brazil, W. by the province of Entre Rios, from which it is separated by the river Uruguay, and S. by the Rio de la Plata, which divides Uruguay from Buenos Ayres. The area is about 100,000 square miles; the population has been estimated at 250,000, but, including a few native tribes, it probably does not much exceed half that number.

The only manufactures are of the rude articles required for domestic use. The commerce is comparatively inconsiderable; though, from the position of the country on the Atlantic and the great æstuary of the La Plata, with the excellent harbour of Montevideo and others of an exceedingly useful class, and with the facilities for internal communication afforded by the Uruguay, it is the natural entrepôt of the ommerce of a vast region of the interior; while its own fertile soil and healthy climate would alone render it, in the hands of a peaceful and industrious people, a great exporting country. At present the trade is chiefly centred in MONTEVIDEO. The exports consist almost wholly of the produce of the herds, as hides, horn, hair, jerked and salted beef, tallow, &c., and do not now probably exceed 1,000,000*l.* sterling annually. The imports are chiefly of articles of British and colonial manufactures, &c.; and of North American and some continental produce. There is also a considerable but fluctuating trade between Uruguay and Brazil, the Argentine Provinces, &c. The exports of British goods in 1853 amounted to 529,883*l.* The exports to the United States in 1853 amounted to 302,980 dollars; the imports to 308,446 dollars.

Uruguay is a republic with an elective president, a senate, and a house of representatives; but the actual power is generally centred in the president, who is usually some successful general. The country is divided into nine departments—Montevideo, Maldonado, Canelones, San José, Colonia, Soriano, Paisandu, Durangō, and Cerro Largo.

MONTEVIDEO is the political capital, the commercial metropolis, and much the largest and most populous city of the republic. Between it and Cape Santa Maria stands the town of *Maldonado*, with a fine harbour, good fortifications, and about 2000 inhabitants: it exports hides and copper. *Colonia del Santo Sacramento* is a small town, with a harbour, opposite Buenos Ayres. None of the other towns are of any importance.

The Banda Oriental was, during the Spanish supremacy, the name of that portion of the vice-royalty of Buenos Ayres which was situated to the east of the river Uruguay, and comprehended the present republic of Uruguay and the country called the Seven Missions. The continual civil wars by which the declaration of independence was followed in Buenos Ayres, induced the government of Brazil to take possession of the Banda Oriental in 1815. The republic of Buenos Ayres protested against this step, and, as no amicable settlement could be made, a war ensued between the two countries in 1825. Through the intervention of the English government a treaty of peace was concluded in 1828, by which the northern district known as the Seven Missions was ceded to Brazil, and the more exclusive southern district was declared an independent republic under the title of Republica del Uruguay Oriental. But instead of securing peace to the country its independence appears hitherto to have only entailed discord upon it. Internal hostilities broke out at a very early period, and this was soon followed by the incursion of troops from Buenos Ayres; the assistance of Rosas, the president of Buenos Ayres, having been invoked by Aribe, one of the unsuccessful aspirants to the rulership of Uruguay. After a long continuance of strife without any prospect of either party securing a manifest superiority, Brazil was induced by the appeals of Paraguay and other neighbouring powers to interfere. In order to show her good faith, Brazil sent ministers to the courts of England and France, with a view to obtain their assistance either as umpires or active agents in compelling the respective parties to come to terms. Those powers accordingly sent some ships of war to the Rio de la Plata in 1845. The English ships blockaded Montevideo till 1848 and the French till 1849, when both England and France made treaties with Rosas. On these powers withdrawing, Brazil commenced more active hostilities—the Argentine Provinces of Corrientes and Entre Rios uniting with her. The war was however prolonged till 1851, when Aribe was forced to capitulate in Uruguay, and Rosas was soon after deposed in Buenos Ayres. Treaties between the several parties gave peace to Uruguay as far as regarded hostilities with foreign powers, and secured the recognition of the republic by the neighbouring states. But internal discord in this as in so many other of the petty republics of South America appears to have been chronic. Brazil, which by assisting the government with money and men, had hoped to enable it to re-establish peace, order, and security in the country, failed for a time; but under the new president Pereira a treaty has been concluded by which the freedom of navigating the La Plata and the Paraguay has been secured. But the revenue of Uruguay has for some time been inadequate to meet the current expenses, and the interest on its heavy public debt has been long unpaid.

URYLE. [CHEMISTRY, *S.* 2.]

USES, CHARITABLE AND SUPERSTITIOUS. [TRUSTS.]

USURY. Although the legitimacy of interest upon moderate and conscientious terms has long been recognised amongst us, it has, until quite recently, been believed desirable to regulate by law the rate at which it should be taken, and interest beyond this allowed limit has long been stigmatised with the odious appellation of usury. [INTEREST, vol. xii., p. 506.] It has been reserved for our own time to carry out a principle which political economists have preached for above a century, that of permitting the rate of interest to regulate itself according to the exigencies of the time and the nature of things. The first statute by which some relaxation of the usury laws was made in favour of trade, was the 3 & 4 William IV. c. 98, which enacted, that no person taking more than the rate of legal interest for the loan of money on any bill or note not having more than three months to run, should be subject to any penalty or forfeiture. Shortly afterwards the statute 5 & 6 Will. IV. c. 41, enacted that bills or other securities should not be void because a higher rate of interest than was allowed by the statute of 12 Anne had been received thereon. The statute 1 Vict. c. 80, next enacted, that bills payable within 12 months, should not for a limited time be liable to the usury laws, and this statute was followed by six others, extending from time to time the application of the original act. The statute 2 & 3 Vict. c. 37, enacted that no bill or note, payable within twelve months after date, or not having more than twelve months to run, nor any contract for the loan of money above 10*l.*, should, by reason of interest taken thereon or secured thereby, or any agreement to buy or receive or allow interest in discounting, negotiating, or transferring any such bill or note, be void, nor any person so lending be liable to the penalties of the usury laws; but it was provided that this relaxation should not extend to the loan or forbearance of any money on the security of land. The public mind having thus slowly advanced in the direction of the policy advocated by Bacon above two centuries ago, at length became prepared for a still wider measure, and the statute 17 & 18 Vict. c. 90, after laconically reciting in the preamble, that "it is expedient to repeal the laws at present in force relating to usury," proceeds to repeal wholly, or in part, eleven English, five Scotch, and four Irish Acts, on which the whole penalties of usury previously rested: among these Acts are included those relating to annuity transactions. [ANNUITY.] The natural laws which regulate the terms on which money can be borrowed are therefore now left to operate freely, and borrowers and lenders are amenable to no other rules than those which govern contracts in general.

(Blackstone's 'Commentaries,' Mr. Kerr's edition, vol. ii. p. 475).

UTAH, a Territory of the United States of North America, lying between 37° and 42° N. lat., 106° and 120° W. long. It is bounded S. and S.E. by the Territory of New Mexico; E. by the Territories of Kansas and Nebraska; N. by that of Oregon; and W. and S.W. by the State of California. The area of Utah is estimated by the 'Topographical Bureau of the United States' at 269,170 square miles. The population in 1850 was 11,380 (of whom 24 were free coloured persons, and 26 slaves en route to California), or 0·04 to the square mile: but this does not include the native Indian population, who were estimated by the Commissioner of Indian Affairs in 1853 at 11,500.

Surface, Hydrography, &c.—The Territory of Utah occupies for the most part a vast broken depression, known as the Great Basin, which lies between the Rocky Mountains on the east and the Sierra Nevada [CALIFORNIA, *S.* 2] on the west; these lofty mountains rising in parts above the line of perpetual snow, while across them are only a few difficult passes. On the north of the Great Basin there is no continuous mountain chain, the watershed being formed by an elevated tract, which is sometimes a swamp. On the south-east the rocky barrier is broken through by the head streams of the Colorado, the only river which finds its way out of the Great Basin; all the others which flow into the basin from the slopes of the mountains being lost in the plains or in the lakes which occupy the bottoms of the larger valleys. The Great Basin is about 500 miles long, from east to west, and little less wide, and some 4000 feet above the level of the sea. Parallel to the main ranges of the Sierra Nevada and the Rocky Mountains are several inferior ranges, of which the Wahsatch Mountains on the east are the most important.

Some of these secondary chains attain an elevation of from 2000 to 3000 feet; and from these diverge cross ridges, which form lesser valleys. A large portion of the Great Basin consists of arid plains, on which artemesias and salicornias are almost the only plants, but in many parts these plains are so impregnated with salt as to be unfit to sustain vegetable life. The most remarkable features of this singular country are the great valleys. Of these by far the largest is the Great Salt Lake Valley, which is about 120 miles long and from 20 to 40 miles wide, the Great Salt Lake occupying the greater part of the northern portion of it. In the centre of this valley the surface is level, but it rises gently on both sides to the mountains. There are few or no trees visible. On the south and west of the Great Salt Lake the land is a soft sandy irreclaimable barren, on the north it is a swamp, on the east and south-east, where is the Great Mormon settlement, it is fertile and cultivated from the mountains to the shore. The climate of the valley is dry and mild; but rain seldom falls during the summer months, so that the agriculturist is to a great extent dependent on irrigation. The other valleys bear a general resemblance to Salt Lake Valley, but they are much smaller. The chief are—Utah Valley, about 60 miles long by 20 miles wide; Sand Pitch Valley, 45 miles long by 20 miles broad; Bear River Valley, South Valley, Ynab Valley, Cache Valley, and Sevier Valley. Of that portion of the territory which does not strictly belong to the Great Basin, the Valley of Green River with its tributaries, which occupies the eastern portion of the territory from the Sierra Madre to the Bear River Mountains, is the most extensive, being more than 150 miles long; but it is so elevated and so badly watered that it is thought not to contain a single spot available for agricultural purposes. The little valley of the Uintah River, a more southern tributary of the Colorado, is much warmer and more promising. But all this eastern part of the country is, with this exception, barren.

Utah possesses no great navigable rivers. The Colorado, as already mentioned, is the only river which flows out of the Great Basin, and it is a stream of little consequence till it has flowed some distance along the territory of New Mexico. There are indeed accumulated in the gorges of the mountains unfailing stores of snow, which furnish during the whole of the summer abundant and perennial streams, which in some instances possess a considerable volume of water; but many of these never reach the bases of the mountains, and the great majority are lost in the arid plains. A few find their way to the lakes, but from the lakes, except from one to another, there is no outlet. Some of the streams which connect the lakes are however of considerable value for irrigation, and may become of essential importance for manufacturing purposes. The most valuable of these rivers is the Jordan, a rapid stream which unites the Great Salt Lake with Lake Utah; it is on this river that Salt Lake City is built, and already several manufactories are established along its banks.

Of the numerous lakes which are in the territory the largest and most remarkable is the Great Salt Lake, which lies at the northern end of Great Salt Lake Valley. This lake is about 70 miles long, from 20 to 30 miles wide, and has a shore-line of of 291 miles. Its water is saturated with chloride of sodium (salt). Dr. Gale, who made an analysis of its water for the United States government, says that it contains full 20 per cent. of pure chloride of sodium, and not more than 2 per cent. of other salts, and is one of the purest and most concentrated brines in the world. The specific gravity of the water is 1·170. Several picturesque islands rise to a great altitude above the surface of the lake. On the mountains on each side of the lake are several distinct terraces, exhibiting unmistakeable evidences of this valley having been at some time the bed of a great inland sea. The other lakes are much smaller than the Great Salt Lake; the water of Lake Utah, which is connected with the Great Salt Lake by the river Jordan, is said to be quite fresh. It receives several streams from the mountains. In the neighbourhood of the Great Salt Lake, and in other parts of the territory, are several hot and sulphureous springs.

Geology, &c.—Metamorphic, Silurian, and Carboniferous rocks prevail. In the neighbourhood of the Great Salt Lake rocks of granitic and sienitic character occur, with hornblende rocks, and talcose and mica-schists. The more elevated portions of the lake shore and mountain summits appear to consist of carboniferous limestone, which, in some localities, lose their granular character, and become sub-crystalline, or threaded with veins of calcareous spar. All the elevated ranges on the north, south, and west of the Great Salt Lake seem to be capped with the carboniferous limestone, which generally rests on a coarse granular sandstone. In some localities the sandstones are overlaid with a coarse conglomerate, which is sometimes partly altered so as to assume the character of a quartz rock. Cretaceous strata occur in several places; and along the valleys are tertiary clays, &c. Good building-stone is quarried in the vicinity of Salt Lake City. Of the mineral wealth of Utah little is really known.

Soil, Climate, Productions, &c.—A large proportion of the country is uninhabitable and unproductive, but that portion which is available for agricultural purposes, though limited in extent as compared with the intervening desert tracts, is much of it of extreme fertility; and according to Captain Stansbury, who made a careful survey of the territory for the government of the United States, fully sufficient for the support of a large though not dense population. These fertile and habitable tracts are for the most part confined to the narrow strips of alluvial land along the bases of the mountains and the bottoms of the warmer and more sheltered valleys. Along the western foot of the Wahsatch range occurs one of the richest of these tracts, a narrow slip only a mile or two wide, but stretching for more than 300 miles in length. In the valley of the Jordan it is much wider; and there are wider patches in several other of the valleys, as in those of the Tuilla, of the Timpougas and others of the Traverse Range. In fact the most available part of the Great Basin appears to consist of the valleys along its eastern border, sheltered by the Wahsatch range. The most productive of the cultivated soils consist of disintegrated feldspathic rocks, mixed with the débris of the limestones. There also occur in the valley bottoms very rich vegetable and marly loams. So productive are some of the soils that Captain Stansbury mentions an instance of a bushel of wheat producing on three acres and a half of land a yield of 150 bushels; and other authorities speak of 50 or 60 bushels of wheat to the acre as being by no means unusual, but there can, we think, be no doubt that such must be exceptional cases.

In the valleys the climate is milder and drier than in the same parallel of latitude on the Atlantic, and the winters are much more temperate; in the Salt Lake Valley the thermometer seldom descends to zero. But on the higher and plains the heat is often oppressive. Over these plains the mirage is frequently observed in the warm season. The eastern section of the country is cold. Throughout the habitable portions of the territory rain seldom falls between May and October, and can never be relied on for agricultural purposes. Artificial irrigation is therefore requisite to agricultural success; but the character of the country happily admits of irrigation being effected with comparative ease in the more fertile valleys, although there are extensive tracts of land which will not admit of cultivation on account of their being beyond the application of irrigation.

The principal cereals grown are wheat, oats, maize, barley, and rye. Very little buckwheat is raised. The common potatoes grow luxuriantly; of sweet potatoes the crops are limited. All the vegetables peculiar to the middle and western states succeed here. The sugar-beet grows to a large size, and is being raised, though not largely, for making sugar. Cotton, the sugar-cane, and rice will, it is said, grow in some districts, but they are evidently not suited to the climate. Tobacco and flax are raised in small quantities. A portion of the territory is well adapted for grazing, though the bunch grass on the lower slopes of the mountains, which at present feeds vast herds of antelopes and deer, is burnt up during the summer months. Horses are the animals of which the inhabitants perhaps possess the largest proportionate number; but they have a considerable number of cattle, and there is a growing attention being paid to sheep, which are in great request for their wool.

The country in its natural state is almost destitute of trees. The only timber found is in the more sheltered ravines, on the banks of a few of the streams and occasionally at the bases of some of the mountains. Wild game abounds. The antelope, deer, bear, and panther are very numerous. The lake-islands are frequented by aquatic birds in astonishing quantities. The more common kinds are swans, geese, ducks, curlews, plovers, gulls, blue herons, cranes, pelicans, &c. Mosquitoes and sand-flies are very numerous and troublesome. But the greatest insect pest is a large kind of cricket, which at irregular periods appears in enormous numbers, and commits terrible ravages.

Utah from its insulated situation must be to a great extent hrown upon its own resources, if the peculiarities of its population did not cherish by every means their separate self-dependent condition. Cut off by lofty and difficult mountains and vast deserts from all other settled states, with agricultural resources little more than sufficient for the supply of its own increasing requirements, and without any staple product or material required by the arts or luxuries of other communities, it is not likely to have any considerable amount of external trade or commerce; while there will probably be a sufficient stimulus to the growth of such manufactures as are required for ordinary domestic purposes. With California regular communication is maintained, but he cost of transit is too great for California to offer a market or the produce of Utah. On the other hand, from Salt Lake City to St. Louis, the nearest considerable market, is upwards of 1600 miles. Some modification would undoubtedly be wrought by the construction of the projected Great Pacific Railway, but in any case Utah must remain to a great extent a country separated geographically, politically, and commercially. The local government has done everything it could o encourage the establishment of factories, and there are already several woollen-mills, potteries, hardware-works, &c., especially along the valley of the Jordan. Flour-mills are in operation very generally.

Divisions, Towns, &c.—Utah is divided into 12 counties. *Fillmore*, a little village, in the south-western part of the tate, is the political capital; but the chief city, indeed the only one of any consequence, is Salt Lake City. There are everal other 'cities,' but they are merely collections of a ew adobe cottages.

Salt Lake City, or as it is officially designated, the *City of he Salt Lake*, is situated on the east side of the Jordan River, a strait which unites Utah Lake with the Great Salt Lake, in 40° 45′ N. lat., 112° 5′ W. long., and at an elevation of 4300 feet above the sea. The population in 1850 was over 5000; it has since largely increased, but we have only vague estimates of its numbers. The city was laid out in July 1847, under the direction of Brigham Young, the Mormon prophet, as the great central city of the Mormon people. The space marked out was four miles long and three miles broad, the same size as Nauvoo. The streets intersect at right angles, and are 132 feet wide; and the houses are ordered to be set back 20 feet from the front line of the lot, and the intermediate space to be planted with shrubs or trees. A plot of several acres is set apart for the site of the great temple, which is to be built on a scale of the greatest possible splendour, far surpassing the famous temple of Nauvoo. The houses are mostly built of adobe, or sun-dried bricks, and have a neat appearance; but large houses and public establishments are now built of stone. There are several manufactories and mills in the vicinity of the city, and salt is largely made on the borders of the lake. Several schools have been established, and a site has been set apart on one of the terraces of the Wahsatch mountain for the erection of a university.

Government, History, &c.—The government of Utah territory is exactly similar to that of New Mexico.

The Territory of Utah originally formed a part of the Mexican Province of Alta or Upper California, and, with the rest of that province, was transferred to the United States by treaty in 1848. But the whole of the province had really passed out of the hands of Mexico for some years before the formal transfer; and while the tract west of the Sierra Nevada, or what now forms the state of California, was already in the possession of the citizens of the United States, the Great Basin, hitherto abandoned to the native Indians, lay open to any body of settlers strong enough to maintain themselves within it. By such a body it was occupied in 1847. We shall not relate here the early history of that remarkable sect the Mormons, whose occupation of the territory has invested Utah with so singular an interest. [Smith, Joseph, *S.* 2.] It will be enough to remind the reader, hat the Mormons first settled as a community at Independence, and afterwards in Clay county, Missouri; and that on being expelled in succession from each of these places, they left the state, and established themselves at Nauvoo in Illinois. Here they speedily became a large and flourishing body; and, besides various public edifices, erected a spacious temple at a cost of nearly a million dollars. Joseph Smith, their prophet, governed them with absolute and almost unquestioned authority until his death in 1844, which was brought about in a very shocking manner. A newspaper established in Nauvoo by some opponents of the sect, having published certain scandalous statements respecting him, the town council directed its publication to be stopped and the office to be razed. The editors appealed to the mayor of Carthage, who issued a warrant for the arrest of Smith and his brother. Smith at first refused to obey, and placed the city in a state of defence; but he was induced to surrender in order to prevent a collision between his followers and the state authorities on receiving a pledge of protection from the populace. A mob was however permitted to break into the state jail and murder both Smith and his brother. The Mormons elected a new prophet, Brigham Young, as the successor of Smith, and affairs again became prosperous. But organised mobs several times attacked the city, and at length regularly invested it; and the leaders were forced to undertake that the whole body should entirely quit the state. The prophet and elders now formed the bold resolution to lead their followers across the vast western wilderness, to the far distant and nearly unknown country lying beyond the Rocky Mountains—there to seek some secluded retreat beyond the reach of their persecutors. They had been promised to be allowed till the spring to make their preparations for the departure of the first or pioneer party; but their enemies became clamorous, and they were obliged to set out in February 1846, while it was yet winter. The sufferings of this pioneer party were of the most terrible and trying kind; but they struggled on resolutely, planting crops, and otherwise preparing the way for those who were to follow them. It was not till July of the following year that the first section of the pioneers reached the promised land. The remainder were soon to follow; for although the authorities had engaged that the rest of the community should be allowed to stay in Nauvoo till apprised of the safe arrival of the first migration, their old opponents came down, and drove them all out of the city in September 1846.

On taking possession of the site of their new city by the Great Salt Lake, the elders at once set about organising a regular government, at the head of which they placed their prophet Brigham Young; and as soon as what they deemed a sufficient number of their followers had arrived, and their territory had become by cession from Mexico a part of the United States, they elected the usual state-officers, and applied to the federal government to be admitted into the Union as a sovereign state under the name of the State of Deseret. But Congress refused their application, and remanded the state back to a territorial condition, naming it Utah. Brigham Young was however appointed or continued as governor; and the community, though nominally under the laws of the Union, remained virtually independent, and governed by the maxims of the Mormon leaders. In 1855, however, Young was superseded by the President, who appointed a 'Gentile' governor, and the federal government assumed a more direct control. This led to disputes, and at length the federal judges were expelled, and the governor was forced to leave. This has produced a contest between the federal state and Utah. Forces have been sent against it to subdue it. Little impression has been made as yet; there has been no serious fighting; but supplies have been intercepted, and detachments cut off by the Mormons; but the state forces are gradually being strengthened and are approaching their city.

The religious opinions of the Mormons are stated under Smith, Joseph, *S.* 2. Here however, as Utah is their appointed Zion, and as they are almost its only inhabitants, we may just state that the Mormons profess to be a separate people, living under a patriarchal dispensation, with prophets, elders, and apostles, who have the rule in temporal as well as religious matters; their doctrines being embodied in the 'Book of Mormon' and the 'Book of Doctrine and Covenants,' revealed to their first prophet, Joseph Smith; that they look for a literal gathering of Israel in this western land; and that here Christ will reign personally for a millennium, when the earth will be restored to its paradisaical glory. The practice of polygamy, which has drawn upon them so much obloquy, was not at first officially admitted; but there is little doubt that it has been allowed, at least to their leaders, and some of their more ardent advocates defend it by reference to the practice of the ancient Jewish patriarchs. That such a system could possibly grow up into such magnitude in these times is sufficiently startling; but that it can long maintain itself if not subjected to persecution, is inconceivable.

As we did not notice *Nauvoo* under Illinois, we may add to what we have said of it above, that it stands on the Mississippi, 125 miles N.N.W. from Springfield; and that after the departure of the Mormons, Nauvoo became the seat of a colony of French communists, or Icarians, under the direction of M. Cabot, who were however far from successful. Of its present state we have no trustworthy particulars; its population has dwindled down to a very insignificant number. The great Mormon temple of Nauvoo was, in October 1848, set on fire by an incendiary and destroyed.

(Captain Howard Stansbury, Topographical Engineers, U. S. Army, *Expedition to the Valley of the Great Salt Lake of Utah;* Fremont, *Report of Expedition to the Rocky Mountains;* Lieut. J. W. Gunnison, *The Mormons, &c.; Statistical View of the United States; Seventh Census of the United States; Gazetteers of the United States, &c.*)

UVAROV, SERGY SEMENOVICH, or OUVAROFF, as the name is written in French, an eminent Russian statesman and author, was born about 1785 of a noble family, and received his Christian name from the Empress Catherine, to whom his father was aide-de-camp. He studied at Göttingen, and in the year 1810 made his first appearance as an author in a 'Project for an Asiatic Academy,' written in French and addressed to the Emperor Alexander, in which he proposed the foundation of a great institution for the study of the languages and literature of Asia. In the following year he was appointed, young as he was, to the curatorship of the university and educational establishments of the district of St. Petersburg, an important office which he discharged with great liberality of views. "The European Republic," he remarked in a Russian pamphlet, published at the conclusion of the great struggle in 1814, "is now preparing to emerge from chaos and to consolidate its foundations. A stupid tyranny will no longer oppose itself to the efforts of reason, and on the whole surface of the globe it will be permitted to think." When the Emperor Alexander's views became of a more retrograde character than they had been, Uvarov, after in vain offering the introduction of some new regulations relating to education, retired, in 1821, from his curatorship, but still retained the post of president of the Academy of Sciences which had been conferred on him in 1818. In the following year he became director of the department of manufactures and internal commerce, and he was subsequently for some years minister of finance. That his influence was not extinct was proved by his being able to establish in 1823 an institution for the instruction of young diplomatists in the Oriental languages, carrying out in some degree his early project. After the accession of the Emperor Nicolas he was appointed in 1832 Minister of Public Instruction, a step which excited some surprise, as the tendencies of the new government were certainly not in favour of permitting the liberty to think. From that time till 1848 Uvarov was indefatigably active in founding museums, botanical gardens, observatories, and educational institutions, and in providing for the better endowment of such establishments, and any deficiency in liberality in their management was attributed rather to the emperor than the minister. In 1848 he again retired from office on occasion of some restraints on education being imposed, of which he did not approve.

The principal writings of Uvarov are rather elegant than profound: they are collected in two volumes, one bearing the title of 'Studies of Philology and Criticism,' and the other 'Political and Literary Sketches' ('Études de Philologie et de Critique,' St. Petersburg, 1843, 2nd edition, Paris, 1845; 'Esquisses politiques et litéraires,' Paris, 1848). All of these essays are in French, except two on philological subjects, one 'On the poet Nonnus of Panopolis,' and the other 'On the Ante-Homeric Age,' which are in German. In the preface to the essay on Nonnus, addressed to Göthe, the author expresses an opinion that "it is now time for every author to choose for his instrument the language which is best suited to the circle of ideas he intends to treat." He seems however, in spite of the confidence of his tone, to have been for some time in doubt as to venturing to print in German, and before publication applied to Göthe for advice, who in a half jesting tone replied "Never confide to any German the grammatical revision of your manuscripts. Do not forfeit the immense advantage you enjoy in not knowing German grammar; I have been trying to forget it these thirty years." Among the few foreigners who have written in that language, Uvarov is admitted to have been one of the most successful. In French, which was in the time of his youth more familiar than Russian to educated Russians, his style is pronounced to be perfectly idiomatic by his French editor M. Léouzon Leduc, who in his amusing preface declares with apparent confidence in his own correctness that "everywhere our novels, our plays, our books, whether serious or frivolous, enjoy a monopoly of admiration." The subjects of Uvarov's essays 'Stein and Pozzo di Borgo,' 'The Prince de Ligne,' 'Venice,' Rome,' &c., are in themselves of interest and are treated in a light and graceful style which never fatigues the reader. Uvarov is reported to have written memoirs of his own time, which may probably form the best portion of his writings in the eyes of posterity.

UWINS, THOMAS, R. A., was born in Pentonville, London, in 1783. Apprenticed to Smith, an engraver of some repute in his day, he acquired, whilst learning the use of the burin, a certain familiarity with the general principles of design. But having fixed his heart on becoming a painter, he, on quitting Smith, entered as a student at the Royal Academy, at the same time availing himself of the lectures which Sir C. Bell was then delivering to students in art. For some years he was principally occupied in making designs for book engravings, in which he seems to have taken Stothard as his model, though maintaining considerable originality; many of his designs display very decided power as well as grace. He also made numerous copies of paintings for the use of engravers. At this time he practised almost exclusively in water-colours, and in 1811 he was elected a member (and subsequently secretary) of the Society of Painters in Water Colours. Failure of health having led to a temporary abandonment of his profession, he after a short interval commenced practice in Edinburgh as a portrait painter, having prepared himself by making a series of portraits for book illustrations. In 1826 he visited Italy, and the studies which he made during his stay led him to commence painting pictures illustrative of the cheerful out-door life of the Italian and especially of the Neapolitan peasantry. These works painted with a light bright pencil, picturesque in costume, gay in colour, and cheerful in spirit, became at once very popular, and their popularity remained undiminished as long as he continued to produce them. As samples of these sunny Italian pictures may be mentioned, 'The Mandolin;' 'Dressing for the Festa;' 'Neapolitan Peasantry returning from a Festa;' 'The Fisherman's Song of Naples;' 'Interior of a Saint Manufactory at Naples;' 'Festa della Madonna del Arco;' 'Loggia of a Vine-dresser's cottage in the afternoon of a Saint-day;' 'Mountaineers returning from the Festa;' 'Bay of Naples on the 4th of June; "Teaching a Child the Tarantella;' 'Children asleep in a Vineyard;' 'Making a Nun.' He also painted some English peasant pieces, as 'The Top of the Stile,' 'The Pet of the Village,' &c., but with less success. Later he painted illustrations from popular authors, Sterne's Maria, the Dorothea, &c.; and still later he essayed a loftier class of subjects, as 'Lear and Cordelia in Prison;' 'Cupid and Psyche' (painted for Prince Albert); 'Psyche returning from the Infernal Regions with the Casket of Beauty;' 'The Reproof;' 'John the Baptist proclaiming the Messiah on the Morning after the Baptism;' 'Judas,' &c.; but these were scarcely adapted to his pencil. Mr. Uwins was elected a Royal Academician in 1836; and from 1844 to 1855 he held the office of librarian to the Royal Academy. He was appointed keeper of her Majesty's pictures in 1842, and keeper of the National Gallery in 1847, but he resigned the latter situation after two or three years. He died Aug. 25, 1857, at Staines, in Middlesex. In the Vernon collection are two pictures by Mr. Uwins, 'The Vintage in the Claret Vineyards, South of France,' and 'Le Chapeau de Brigand:' in the Sheepshanks' collection are four more characteristic examples of his pencil—'Italian Mother teaching her Child the Tarantella;' 'Neapolitan Boy decorating his Inamorata;' 'The favourite Shepherd;' and 'Suspicion.'

UWAROWITE. [MINERALOGY, S. 1.]

V

VALENTIA, HARBOUR OF. [Kerry.]

VALERYLE. [Chemistry, *S.* 2.]

VALLEJO. [California, *S.* 2.]

VALLEY, LILY OF THE, a common name for the *Convallaria majalis.* This plant is too well known to need description. The genus *Convallaria* has a bell-shaped 6-parted deciduous perianth; a 3-celled 2-ovalled ovary; a blunt trigonous stigma; berry with 1-seeded cells; flowers jointed to the pedicel.

C. majalis, the Lily of the Valley, is about a foot high, with two ovate-lanceolate radical leaves. The flowers are racemose, nodding, pure white, globose, bell-shaped, and fragrant.

VAN DIEMEN'S LAND. [Tasmania, *S.* 2.]

VANCOUVER ISLAND (or *Quadra and Vancouver Island*) lies off the western coast of North America in the North Pacific. It is long and narrow, extending in a direction from south-east 48° 24′ to north-west 50° 3′ N. lat., and between 122° and 129° W. long., the length being about 250 miles, the average width 50 miles. It is overlapped at its southern end by the continental headland of Cape Flattery, and between is the Strait of Juan de Fuca, five leagues wide at its entrance, and running in an east-south-east direction for about 100 miles, widening in several parts, extending southward into Puget's Sound, and forming several bays on the continental shore, then, suddenly narrowing, turning northward through an archipelago of small islands, called the Arro Archipelago, thence widening into the Gulf of Georgia, and re-entering the ocean amidst another archipelago, through Johnstone's Strait into Queen Charlotte's Sound. Vancouver first discovered this passage in 1792. There are many bays and harbours all round the island. Three islands of the Arro group are separated from the coast of Vancouver Island by a passage called the Arro Canal, which is narrow at both extremities, but expands to a considerable width in the middle. At Wentuhuysen Inlet, which is at the north end of the Arro Canal, several extensive beds of coal have been discovered, the site of which has been named Newcastle. Coal exists also in the northern part of Vancouver Island. At the southern end the settlement of Victoria has been formed, on a harbour named Camosack, safe and easily accessible for vessels, but having the drawback of being scantily supplied with water. The other principal harbours are, Nootka Sound, Clayquot, Nitinat, all on the western coast. The shores of the island present an alternation of rocky cliffs and sandy beaches. At no great distance from the sea is a compact mass of rugged mountains, whose summits are covered with snow. The island contains a considerable quantity of fertile land, covered with good natural grass. There are numerous small tribes of Indians on the island, of whom some have been found of a friendly disposition.

The possession of Nootka Sound had nearly given rise to a war with Spain, who claimed it, and had expelled some English settlers from Nootka, but it was at length resigned to England, and has since continued in their hands. Vancouver Island was made over in 1846 to the Hudson's Bay Company by a charter, on condition that they should colonise it; the government reserving the right to reclaim possession of the island for Great Britain within a specified time.

North of Queen Charlotte's Sound lie *Queen Charlotte's Islands,* between 52° and 54° N. lat. The group consists of three islands extending about 150 miles in length, by about 60 miles in breadth. In these islands are several excellent harbours. At Mitchell Harbour, on the middle island, and at other spots, gold has been found, embedded in quartz rock. Traces of silver have been found in the rocks. The interior of the islands is hilly and well wooded, the climate is healthy, and the soil remarkably fertile. The islands contain some beds of coal, and several fine specimens of lead and copper have been obtained.

VARNA, a fortified town and sea-port of Turkey-in-Europe, in the province of Bulgaria, is situated at the head of a small bay on the west coast of the Black Sea, in 43° 12′ N. lat., 27° 53′ 58″ E. long., and has a population of 16,000 to 20,000. The bay or road of Varna is protected from the north and north-east winds, and has a good bottom, with a depth of 8 to 15 fathoms. The entrance of the bay is formed by two steep rocky capes (Galata and Hodrova, or Sughanlik), 4½ miles asunder. The shores sink gradually to the head of the bay, where in the neighbourhood of the city they are level. The Paravati River (the ancient Lyginos), which rises in the Balkan near Shumla, after traversing the two lakes of Devne, discharges itself by a broad stream into the Black Sea, along the foot of the southern walls of Varna. The distance between the eastern shore of the eastern Lake of Devne and the Black Sea is little more than half a mile. It has been in contemplation to deepen the channel of this river so as to admit ships to the lake, which would thus be converted into a harbour capable of affording shelter and accommodation to the largest fleets in all weathers. In the isthmus between the two lakes Alexander the Great defeated the Triballi. The isthmus is from a mile to a mile and a half broad.

Varna is a wretchedly built town, surrounded by old stone walls and a dry ditch. It is a place of considerable trade, the exports of corn, barley, tallow, eggs, and other Bulgarian produce, amount in value to about 600,000*l*. Austrian steamers between Constantinople and Galatz put in at Varna. Under the walls of Varna the Sultan Murad II. in 1444 defeated the Hungarians under King Ladislaus (who was killed) and John Huniades. The Russians took Varna in 1828. The Anglo-French army encamped in Varna and its environs in the summer of 1854, previous to its embarkation for the Crimea.

VAUQUELINITE. [Chromium.]

VENIRE FACIAS. This writ, and also the other writs referred to under this head (vol. xxvi., p. 245), the *distringas* and *habeas corpora juratorum,* have been in effect abolished by the Common Law Procedure Act, 1852; which has supplied a much simpler jury process. (Blackstone's 'Commentaries,' Mr. Kerr's ed., vol. iii., p. 380.)

VENUS'S FLY-TRAP. [Dionæa.]

VERNAL GRASS, SWEET. [Anthoxanthum.]

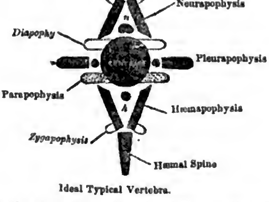
VERNON, ROBERT. Though possessing personally no title to an enduring name, yet as the founder of the National Gallery of British Art, Mr. Vernon claims an honourable place in this work. The so-called 'National Gallery' of paintings was founded in 1824 by the purchase by Lord Liverpool's government of the collection formed by Mr. Angerstein. This collection included nine pictures by British painters — the 'Marriage-à-la-Mode' of Hogarth; that painter's portrait; Lord Heathfield by Sir Joshua Reynolds; and Wilkie's 'Village Festival.' In the course of the next twenty-three years there were occasional bequests or presentations of English pictures, but not a single English picture was added to the national collection by purchase: the entire number of British pictures in the National Gallery in 1847 was only forty-one, and several of these were portraits of unknown or insignificant persons by second-rate artists, or works of little artistic excellence or general interest. In every other country the possession of worthy specimens of the pencils of the chief painters of that country had been deemed the essential feature of a national collection; here the National Gallery, according to the official estimate, was to be a gallery of the works of the 'Old Masters' of Italy and Holland.

It is to Mr. Vernon that the country is primarily indebted for what has been done towards placing matters on a more rational and satisfactory footing. Born in 1774, he by diligence, perseverance, and skill, during a long commercial career, raised himself from very humble into very affluent circumstances; earning at the same time a high character for liberality, and enlarged though unostentatious benevolence. Having a great fondness for pictures, he began, as soon as his means permitted, to indulge his inclination by purchasing some, and following his own taste he selected the works of English artists. In the course of years his collection grew till every room in his house was filled. He now conceived the design of presenting his pictures to the nation, in the hope that if kept together they might serve as the nucleus of a gallery of British art. With this view he sold such of his pictures as he deemed undeserving of such a destiny, and purchased or commissioned (in nearly every instance direct from the painter) fresh examples of the masters he most admired. Then—not waiting to make it a posthumous gift—he offered his collection to the government, requesting that all those pictures might be selected which were considered worthy of national acceptance: and that being done, he made them over by a deed of gift, dated December the 22nd, 1847, to the Trustees of the National Gallery. The collection so transferred comprised 157 pictures, all but two by British artists, and a large proportion by living artists. The pictures having been selected in the first instance for a private residence of moderate dimensions, are mostly of cabinet size, and to a considerable extent of homely subjects; but they include favourable specimens of a large proportion of the chief deceased and living English painters. Mr. Vernon lived long enough to see that his munificent gift was warmly appreciated by the great bulk of his countrymen; but not to see it provided with a fitting repository. He died May 22nd, 1849. Since his decease the Vernon collection has found a temporary resting place in Marlborough House. To it has been added the splendid bequest of Mr. Turner [TURNER, J. M. W., *S.* 2]; and Mr. Sheepshanks has also presented to the nation his noble collection of 233 paintings in oil by English artists: but his gift is clogged with stipulations as to the place where they are to be deposited, which prevent them from being—for the present at least—placed along with the Vernon and Turner pictures. It is however greatly to be desired that some arrangement may be made by which these collections may be brought together, and thus form the commencement of a National Gallery of British Art worthy of the nation.

A marble bust of Mr. Vernon, purchased by subscription, is placed in the hall at Marlborough House; where also are a marble group by Gibson of Hylas and the Nymphs, and about half a dozen marble busts, presented with his pictures by Mr. Vernon—the somewhat sorry commencement of a National Collection of the works of British Sculptors.

VERTEBRA is the name given to each of the separate bones of which the spinal column of the skeleton of the *Mammalia* is composed. [SKELETON.] Although in technical anatomy the term is thus restricted, it has recently received a much more extended signification. Professor Owen defines a vertebra as "one of those segments of the endo-skeleton which constitute the axis of the body and the protecting canals of the nervous and vascular trunk: such a segment may also support diverging appendages." According to this definition, the vertebra becomes the type or plan on which all the bones of the skeleton of vertebrate animals are constructed. It is not only a portion of the spinal column, but the elementary form to which all the parts of the skeleton may be reduced. The bones of the head, of the thorax, the pelvis, and the limbs, however complicated, are reducible to the plan of the typical vertebra. In the history of the development of this interesting branch of anatomical inquiry a variety of opinions have been expressed, as to what may be regarded as the true elements of a typical vertebra, since in no instance do we find all the parts of the vertebra developed in exactly the same manner.

The diagram exhibits a typical vertebra, according to the plan of Professor Owen.



Ideal Typical Vertebra.

This plan does not include the parts which constitute the diverging appendages. Of this plan Professor Owen says, "The names printed in Roman type signify those parts which, being usually developed from distinct and independent centres, I have termed 'autogenous' elements. The italics denote the parts more properly called processes, which shoot out as continuations from some of the preceding elements, and are termed 'exogenous;' e. g., the diapophyses, or upper transverse processes, and the zygapophyses, or the 'oblique' or 'articular processes' of human anatomy."

The autogenous processes generally circumscribe holes about the centrum, which in the chain of vertebræ form canals. The most constant and extensive canal is that formed by the neurapophyses for the lodgment of the trunk of the nervous system, and marked *n* in the diagram. The second canal is formed by the hæmapophyses, and is below the centrum, and embraces the central circulating organ (*h*), the heart, and the large trunks of the vascular system. At the sides of the centrum, most commonly seen in the cervical region, rise two other canals, formed by the three lateral elements of the vertebra, and these often embrace an artery and a nerve. Thus a typical or perfect vertebra, with all its elements, presents four canals or perforations about a common centre; such a vertebra is seen in the thorax of man, and most of the higher forms of vertebrate animals, as in the neck of many birds. In the tails of most reptiles and *Mammalia* the hæmapophyses are articulated or anchylosed to the under part of the centrum, space being needed there only for the caudal artery and vein. But where the heart is to be lodged an expansion of the hæmal arch takes place, analogous to that which occurs in the neural arches when the nervous trunk assumes the form of a brain.

In the same manner that the parts of the thorax, spinal column, and skull, may be traced to the elements above referred to, the parts of the two pairs of locomotive organs with which all vertebrate animals are endowed may be traced to a common plan in the diverging appendages. These parts of all others are most subject to change,—now developed to an enormous extent, and again almost entirely disappearing, according to the necessity of adapting the animal to its special habits. With the exception of the posterior and anterior extremities, these organs are developed only to a limited degree. It is through the study of these appendages that the pectoral fins are seen to be the homologues of the anterior extremities in the Reptiles, of the wings in the Birds, of the fore legs in the majority of the *Mammalia*, the flippers of Seals and Whales, and of the arms in Man. In like manner the abdominal fins of Fishes are the homologues of the legs in Birds, and of the posterior extremities of the Reptiles and *Mammalia*, and the legs in Man. These homologues include not only the totality of these organs, but the individual parts, and the scapula, clavicle, coracoid process, humerus, radius, ulna, carpal and metacarpal bones, and phalanges, in the higher *Mammalia* and Man have their homologues in the lower form of vertebrate animals. So with the pelvic arch, with its ilium, ischium, pubis, femur, fibula, tibia, tarsal and metatarsal bones, and phalanges.

We have not space here to enter into the details of the application of this general plan to the structure of the skeleton of the various forms of vertebrate animals, but this has been done in a most masterly manner by Professor Owen, in his 'Report on the Homologies of the Vertebrate Skeleton,' published in the 'Transactions of the British Association' for 1846, and also subsequently in an independent volume devoted to the same subject. This department of anatomical inquiry is no longer a matter of ingenious hypothesis and verbal speculation, but has been placed by this inquirer, through the unerring principles of comparative anatomy and development, upon the firmest basis, and may be regarded as an essential part of scientific truth.

VICO, FRANCESCO DE, one of the most distinguished astronomers of modern Italy, the son of Count Ascanio de Vico-Ubaldini and the Countess Amalia Archinto, was born at Macerata on the 19th of May 1805. He was educated partly at the Collegio dei Nobili in Urbino, partly in the school of the well-known congregation of the Scolopi at Siena, and entered the Jesuit Society as a novice in 1823. After passing with much distinction through the usual stages, both as a scholar and as a master, in the Roman College of that Society, he was appointed (in 1835) assistant of Father Stephen Dumouchel, who was at that time in charge of the observatory; and it was a sort of presage of the history of his after-career, that one of the first duties assigned to him was to calculate the time of the appearance of the then expected Halley's comet, both according to the elements of Damoiseau and to those of Pontécoulant. The young astronomer had the satisfaction of being the first to observe the comet, on the 5th of August 1835. Soon afterwards, De Vico, in consequence of the great age of F. Dumouchel, becoming the principal astronomer of the Roman observatory, undertook a long series of observations for the purpose of ascertaining the suspected error in the latitude of Rome, as determined by his illustrious predecessors, Boscovich, Calandrelli, Conti, and Reichenbach. These observations, which amounted to nearly 8000 in number, were eminently successful, and the result was a correction of an error of two seconds in the received latitude. He engaged at the same time on a similar series of observations for the longitude, in concert with the astronomers of Paris and Naples. Soon afterwards, Father De Vico, at the instance of Schumacher of Altona, undertook a course of observations of the planet Venus, for which the clearness of the Roman atmosphere was peculiarly adapted, with a view to the determination of the time of its rotation upon its own axis. The success of this undertaking contributed more than all his previous labours to establish his reputation among the astronomers of Europe; and his subsequent observations of the satellites of Saturn, and of the inner ring of that planet, as well as his detailed reports on the nebulæ, which about that time had become a prominent subject of interest, fully sustained that reputation.

Father De Vico however is most popularly known as an observer by his numerous and successful discoveries in the cometary system, which he was one of the earliest in more recent times to take up as a systematic study. During the years 1845, 1846, and 1847 he discovered no less than eight of these mysterious bodies, in seven of which his claim to priority of discovery is undisputed. The eighth had been observed by another astronomer two days before it was discovered (independently however) by Father De Vico.

Another more humble but hardly less useful work undertaken by Father De Vico, was an improved and enlarged system of astronomical maps and charts, in which he is said to have made considerable progress; but in this and other works which he had commenced, he was interrupted by the Revolution of 1848, by which, in common with the other members of his order, he was driven from Rome. He was treated with much distinction during his exile by his fellow-astronomers in France and England, and received more than one invitation to fix his residence in either of these countries; but the circumstances of his order at that time determined him upon establishing himself in the United States of America, and he had almost completed his arrangements for the purpose, when he was seized with acute inflammation of the chest, and was carried off after a short illness. He died in London on the 15th of November 1848, at the early age of forty-three. Father De Vico is chiefly known in literature by his contributions to the 'Raccolta Scientifica,' a scientific journal which owed its origin principally to himself, and which is still continued under a new form.

(*Ragguaglio intorno alla Vita e ai Lavori del P. Francesco de Vico*, Roma, 1851.)

VICTORIA, ALEXANDRINA, Queen of the United Kingdom of Great Britain and Ireland. [In the 'Penny Cyclopædia,' the history of the Kingdom is briefly given under the names of the respective Sovereigns; and that history is brought up to the accession of our present Queen. In this historical point of view, and not as the biography of a living personage, we continue the series of Monarchs, but upon somewhat different a plan, as we shall presently explain.]

Queen Victoria, the only child of Edward, Duke of Kent, the fourth son of George III., and of Maria Louisa Victoria, a daughter of Francis, Duke of Saxe-Coburg Saalfeld, was born at Kensington Palace, London, May 24, 1819. The Duchess of Kent, who is the sister of Leopold, King of Belgium, was the widow of the Prince of Leimingen, on whose death in 1814, she had been left the guardian of her youthful sons and the ruler of their territory, both which duties she fulfilled with remarkable care and prudence. The Duke of Kent died on January 23, 1820, leaving his widow in charge of their infant daughter. On the accession of Victoria to the throne on June 20, 1837, she found Lord Melbourne at the head of the government, and she willingly continued him in that post. On February 10, 1840, the Queen was married to Prince Albert-Franz-August-Karl-Emmanuel, the second son of Ernst-Anton-Karl-Ludwig, Duke of Saxe-Coburg-Gotha. On November 21, 1840, the Princess Royal was born, who was married, January 25, 1858, to the presumptive heir of the Prussian monarchy. On November 9, 1841, was born Albert Edward, Prince of Wales: on April 25, 1843, Alice Maud Mary; on August 6, 1844, Alfred Ernest Albert; on May 25, 1846, Helena Augusta Victoria; on March 18, 1848, Louisa Caroline Alberta; on May 1, 1850, Arthur William Patrick Albert; on April 7, 1853, Leopold George Duncan Albert; and on April 14, 1857, Beatrice Mary Victoria Feodore.

We have considered it desirable, in the instance of our present Queen, when the public events of the reign so completely belong to our own immediate times, to deviate from the plan which has been pursued in the biographies of the other English sovereigns. A connected historical sketch could scarcely be given without some expression of opinion; and we therefore prefer to notice, in the dry form of a chronological abstract, the most prominent circumstances of the past one and twenty years. The historian of this remarkable period will point to it as an epoch of unparalleled progress in all that makes a nation prosperous and great. He will describe the steady advance of the most enlarged principles of political action, without the slightest disturbance of that respect for law and order, in the absence of which no accession of freedom can be permanent. He will mark a growth of industrial prosperity so mighty and so rapid, that it could only be accomplished by a people living under the stability of a monarchy and the liberty of a representative government. He will see the happiest development of the aim at an universal social improvement, not to be effected by sudden changes, but with an accelerated energy at every step, which gives the hope that the inequalities in the condition of the people may become far less onerous than in any previous period, and eventually produce a community more united by common interests than any other in the world. He will dwell upon the progress of the civilising Arts—how Music has again become an enjoyment for all; how Painting has received a more important impulse in the extension of taste, than it ever derived from mere patronage; how the higher branches of Art have come to the aid of manufactures; how, if Literature has become less bold and original, it has applied itself to the advance of the knowledge and amusement of a body of readers, who have increased tenfold since Queen Victoria came to the crown. Above all, it will record the growth of the domestic virtues; the universal contempt with which the low indulgences of a former generation are regarded; and with some differences upon minor points of doctrine and ceremonial observance, how the great religious principle which has ever distinguished Protestant England prevails throughout the land in companionship with that spirit of free inquiry, derived from our scientific progress, from which truth has no reason to shrink. How large a portion of the great characteristics of our time have been derived from the influence of the personal character of Queen Victoria, the future historian will feel it his duty to set forth. It is impossible for any thinking man, who has had the happiness to live under her benignant rule, not to feel how essentially that rule has contributed to the welfare of his country. It is a great feature of this reign, that during seventeen years it was a reign without the excitement of foreign warfare. A prince with martial propensities might have plunged the country into European and even trans-Atlantic quarrels. But let it not be forgotten that, when the sword was to be drawn in a just cause, a more animating example was never presented than that derived from the patriotic spirit of Victoria; and that the world felt that, after forty years' peace, Great Britain, under a Queen, was as warlike as under the most chivalrous leader, and far more just and considerate towards other nations, than in the days when war was held the greatest glory. In the chronological abstract which follows, will be found the record of some events which have a natural bearing upon the great characteristics of the reign of this queen. But there are others, far more numerous, and some more important, which cannot be indicated in such a form. We only attempt to offer an aid to the memory of the reader when he desires to know the date of some remarkable occurrence which belongs to the public history of the period.

1837. June 20, Queen Victoria succeeded to the throne, and was proclaimed on June 21. The Duke of Cumberland succeeded his brother as King of Hanover, as the succession is restricted to males, and thus the connection of the royal family with the Continent was sundered after continuing for 123 years. July 6, William IV. was buried at Windsor. November 20, the Queen in person opened the new parliament, and in her speech called attention to the insurrection in Canada. December 14, the Canadian rebels were defeated at St. Eustace in Lower Canada, their chiefs saving themselves by flight. December 29, the American United

States steamboat Caroline, which had brought assistance to the rebels, was attacked and burnt, on the territories of the United States.

1838. January 5, the Canadian insurgents, under Dr. Mackenzie, surround Toronto, but are repulsed by the governor, Sir Francis Head; and a proclamation of the President of the United States forbids the attacks of its citizens on neighbouring states. January 10, the London Royal Exchange was burnt down. January 16, the Earl of Durham was appointed governor-general of her majesty's possessions in North America, with extraordinary powers, in order to effect the adjustment of the disputes there. April 23, the Sirius (which left April 4) and Great Western (April 8) steam-ships arrived at New York from England, being the first vessels which crossed the Atlantic by steam power alone. May 31, a lunatic named Thom, who assumed the name of Sir William Courtenay, and proclaimed himself king of Jerusalem, having excited a number of deluded followers against the Poor-Law Act, a contest ensued with the military near Canterbury, and Thom having shot two men was himself shot by one of the soldiers. June 28, the coronation of Queen Victoria, attended by Marshal Soult, the old opponent of the Duke of Wellington, as ambassador from the King of the French. July 31, the new Irish Poor Law and the International Copyright Acts were passed. On August 10 and 15, the Hackney and Stage Coaches and the Irish Tithe Compositions Acts were passed. August 16, the Queen prorogued parliament. On September 17, the London and Birmingham Railway was opened throughout its entire length. October 9, the Earl of Durham declared his intention of resigning the governorship of Canada, in consequence of some of his proceedings being disapproved. November 1, the rebels were defeated at Napierville. On November 4, there were riots at Montreal. In November, intelligence was received that Dost Mohammed Khan, the chief of Cabul, had joined Persia with an intention of attacking the British possessions in India, whereupon the governor-general had adopted the cause of Shah Soojah in his claims on the throne of Afghanistan. [AFGHANISTAN, *S.* 1.] November 17, the rebels were again defeated near Prescott, in Upper Canada, and the insurrection was wholly suppressed. December 12, a proclamation was issued against illegal Chartist assemblies, several of which had been held at night in various parts of the country, those attending them being armed with guns, pikes, &c.

1839. January 7, the Académie des Sciences at Paris made a report on the invention of M. Daguerre, the originator of the daguerreotype process, which has been followed by the photographic process. January 20, the troops of the East India Company occupy Aden. May 6, the government having been defeated in the House of Commons on a bill for suspending the constitution of Jamaica, where the House of Assembly had refused to pass the prisons' bill, Lord Melbourne announced to the House of Lords, on the 7th, that the ministry had resigned. On the 8th, Sir Robert Peel received her Majesty's command to form an administration; but owing to the refusal of the Queen to dismiss the ladies of her household, he declined the commission, and on the 10th Lord Melbourne was reinstated. June 8, ratification of the treaty for the separation of Holland from Belgium. June 14, the Designs Copyright Act passed. July 15, Chartist riot at Birmingham suppressed by the military, but not till a large amount of damage had been done. August 17, the Postage Act passed, enacting a uniform rate throughout the kingdom for all letters not exceeding half an ounce in weight, and it gave the Treasury the power of fixing the rate at first, though it was to be ultimately one penny. This was done by reducing all rates above 4*d.* to that sum, leaving all below 4*d.* unaltered. It came into operation on December 5; and on January 10, 1840 the uniform half-ounce rate was reduced to one penny. The Act was for one year only, but it was confirmed in 1840. November 4, Newport in Monmouthshire was attacked by a party of Chartists, estimated to number about 10,000 men, under the command of John Frost, an ex-magistrate. They were opposed by the mayor, Mr. Phillips, and a party of special constables, assisted by about thirty soldiers. The rioters broke the windows of houses, fired on the inmates, and the mayor was wounded; upon which the soldiers fired, made a sortie, and dispersed the mob, of whom about twenty were left dead on the spot. The next day Frost and some others of the leaders were apprehended; on December 31, they were tried, found guilty of high treason, and sentenced to death, but the punishment was commuted to transportation for life, and in 1856 a free pardon was granted to them. November 23, the Queen announced to the Privy Council her intended marriage with Prince Albert. November 24, the trade between England and China was stopped by order of Lin, the Chinese Imperial commissioner.

1840. January 11, a Chartist outbreak contemplated at Sheffield was discovered and prevented, some of the leaders being apprehended. Slight disturbances took place about this time also, in a few other towns of the North. January 16, parliament opened by the Queen, and Lord John Russell brought before the House of Commons the case of Stockdale, who had brought an action against Hansard, the printer to the House, for a libel contained in some of the papers printed by order. He had obtained a verdict, issued execution, and the sheriffs of Middlesex had seized and sold some of Hansard's property. The House declared all these proceedings breaches of privilege. At different times, and after considerable discussion, Stockdale, his attorney, the two sheriffs, and some subordinate agents, were committed to the custody of the sergeant-at-arms. A bill was subsequently brought in by Lord John Russell, for exempting from such actions all papers ordered by the House to be printed, which was passed on April 14. February 10, the marriage of the Queen took place, attended with festivities throughout the country. March 15, the English ambassador at Naples presented a note, complaining of the establishment of a monopoly of the trade in sulphur granted to a French company, in contravention of the treaties with England. As the Neapolitan government refused satisfaction, an English fleet was ordered to Naples to adopt coercive means; but by the mediation of France hostilities were prevented, and the sulphur trade restored to its former course. May 6, the new stamps and envelopes for pre-paid letters came into use. June 4, the Act for the better effecting Tithe Composition in England and Wales received the royal assent. July 3, the fort of Amoy, in China, was destroyed by the English fleet, and on the 10th, the island of Chusan was taken. July 23, the Act for uniting the provinces of Upper and Lower Canada received the royal assent. August 7, the Act against employing children to sweep chimneys, and on August 10, that for regulating Irish Municipal Corporations, received the royal assent. August 11, the parliament was prorogued. August 25, the Carlist insurrection in Spain having been suppressed, the English auxiliaries evacuate San Sebastian and Pasages. December 2, Mehemet Ali, of Egypt, who had been for some time resisting the claims of the Sultan of Turkey to the sovereignty over Egypt, who had invaded and taken possession of Syria, at length, subdued by Turkey assisted by England and France, accepted on this day the terms proposed. Commodore Napier with an English fleet had greatly distinguished himself by his successful attacks on Beyrout and Acre. December 15, the remains of Napoleon Bonaparte, which England had allowed to be removed from St. Helena, were this day deposited with great ceremony in the Hôtel des Invalides, having been brought to France by a French squadron under Prince de Joinville.

1841. January 9, a meeting of the Repeal Association was held in Dublin, to receive the accounts of the preceding year; and during the spring several monster Repeal meetings were held to hear the addresses of Daniel O'Connell, some of which were attended by as many as 150,000 persons. Jan. 9, the Bogue forts at Canton were attacked and taken by the British forces. January 20, after some further hostilities, the Chinese government proposed terms, by which Hong-Kong was ceded to Great Britain, direct official communication between the two powers granted, some additional ports opened to trade, and an indemnity of six millions of dollars paid. January 26, parliament commenced its sittings. Feb. 10, the union of the Canadas proclaimed at Montreal, and Lord Sydenham took the oaths of office. February 13, a dinner given to Lord John Russell in London, to celebrate the foundation of the most recent colony of Great Britain—New Zealand. On March 15, at a meeting of the Vice-Chancellor, heads of houses, and proctors, of the University of Oxford, a resolution was passed condemning the Puseyite Tracts, which had lately excited much attention. March 23, Father Mathew continues his efforts in Ireland in favour of temperance. On this and two succeeding days, he was said to have administered the pledge to 120,000 persons. March 31, the annual meeting of the Metropolitan Anti-Corn-Law Association was held, numerous meetings with a similar object having been held in various parts of the country. April 28, a meeting called by the Archbishop of Canterbury, in London, to raise funds for sending out bishops to the colonies, when a large subscription was obtained. On the same day, the preliminary expedition of the second colony to New Zealand sailed under the command of Captain Wakefield; the colony to be formed on the principle propounded by E. G. Wakefield, limiting the area, and applying the land produce fund to the purpose of obtaining labour. May 18, a great meeting held at Manchester, to petition for a total repeal of the Corn-Laws. Many other meetings for the same purpose were held throughout the country, some of which were disturbed by the attempts of Chartists to incorporate a petition for universal suffrage. May 28, hostilities re-commenced at Canton. The British forces, under Sir Hugh Gough, took two forts, and the town capitulated, having agreed to the previous terms and to pay six millions of dollars within one week. May 27, the case of the seven ministers of the presbytery of Strathbogie was brought before the assembly of the Scottish Church; when they were suspended for having obeyed the order of the civil courts in placing the minister of Marnoch against the order of the Assembly. A large minority protested, and a numerous meeting was held in Edinburgh on the following Monday (31st), to express their sympathy with the deprived ministers. On the 27th Sir Robert Peel brought forward a resolution in the House of Commons, declaring that the ministry did not possess the confidence of the country. June 4, the debate terminated, and the resolution was carried by 312 against 311. On the 7th, Lord John Russell informed the House, that in consequence they should appeal to the country. On the 22nd the parliament was prorogued and dissolved. June 21, the Act for the Commutation of Copyhold and Customary Tenures, and that for affording Facilities for the Conveyance and Endowments of Sites for Schools received the royal assent. August 19, the new parliament met. An amendment to the address was moved by Sir R. Peel; and after a debate, the amendment was carried. On the 30th, the ministers announced their resignation, and Sir R. Peel was commissioned to form a new ministry. In September, accounts arrived from various parts of the country, representing the extreme distress of the manufacturing districts of the country. October 4, a great fire occurred in the Tower, which destroyed the storehouses and the small-arms armoury. December 31, Lord Ashburton was appointed to a special mission to the United States, in order to settle the various differences between the two countries, which he concluded in September 1842.

1842. January 17, the first stone of the new Royal Exchange was laid by Prince Albert. February 8, about 600 deputies of the Anti-Corn-Law Association assembled in London, to promote its objects. April 29, a new law for a graduated scale on the importation of foreign corn received the royal assent. May 4, the Boers of Port Natal having thrown off their allegiance to the British government, are attacked by Captain Smith with a small force, whom they defeat, but were beaten in a second action on June 26, and forced to submit. May 30, John Francis fires a pistol at the Queen, who escaped uninjured; Francis was tried for the attempt at the Old Bailey, found guilty, and sentenced to be hung, but the punishment was commuted to transportation for life. June 4, there were riots at Cork and Ennis, occasioned by want of food arising from the potato rot in 1841; and great distress and discontent continued to exist among the manufacturing population of England. June 16, the treaty with the Chinese not having been ratified, the British forces entered the river Yang-tze-Kiang, and seized several forts with numerous cannon; and on the 19th they took possession of Shanghai. June 22, Sir Robert Peel's bill imposing an Income Tax of 7*d*. in the pound on incomes of 150*l*. a year and upwards received the royal assent. July 9, a deputation from the Anti-Corn-Law Association waited on Sir R. Peel, to represent the extreme distress of the labouring poor. July 30, a law received the royal assent, bestowing a representative government on New South Wales. August 8, a serious riot took place at Manchester owing to the distress, and the riots extended subsequently to other towns in the North. August 12, the Bankruptcy Amendment Act received the royal assent. August 29, the Queen and Prince Albert visit Scotland. September 30, a special commission was held to try the offenders in the late riots, when fifty-four were convicted, and sentenced to various periods of imprisonment.

1843. January 9, O'Connell announced at a weekly meeting of the Repeal Association that "1843 is and shall be the great Repeal Year." January 20, Mr. Edward Drummond, the private secretary of Sir Robert Peel, was shot at Charing-Cross by a man named M'Naghten, who was acquitted on March 4, on the ground of insanity, and removed to Bethlehem Hospital. On February 2, parliament assembled. February 17, the forces of the Ameers of Sinde were defeated by Sir C. Napier, who, on the 20th, took Hyderabad, and subsequently annexed Sinde to the British empire. [SINDE, *S.* 1; INDIAN EMPIRE, *S.* 2.] About the end of this month, the Rebecca Riots took place in Wales, the object of which was the removal of oppressive turnpike tolls. The riots continued through several months. March 25, the Thames Tunnel was opened. May 18, the secession of the supporters of the non-intrusion principle took place from the General Assembly of Scotland, when above four hundred ministers resigned their parishes. May 30, Natal was annexed to the colony of the Cape of Good Hope. July 3, the Cartoons for the embellishment of the new Palace at Westminster were exhibited to the public. August 17, an Act for the pacification of the Scottish Church received the royal assent, but had no effect in staying the disruption. August 22, a great Repeal Meeting held on the hill of Tara. August 24, parliament was prorogued. August 28, the Queen and Prince Albert embarked at Southampton, on a visit to Louis Philippe at the Château d'Eu; on September 13, they visited the King of the Belgians at Ostend. August 29, Father Mathew holds a great Temperance meeting in London, and in the course of a few weeks administers the pledge to 74,000 persons. On September 9, the French took possession of Otaheite. September 28, the Anti-Corn-Law Association renewed its meetings in London. October 7, the Irish government issued a proclamation forbidding the Repeal meetings, and O'Connell recommends submission. On the 14th, Mr. O'Connell, his son, and several other Repeal leaders, are arrested and held to bail on a charge of conspiracy and sedition. October 27, the Welsh special commission opened at Cardiff for the trial of the Rebecca rioters, the principal culprit being a young farmer, who was sentenced to imprisonment for twenty years. Most of the others were let off, on pleading guilty, and on condition that the riots should cease.

1844. January 29, the Grand Duke of Saxe-Coburg, father of Prince Albert, died. February 1, parliament was opened. February 12, after a trial which lasted twenty-four days, O'Connell and his companions were found guilty. A new trial being refused by the judges, on May 11, O'Connell was sentenced to a year's imprisonment and a fine of 2000*l*.; on September 2, the judgment was reversed, on appeal, by the House of Lords, and he was restored to liberty. March 5, Mr. Pritchard, the British ex-consul at Otaheite, was seized and placed in confinement, by M. Bruat, the French governor, whose conduct, after much contention, was subsequently disavowed by his government. April 12, a treaty of annexation proposed between Texas and the United States was rejected by the Senate. On May 11, a meeting was held under the presidency of Lord Ashley, for improving the habitations of the poor. June 1, the Emperor Nicolas of Russia visited England. June 6, the Factories Act, regulating the employment of children and young persons, received the royal assent. June 14, a discussion was raised in the House of Commons on the subject of Sir James Graham opening letters at the Post-office. He contended that he had the right, but would give no further explanation. The letters said to be opened were addressed to Mazzini, and the information thus obtained had enabled the Austrian government to seize the brothers Bandiera, who had landed in Italy for the purpose of creating an insurrection. A Committee of Examination was appointed by Lords and Commons, but they only reported that the power had been occasionally exercised. July 22, a treaty was signed between England and Hanover for the settlement of the Stade duties. August 8, a meeting was held in Manchester for the formation of public parks, and 25,000*l*. were subscribed by November 1. September 5, parliament was prorogued. November 19, a meeting was held at Birmingham, for the establishment of public parks and baths.

1845. January 11, the Archbishop of Canterbury addressed a letter to the clergy of the Established Church, on the disputes raised by the introduction of Puseyite practices in the ceremonies of the Church, as to which he would not give an authoritative opinion, but recommended moderation. February 4, parliament was opened by the Queen in person. **On the 14th, Sir Robert Peel made his financial statement:**

he proposed to continue the income tax, to repeal all duties on export, to abolish the duties on 430 articles which yielded only a trifling income, also those on cotton-wool, glass, and staves, and to substitute an annual licence for the auction duties: these were ultimately carried. March 6, Sir Robert Peel brought in a bill to enable Jews to hold municipal offices, which was passed on March 14. May 5, a bazaar in aid of the Anti-Corn-Law Association was held in Covent Garden Theatre, by which 25,000*l.* was realised. On the 22nd a meeting was held in London for the establishment of baths and wash-houses, under the presidency of the Duke of Cambridge. May 23, the Arctic expedition of discovery, under Sir John Franklin, sailed from Greenhithe, and, unfortunately, never returned. May 28, a terrible fire took place at Quebec, and on the 28th of June another. In the two fires 2947 houses were destroyed, and 20,000 persons left destitute: parliament voted 20,000*l.* for their relief; subscriptions were raised, and collections were made in all the churches, under the authority of the Queen's letter. May 29, a new convention between England and France for the better suppression of the slave trade was signed. June 15, a French and English squadron attacked Madagascar, in consequence of the Queen of Madagascar having threatened the traders of those countries with expulsion: they destroyed some forts and part of a town, but nothing satisfactory was accomplished. June 30, Sir R. Peel's Act for the endowment of Maynooth College received the royal assent; and on July 21, the Acts for the establishment of museums in large towns, for the endowment of the new colleges in Ireland, and for the amendment of the Poor Law in Scotland. October 31, Mr. Waghorn arrived with the East India mail, which he had brought for the first time by the Overland route. During this month the railway mania reached a crisis, and a panic ensued, by which many were ruined. November 19, the Irish Roman Catholic bishops condemn the new Irish colleges. November 22, Lord John Russell issues his letter to the electors of London, declaring for a total repeal of the Corn Laws. December 10, it having been previously understood that there had been many discussions in the cabinet on the subject of the Corn Laws, it was made known that ministers had resigned, and that Lord John Russell had been sent for to form a ministry. On the 20th, he having failed, Sir R. Peel was again sent for, and re-accepted office.

1846. January 3, the corporations of London and Dublin presented addresses to the Queen representing the sufferings caused in Ireland by the potato-rot of the previous year. January 5, a meeting of agricultural labourers was held at Wootton-Basset in Wiltshire, at which they petitioned for the abolition of the Corn Laws. January 11, the New Zealand chiefs, who had previously committed several outrages on the British settlements, were attacked and defeated: on the 19th they made their submission. January 22, the parliament was opened by the Queen, who referred to the failure of the potato crop, and recommended the consideration of the propriety of relaxing protective duties. On the 27th Sir R. Peel announced his intended repeal of the Corn Laws. March 13, potatoes having risen to a famine price in Ireland, a treasury order was issued allowing the importation of Indian corn, rice, and buckwheat, at a nominal duty of one shilling per quarter. April 4, the governor of the Cape of Good Hope commenced a war upon the Caffres, who had been committing depredations on the colonists. June 9, the town of St. John's, Newfoundland, was destroyed by fire; the damage done amounted to 1,000,000*l.* June 12, a treaty with the United States for the settlement of the Oregon boundary was agreed upon by the senate at Washington. On the 26th the Corn Duties Repeal Act, and the Customs Duties Act, which gave great freedom to commerce, received the royal assent. On the same day, on the motion for the second reading of the Protection of Life Bill (a coercive measure for Ireland), the ministers were defeated, and immediately resigned. On July 6, Lord John Russell and other members of the new ministry were sworn into office. July 28, W. S. O'Brien and many others seceded from the Repeal Association, because O'Connell had denounced all attempts to obtain their object by physical force. August 26, an Act for the establishment of Public Baths and Washhouses received the royal assent, and also the Act for establishing County Courts. September 4, twenty-four districts in Ireland were declared by proclamation to be in a state of distress, and the provisions of the Labour Rate Act were directed to be put in operation in them. September 14, a formal protest was made by the British government against the marriage of the Duke de Montpensier, a son of the King of the French, with the sister of the Queen of Spain. October 2, the distress in Ireland continuing, and the provisions of the Labour Rate Act proving worse than useless, the lord lieutenant issued a circular authorising the undertaking of works of permanent utility. December 18, the island of Labuan was taken formal possession of by the agents of the British government. December 18, a meeting was held in Edinburgh to consider as to the best means of relieving the distress in the Highlands and Islands of Scotland, where 330,000 persons were without the means of subsistence.

1847. January 2, the British Association established, by which large sums were raised by subscription for the relief of the distress in Ireland and Scotland, in both of which countries numbers were dying of starvation. January 19, parliament was opened by the Queen, who directed the attention of the Houses to the great distress prevailing, and called on them to provide measures for its relief. May 13, Daniel O'Connell died at Genoa, while on his way to Rome. June 8, the new Irish Poor Law Bill received the royal assent; on the 21st, that for the improvement of towns; and on the 23rd parliament was prorogued. October 17, thanksgivings were offered up in all the churches for an abundant harvest. October 23, in consequence of a great monetary pressure, the temporary suspension of Sir R. Peel's Bank Restriction Act was ordered, and the order was withdrawn November 23. November 18, parliament re-assembled, and passed an Act for the suppression of crime and outrage in Ireland.

1848. February 21, the revolution commenced in Paris by which Louis Philippe ceased to be King of the French. On the 24th the king abdicated. On the 26th the republic was proclaimed. Louis Philippe and his family fled, and arrived in England at the beginning of March. April 10, a proposed great Chartist demonstration on Kennington Common, near London. The government however had appointed special constables; an intended procession was prevented, and the affair passed off harmlessly. May 15, the state trials in Ireland commenced; the jury could not agree in a verdict as to Mr. O'Brien and Mr. Meagher. Mitchell was tried on May 22 for seditious writing in the 'United Irishman,' found guilty, and sentenced to fourteen years' transportation. July 29, an engagement took place between the Irish rebels and the government forces at Ballingarry: the rebels were easily defeated. On August 5, W. S. O'Brien was captured, and on the 12th Meagher, O'Donohue, and Lyne. August 20, twenty Chartist leaders arrested in the Blackfriars Road. August 29, Sir H. Smith defeated the rebels under Pretorius at Bloem Platts, in the Cape of Good Hope colony. August 31, the Health of Towns Act received the royal assent. September 30, the Chartist trials were concluded in London, and Dowling, Cuffey, and others were sentenced to transportation for life. October 9, the trial of the Irish rebels concluded, and O'Brien, Meagher, O'Donohue, and M'Manns were sentenced to death.

1849. During this year the Hungarian insurrection against Austria and the popular risings in Germany succeeded the revolution in France of 1848, but Great Britain took no part in these commotions. May 11, on the appeal of Smith O'Brien and others to the House of Lords the judgment was confirmed, and on July 9, they were all transported. On May 13 a large meeting was held at Cape Town to protest against the attempt to make the Cape a penal settlement, and the efforts made were ultimately successful. On June 26, the Act for repealing the Navigation Laws received the royal assent, and on the 18th the Irish Encumbered Estates Act. In August a report was furnished to the Cabinet at Washington by Colonel Mason, confirming the discovery of vast quantities of gold in California. On September 16, prayers were offered up in the churches for the removal of cholera, which had been long raging in England. On November 5, Russia and Austria demanded the expulsion or imprisonment of the Hungarians who on the defeat of the insurrection had taken refuge in Turkey: Turkey refused to comply with the request, and applied for assistance to England, which sent a fleet that entered the Dardanelles. December 1, the Dowager Queen Adelaide died. December 16, a large assemblage of tenant farmers and cottiers took place at Mullinahone in Tipperary to petition for Tenant Right.

1850. January 10, the Enterprise and Investigator leave Woolwich in search of Sir John Franklin. January 25, a meeting held in the Mansion House, London, in furtherance of the Industrial Exhibition of all nations. July 26, Baron

Rothschild, having been elected for the city of London, attended the House in order to take his seat, but was refused because he objected to take the oaths on the faith of a Christian. August 5, the Act for regulating metropolitan interments, forbidding burials in church-yards, received the royal assent, as also an Act for the better government of the Australian colonies, forming Victoria into a separate colony, and giving it a representative legislature. August 14, the Act enabling town councils to establish public libraries and museums also received the royal assent. August 21, the Queen embarked at Osborne to visit the King of the Belgians. September 24, the pope issued a bull establishing a Roman Catholic hierarchy in England, which, on its promulgation, occasioned great agitation. October 8, Captain M'Clure, in the Investigator, discovered the North-West Passage by Prince of Wales's Strait. The ship was subsequently frozen up, and the crew were not rescued till April, 1853, when they made their way over the ice to Melville Island. November 22, a meeting of the clergy of the Established Church was held at Oxford to protest against the pope's bull, which was followed by public addresses for the same purpose to the Queen from various parts of the country. December 31, Sir Harry Smith, governor of the Cape of Good Hope, declared war against the Caffres. He had been attacked by them and narrowly escaped on the preceding day, and the Caffres defeated our troops in several places.

1851. January 27, Earl Grey in a despatch places the Clergy Reserves at the absolute disposal of the legislature of Canada. February 4, Parliament opened, and the Queen alluded to the Ecclesiastical Titles bill, as occasioned by the pope's recent bull. February 22, the Russell ministry resigned, in consequence, as stated by Lord John, of the smallness of their majority against Mr. Disraeli's motion in favour of agricultural protection, and of Mr. Locke King having carried a motion against them in favour of the extension of the county franchise. On the recommendation of the Duke of Wellington the Russell ministry resumed their places on March 3. May 1, the Great Exhibition of the Industry of all Nations in Hyde Park was opened by the Queen. May 22, the governor of New South Wales issued a proclamation forbidding the search for gold in the newly discovered gold regions without a license. By the beginning of June 20,000 persons were employing themselves at the diggings. August 1, the royal assent was given to the Ecclesiastical Titles Assumption and the New Metropolitan Cattle Market Acts. October 23, Kossuth arrived at Southampton, on the 30th he went in procession to the Guildhall of London, where an address from the city was presented to him. November 6, the Caffres defeated a British force at Waterkloof. December 2, the Prince-President of France dissolved the legislative assembly, arrested Cavaignac, Changarnier, Thiers, and others, and on January 2, 1852, his continued authority was voted by 7,439,216 votes against 640,737.

1852. January 1, the Roman Catholic synod of Thurles prohibited the Roman Catholic clergy from holding any office whatever in the Queen's colleges in Ireland. February 3, the parliament met; on the 20th the ministry were beaten on the Local Militia Bill, and on the 23rd they resigned; they were succeeded by one under the presidency of the Earl of Derby, who, on announcing his acceptance of office on the 27th, deprecated the attempts which were being made to produce a panic-fear of invasion by the French. April 13, Major-General Cathcart, who had superseded Sir H. Smith as governor of the Cape, issued a proclamation recognising the independence of the Boers of the Vaal river. June 1, the electric telegraph between England and Ireland opened for communication. June 2, the independence of Greytown was guaranteed by the English and American governments. June 30, the Act granting a representative constitution to New Zealand received the royal assent. July 1, the parliament was dissolved. July 3, a great Tenant-Right meeting at Waringstown in Ireland, at which Mr. S. Crawford, M.P., attended, was dispersed by the magistrates. November 2, a great Free Trade banquet held at Manchester, which was attended by 3000 persons. November 23, three ships arrived in the Thames with a large quantity of Australian gold. December 16, in the new parliament which had assembled on November 4 the ministry were beaten on the budget by 305 against 286; they immediately resigned; and on the 27th the Earl of Aberdeen announced that he had accepted office, and formed a new ministry.

1853. January 5, the Emperor of China legalised the importation of opium, in order to make it contribute to the revenue. March 9, a treaty with the Caffre chiefs was concluded by General Cathcart at King William's Town. May 3, Prince Menzikoff presented the Russian ultimatum to the Turkish government, claiming for the czar the protectorate of the Greek Christians in the Turkish dominions, which was rejected. May 12, the Industrial Exhibition opened at Dublin. June 26, the Emperor of Russia issued a manifesto against Turkey, and announced the march of Russian armies upon its Danubian Provinces. September 27, Turkey declared war against Russia. October 22, the French and English fleets entered the Bosphorus. December 5, a protocol was signed at Vienna by France, England, Austria, and Turkey, for the maintenance of the integrity of the Turkish empire.

1854. February 13, Lord John Russell introduced to the House of Commons his new Reform Bill, which was abandoned on April 11, in consequence of the state of public business. February 20, the Grenadier and Coldstream guards embarked at Southampton for Turkey, and other troops followed in rapid succession. March 11, the Queen reviewed a fleet at Spithead previous to its sailing for the Baltic. March 28, war declared by England against Russia. April 22, Odessa bombarded by the French and English fleets. June 7, a treaty concluded at Washington for facilitating the intercourse of the British North American colonies with the United States. June 8, the Crystal Palace at Sydenham opened by Queen Victoria. June 16, the Act for doubling the income tax, on account of the war with Russia, received the royal assent. August 7, the Act for regulating Oxford University received the royal assent. August 16, Bomarsund was surrendered to the allied fleet. September 14, the allied army landed in the Crimea, after having suffered severely from cholera during this and the preceding month. On the 15th the Russians evacuated Moldavia, and the Danubian Provinces were garrisoned by the Austrians. On the 20th the battle of the Alma took place, and the Russians were defeated. [RAGLAN, LORD, *S.* 2; SAINT-ARNAUD, MARÉCHAL, *S.* 2.] October 17, the bombardment of Sebastopol commenced. November 5, the battle of Inkermann, when the Russians were again beaten. On the 14th a violent storm destroyed many ships laden with stores, and caused great calamities on shore. This was followed by a season of great suffering: the roads were impassable; the weather was bitterly cold; men and horses, ill supplied with food or shelter, perished in large numbers, while medical attendance and hospital accommodation were wofully deficient. Great dissatisfaction was expressed at home, and private subscriptions to a large amount were raised to alleviate the distress. Miss Nightingale organised a staff of nurses, and proceeded with them to Constantinople to superintend the hospitals, and attend the sick and wounded.

1855. January 6, conferences between the plenipotentiaries of England, France, Austria, and Russia, were opened at Vienna. Lord John Russell was the English plenipotentiary, and his conduct in supporting the propositions of Austria for a peace with Russia, formed the subject of a parliamentary discussion on July 6, and led to his secession from office on July 13. January 10, Sardinia joined the allies, and undertook to send troops to the Crimea. January 29, Mr. Roebuck's motion for a committee to investigate the causes of the sufferings of the army in the Crimea was carried against the ministry by 305 to 148. In consequence the Aberdeen ministry resigned, and on February 10 was succeeded by one of which Lord Palmerston was the Premier. March 2, Nicolas, Emperor of Russia, died, and was succeeded by his son Alexander II. May 24, Kertch occupied by the allies, whose fleets swept the sea of Azoff, and destroyed several towns and a vast number of vessels. June 18, the French attacked the Malakhoff and the English the Redan, but were repulsed. July 1, a large assemblage of persons took place in Hyde Park to protest against Lord R. Grosvenor's Sunday Trading Bill, and some rioting occurred. The bill was withdrawn on the next day, but the meetings and the riots were continued on the two following Sundays. July 11, Sveaborg, in the Gulf of Finland, was bombarded by the allied fleets. August 14, the Metropolis Local Management Act, constituting a representative board for the management of the improvements of the whole metropolis, received the royal assent. September 8, the French captured the Malakhoff, and in the night the Russians evacuated the south side of Sebastopol, of which the allies took possession. September 29, the Russians assaulted Kars, and were repulsed by the Turks, assisted by Sir W. F. Williams, several other English officers, and General Kmety. October 17, Kinburn, at the mouth of the Dnieper, surrendered to the allies, and on the next day the Russians blew up the fortress of Oczakoff. November 26, Kars was surrendered to the Russians, after a gallant defence; Sir W. F. Williams and the English officers were made prisoners, and treated with great kindness by the Russians. November 30, the King of Sardinia arrived at Windsor Castle on a visit to the Queen. December 19, the united kingdom of Sweden and Norway joined the alliance of the Western Powers.

1856. January 31, the Queen, on opening the session of parliament, announced the acceptance by Russia of the terms proposed for a general peace. February 1, Mr. Murray, the British minister to the Persian court, quitted Teheran in consequence of a dispute with the Persian government. February 7, the Queen, having created Sir J. Parke, one of the barons of the Exchequer Court, a peer for life only, a motion to refer the subject to a committee of privileges was carried against the ministers. The committee reported that such a peerage gave no right to sit in parliament, which was confirmed by the House. Ultimately ministers gave way, and Baron Wensleydale was created a peer in the usual form. April 29, official proclamation made of the peace with Russia. May 29, public celebration of the conclusion of peace; magnificent fireworks exhibited in London, Edinburgh, and Dublin, and a general illumination took place. July 12, the allies evacuated the Crimea. July 29, the Act for establishing reformatory and industrial schools for criminal and vagrant children received the royal assent. August 20, the Queen of Oude arrived in England, to appeal against the annexation of her son's dominions to the British possessions in India. September 4, the Royal British Bank stopped payment; on the accounts being investigated gross frauds were disclosed; the failure caused a vast amount of distress; and ultimately the attorney-general undertook to prosecute some of the directors, seven of whom were found guilty in February, 1858, and six were sentenced to various periods of imprisonment, and one to a fine of one shilling; an Act of Parliament was also passed in 1857 to render trustees more easily punishable for misconduct and misapplication of funds. October 11, the seizure by the Chinese in the Canton river of the 'lorcha' Arrow, gave rise to a series of attacks on Canton, from which place all the foreign commercial residents withdrew. November 10, in consequence of the Persians having taken Herat, in violation of a treaty, war was proclaimed at Bombay against that country. December 11, the collection of pictures belonging to Mr. John Sheepshanks was made over by him to the government as a gift to the nation.

1857. March 3, the ministry were defeated on a motion by Mr. Cobden, involving censure on them for the attack on Canton. Lord Palmerston then announced his intention of appealing to the country as soon as the indispensable business of the House could be got through. Parliament was dissolved on March 21, and a new one summoned, which met on April 30. In the new elections the most remarkable fact was that Mr. Bright, Mr. Cobden, and most of what were called the 'Peace Party,' failed in getting returned. March 14, the treaty with Denmark for the abolition of the Sound Dues was signed at Copenhagen. An indemnity was to be paid to Denmark, of which England's share was settled at 1,300,000*l*., and the dues ceased from April 1. May 5, the Art Treasures Exhibition was opened at Manchester by the Queen and Prince Albert. May 7, a mutiny broke out in the Indian army. [See INDIAN EMPIRE, *S.* 2.] May 25 and 27, Commodore Keppel, with a British naval force, attacked a number of Chinese junks in Escape Creek, and on June 1, another attack was made on those assembled in Fatshan Creek, in the Canton river. Both attacks were successful, numerous junks were destroyed, a quantity of cannon taken, and a large part of the enemy's force killed. The issue of this war, with the capture of Canton, will be found under CHINA, *S.* 2. June 25, an order in Council directed that in future Prince Albert was to be prayed for in the churches and addressed as the Prince Consort. July 10, the Oaths Bill, by which Jews would have been admitted to parliament, was rejected in the House of Lords, after being carried in the Commons by a large majority. In November (chiefly in consequence of a commercial panic in the United States of America, during which all the banks suspended payment, and bankruptcies to the amount of fifty millions took place) a crisis occurred in Great Britain. Several extensive failures of commercial houses in London, Liverpool, Glasgow, and other towns followed. Two banks in Glasgow suspended payment, one of them in a state of hopeless insolvency, accompanied with the disclosure of imprudent management in discounting an enormous amount of accommodation bills. As early as October 8 the Bank of England raised its rate of discount to 6 per cent., which was increased on the 12th to 7 per cent., on the 19th to 8 per cent., on November 5 to 9 per cent., and on November 9 to 10 per cent. On the 12th the operation of Sir R. Peel's Bank Restriction Act was suspended for the second time, and the Bank of England was authorised by the government to issue notes to an amount not exceeding two millions, for which an Act of Indemnity was passed on December 12. This calmed the panic, confidence was restored, the rate of discount was rapidly lowered, so that by February, 1858, it was reduced to 3 per cent., and the bullion in the bank increased from 6,666,000*l*. on November 11, 1857, to 17,617,283*l*. on March 3, 1858. The effects of the failures abroad, however, which had extended to Hamburg, and most other of the commercial towns of Europe, had a most calamitous influence on the manufacturing industry of the country.

On January 14, 1858, an atrocious attempt was made to assassinate the Emperor of the French, by casting explosive balls among the crowd assembled to see him and the Empress proceed to the Opera. The criminals, Orsini, Pierri, Rudio, and Gomez were apprehended; and on its appearing that they had recently left England, where each had resided for various but not very lengthened periods, an outcry was raised in France against England for harbouring conspirators; and a letter was sent by the French ambassador, which was published in the 'Moniteur,' complaining of the defective state of the law in England respecting conspiracy, and asserting that in England it was allowed openly to advocate regicide. Soon after the meeting of parliament Lord Palmerston brought in a bill to remedy this asserted defect, which was ordered to be read a first time by a large majority; but on the motion for the second reading, Mr. Milner Gibson moved an amendment that the French ambassador's letter ought to have been answered by the ministers, and the amendment was carried, on February 19, by a majority of 234 to 215. In consequence of this vote Lord Palmerston announced to the House on February 23, that the ministry had resigned; that the Earl of Derby had been sent for by the Queen, and that he had undertaken the formation of a new ministry. This was accomplished, and the ministry was completed, and met the Houses on the 12th of March. The new cabinet abandoned the conspiracy bill, but continued the prosecution of Dr. Bernard, for the asserted complicity in the conspiracy against the Emperor's life. He was indicted as accessory to the murder of one of the individuals who perished from the explosion of the grenade thrown at the Emperor on January 14, but was acquitted on Saturday April 17, after a trial lasting for six days. After the capture of Canton, the war in China [CHINA, *S.* 2] almost ceased; and since the reduction of Lucknow [INDIAN EMPIRE, *S.* 2], the chief military operations have been the taking of detached forts or towns, and the pursuit and defeat of scattered bodies of the rebels. On April 20, the new Chancellor of the Exchequer (Mr. Disraeli) introduced his budget, in which he announced the reduction of the income tax to 5*d*. in the pound, the equalisation of the duty on Irish distilled spirits with that of England and Scotland, and the imposition of a penny stamp on every cheque issued for payment on a banker, all of which were subsequently agreed to. On April 12 the Oaths Bill was again carried in the House of Commons, but was rejected in the Lords, so far as regarded the clause relieving the Jews. On May 14 Mr. Cardwell introduced a motion of censure on the ministry for having made public a despatch from Lord Ellenborough, as President of the Board of Control, to Viscount Canning, Governor-General of India, condemning the proclamation issued by him. Lord Derby, on behalf of the ministry, disapproved of the publication, Lord Ellenborough resigned, and after several nights' debate in the House of Commons the motion was withdrawn on May 21.

VICTORIA, or PORT PHILLIP, a British colony in Australia, situated at the southern extremity of the continent, extends between 34° and 39° S. lat., 141° and 150° E. long.; and is bounded N. and E. by New South Wales, from which it is divided by the river Murray, and a line drawn from the head waters of that river to Cape Howe; S. by Bass's Strait and the Pacific Ocean; and W. by South Australia, from which it is separated by the meridian of 141° E. long. The form of the province is triangular, its greatest length being from east to west about 500 miles; its greatest breadth about 300 miles. The area is 98,000 square miles or nearly 63,000,000 acres. The population in 1846 was 32,800; on March 2nd 1851 it was 77,345; on December 31st 1852 it was estimated at 151,127; in February 1858, Bradshaw's 'Monthly Guide to Victoria,' gave the total population as 430,656, including 33,285 Chinese, and 1768 aborigines. In 1855 it was estimated that the population on the gold-fields of Victoria colony was 145,852, of whom 20,546 were Chinese; in this number of Chinese there were 3 women, and 3 children.

From Cape Howe, at the eastern extremity of the province, a line of coast, called the Long Beach, extends 200 miles, in a south-westerly direction to Wilson's Promontory. This part of the coast, which curves slightly inwards, consists for the most part of low and sandy shores backed by hills. Near the centre are several lagoons, and a considerable sheet of water called Lake Wellington. A short distance north of Wilson's Promontory is Corner's Inlet, where a settlement called Alberton has been formed. The inlet is full of shoals, but it forms a harbour for small vessels, and maintains considerable intercourse with Hobart Town, exporting sheep and fat cattle from the adjoining country. Near Cape Wilson are a number of small rocky islands, forming a continuation of the ridge of the Australian Alps. From Wilson's Promontory to the western boundary of the province, the coast-line runs in a north-westerly and westerly direction more than 300 miles. Only three harbours are found on it—Portland Bay, near the western, and Port Phillip and Western Port, near the eastern extremity. Between Portland Bay and Port Phillip, a distance of more than 200 miles, there is no place of safety even for small vessels, with the exception of Warrnambool and Port Fairy, small harbours for coasting vessels. During the summer the south-eastern winds blow on this coast for three months with great force. From Wilson's Promontory to Western Port the coast is mostly high. From Western Port to the western boundary-line it is generally low. The low shores are sandy, except at some places where swamps exist. West of Cape Nelson the coast is bounded by sand-hills.

Western Port affords good anchorage for vessels of considerable size, and is safe, being protected against the southern and south-eastern winds by Phillip Island, which lies across its entrance. Port Phillip, situated at the western entrance of Bass's Strait, is a harbour of great capacity. It is entered by a passage a mile and a half wide, bounded by Cape Nepean on the east, and Cape Lonsdale on the west. The channel is still further narrowed by some shoals which front the entrance. Within, the basin extends about 40 miles north, and about midway attains the same breadth, sending off an arm to the west, where it forms the harbour of Geelong. Hobson's Bay, at the northern extremity of the basin, affords good anchorage for vessels of all sizes, and forms the port of Melbourne. Lighter vessels ascend the Yarra-Yarra 8 miles to the capital, which is only a mile and a half distant by land. Portland Bay, near the western boundary, extends 26 miles from east to west, and 10 miles from north to south, and has good anchorage on its western shores in from 4 to 6 fathoms; but it is open to the south-east winds, and during the south-west gales a swell sets in, causing a heavy surf on the beach.

Wilson's Promontory, the most southern headland of Australia, is formed by a mountain, which is visible at the distance of 15 leagues. This rocky mass may be considered as the commencement of the Australian Alps, a range of mountains which, for a distance exceeding 70 miles, runs to the west of north, and farther on, for about 100 miles, to the east of north, until it approaches 37° S. lat. From this part of the range, which has a mean elevation of 2500 feet above the level of the sea, several lateral ridges extend to the south-east and west. The acclivities both on the east and west are gentle, and are partially overgrown with forests, containing many timber-trees, mostly blue gum and black butt. Near 37° S. lat. the range rises above the snow-line, and this portion of it is called the Ajuk Mountains. The valleys in this district comprise much land no less fit for cultivation than for pasture. That portion of the province which from the eastern declivity of the southern portion of the Australian Alps and the Ajuk range descends to the Pacific, is called Gippsland. It extends along the coast to 148° E. long., and consists of an inclined plane, which however near the mountains appears to descend with great rapidity, as in the middle of the region the plain is only 210 feet above the sea-level. The northern portion of this country is traversed by several ranges of hills, which are of considerable elevation near the principal range, but grow lower as they proceed southward. The valleys exhibit a considerable degree of fertility, and many cattle stations have been established in them. In the centre of Gippsland are plains of considerable extent, which are covered with open forests, and are capable of maintaining numerous herds of cattle. The most southern portion of Gippsland is traversed by several offsets of the Southern Australian Alps, which are covered with forests of blue, green, and black butt, in which numerous timber-trees are found. The whole of Gippsland is abundantly watered by several streams. The country extending north-east of Gippsland to the boundary of New South Wales has been but partially explored.

On the north of Port Phillip the watershed between the rivers falling into the Southern Sea and the Murray occurs about 45 miles from the northern extremity of the harbour, but farther to the west it is between 80 and 100 miles from the sea-shore. On both sides of the watershed the country is hilly and broken, and between 142° and 143° E. long. it rises into mountains. This hilly tract is in general from 30 to 40 miles across. To the south of it is an extensive plain, which descends gently to the sea-shore. Near the sea it is almost level or slightly undulating; but farther north it contains a rather large number of hills, rising from 500 to 700 feet above their bases; among them is Mount Buninyong, which rises 1570 feet above its base. A great number of lakes are scattered over this plain, one of which, called Carangamite, is about 90 miles in circumference. Its waters are salt, as are those of nearly all the others. The isolated hills which rise on this plain appear, from their formation, to be of volcanic origin. The southern part of this plain contains extensive tracts of the finest land for pasture and tillage. West of the river Hopkins (142° 45′ E. long) the land along the sea-shore, as far as Portland Bay, is generally poor, and that lying west of Portland Bay, though better, is only indifferent. But that portion of the plain which lies north of 38° S. lat. contains a large portion of good land. In some parts it is overgrown with thick forests of Eucalyptus trees, *Banksiæ*, *Casuarinæ*, and other trees peculiar to Australia; at other places it is covered with open forests and abundant grass. The numerous hills are thickly wooded, and the best soil is found at their bases.

Of the western division of the province, which, for its beauty and apparent fertility, was called by Sir Thomas Mitchell, who first explored it, Australia Felix, the best portion is that which lies within the hilly tract on both sides of the watershed. Nearly all the ridges by which this tract is overtopped run nearly at right angles to the watershed. The most western of these ridges rises to the elevation of mountains, and has been called the Grampians. Nearly in the centre of the Grampians stands Mount To-ol, or Mount William, which rises to 4500 feet above the sea-level. Mount Abrupt is 1700 feet, and Mount Sturgeon is 1071 feet, in height. The Grampians are surrounded with extensive forests of fine tall timber-trees of Eucalypti.

The country which is drained by the rivers originating in the southern and western portion of the Grampians appears to be the most fertile tract of New South Wales. It is abundantly watered by the Nangeela, or Glenelg, and its tributaries. The soil is black and rich, several feet deep, and rests on a subsoil of clay. The surface of the higher portion of this plain is strongly undulating, and on it are found many small sandhills.

The hilly tract of the watershed east of the Grampians has its surface diversified by numerous narrow ridges of rocks, several round hills of moderate elevation, and many rather narrow valleys traversed by clear and beautiful streams. In some parts the hills are covered with wood; at other places free from wood, but overgrown with grass to the top. About 30 miles east of the Grampians, some more elevated ridges traverse the watershed. They have been named Pyrenees, but the natives call them Peerick Hills. They consist wholly of granite, but are all grassy to their summits, and thinly wooded. East of the Pyrenees the country is more broken and the hills are higher. There are forests chiefly composed of box and lofty blue gum trees. A considerable portion of the hilly country, placed nearly in the centre of it, consists of hills of lava. A very large portion of this hilly country affords excellent pasture.

Between the hilly region of the watershed on the south, the mountain region of the Australian Alps on the south-east, the course of the Murray on the north, and the boundary line of South Australia on the west, lie the plains of the Murray River. The Murray and its tributary the Bayunga flow in wide bottoms, sometimes 8 or 10 miles across, which bottoms are overgrown by high trees, partly swampy or covered with lakes and ponds, but exhibiting an extraordinary degree of fertility in the vigour of their vegetation. In some places are found salt lakes in considerable numbers, but in general the plains are open, grassy, and beautifully diversified with serpentine lines or clumps of wood. Even at a considerable distance from the banks of the rivers water is not scarce, as there are numerous hollows in the plains, which generally contain water. The plains of the Murray are fit both for cultivation and rearing of cattle. The river Murray, rising in the Australian Alps, flows in a north-westerly direction along the boundary of the province, entering South Australia at 34° S. lat., after a course of above 600 miles. In the lower part of its course along the border it has a channel 350 yards broad, with a depth of from 12 to 20 feet. Its chief tributaries, which drain the northern division of the colony, are the Mitta-Mitta, Ovens, Goulburn, Campaspe, and Loddon, most of which are dried up during summer and converted into chains of ponds. The Mitta-Mitta rises in the Australian Alps, not far from Lake Omeo, the neighbourhood of which forms one of the gold-fields of Victoria. The Loddon rises near Mount Alexander, the principal gold-field, and its feeders, after the rainy season, are employed in the process of gold-washing. The Avoca, Avon, and Wimmera flow northward from the Pyrenees and Grampian chains. The Glenelg, collecting several tributaries from the western slopes of the Grampians, flows southward along the frontier, and enters South Australia just before reaching the ocean. The Hopkins, with its several affluents, waters the country south from the Pyrenees, reaching the ocean a little to the eastward of Port Fairy. The Barwon, after flowing in a north-easterly direction to the neighbourhood of Geelong, bends to the south-east, and falls into the sea near the entrance of Port Philip. The Yarra-Yarra, a considerable stream, which washes the capital, is subject to heavy floods during the rainy season. It comes in from the mountains to the east of Melbourne and continues in a very circuitous course to the head of Port Phillip. It is navigable to the city for small vessels and steamers of light draught. The Latrobe, rising in the Great Swamp, which is divided from Western Port by a belt of land a few miles broad, intersects the southern range of the Alps and flows eastward through Gippsland into Lake Wellington. Lake King collects the waters of the Tambo, the Riley, and the M'Arthur, which drain the northern district of Gippsland.

The predominating rocks in the higher masses of the Australian Alps are granite, sienite, and quartz, intermingled occasionally with mica-schists and various other rocks of a slaty texture. Quartz, ironstone, sandstone, and clay-slate are general throughout the other hilly portions of the colony. Veins of coal have been found on the coast between Port Phillip and Cape Otway, besides traces of lead and manganese. Rich veins of copper ore have been met with on the banks of the Yarra-Yarra. The chief mineral however is gold, the discovery of which in 1851 has led to a remarkable increase in the wealth and population of the colony. The gold is found chiefly at Ballarat, 40 miles N.N.W. from Geelong; at Mount Alexander, 75 miles N.W. from Melbourne; and around Lake Omeo, in the Australian Alps. At Ballarat, where the precious metal is found extensively on the ranges and flats and in the beds of the watercourses, a section of the workings exhibits the following series of strata:—Red ferruginous earth and gravel, streaked yellowish and red-clay, quartz gravels of moderate size, large quartz pebbles and boulders with masses of ironstone set in very compact clay, blue- and white-clay and pipe-clay. The gold is uniformly found in the formations superior in position to the pipe-clay. The richest deposits occur in the blue-clay, where the ore is for the most part quite pure. It is washed from the clay in rounded or flattened grains; sometimes it is found in fused pieces of pure metal, at others incorporated with quartz-pebbles, and occasionally in rolled water-worn lumps called nuggets. The quantity found has been enormous. The rush of emigrants and others to the diggings was at first productive of some inequalities and much suffering; but the judicious establishment of a mounted police, and the imposition of a small tax for a licence to dig, reduced the system to great regularity in a short time. The amount of gold exported in 1855 was valued at 10,302,980*l*. In the early part of 1855 serious riots took place at the gold-diggings of Ballarat, in consequence of the miners resisting the payment of the licence fees. This led to the substitution of a tax on gold exported from the colony, instead of the licence fee for diggers.

The climate of Victoria is comparatively mild. The mean temperature of summer is 65°, of winter 48°, of the whole year 57. The atmosphere is so dry and elastic that the heat of summer, sometimes very intense, is less oppressively felt. Hot winds occasionally come from the north, and last from 20 to 30 hours, suddenly raising the temperature to an extreme heat, but they do not occasion great inconvenience, and they are generally succeeded by a refreshing breeze from the ocean. During June, July, and August, the winter months, cold and wet days frequently occur, and at rare intervals light snow showers fall. In August, 1852, snow fell at Bendigo to the depth of seven feet. The average fall of rain for the year is 30·7 inches. The rapid changes of temperature, sometimes 30 degrees in 24 hours, are unfavourable to consumptive patients. Dysentery and a species of ophthalmia prevail to some extent in the hottest months. On the whole, the climate is found agreeable and salubrious. The wild animals found in the province are, the dingo, or native dog; the great gray kangaroo, which abounds in some districts; the rock wallaby, or badger; kangaroo rat; opossum; flying squirrel; wild cat; bandicoot; sloth, or Australian bear; and various others. Among its birds are, the bustard, or wild turkey, which on some of the plains appear in considerable flocks; numerous quails; many species of parrots; the lyre-bird, or Australian pheasant, which frequents the mountains of Gippsland; black swans, which abound in the neighbourhood of Western Port; the emu; magpie; pelican; eagle-kingfisher; and plover. Snakes are numerous. Musquitoes, locusts, and ants appear in great numbers in summer, and also lizards and other reptiles. The bays and rivers abound with fish. Codfish of a large size are found in the rivers of the northern district. Shoals of herring appear on the coasts in February and March. The most important timber-trees are, the red-gum, lightwood, blackwood, pine, tea-tree, she-oak or siak, honey-suckle, and iron-bark. The kangaroo apple-tree, the grass-tree, and the quandung, which forms a fine preserve, are indigenous. The fruits which have been successfully cultivated are, the peach, plum, quince, nectarine, apricot, pear, apple, mulberry, almond, and fig. Several vineyards have been formed. Vegetables are abundant. The potato, turnip, carrot, cabbage, brocoli, and radish, grow to an enormous size. Indigo and flax are indigenous. The tobacco and castor-oil plants and Indian corn grow luxuriantly. The common cereals are produced in great perfection; wheat is of the finest quality, with a return of from 40 to 50 bushels an acre.

The country around Melbourne is equal to any part of Australia for the growth of wheat, Indian corn, and potatoes. In all parts of the colony there are tracts of the finest arable land. But sheep-farming is the principal pursuit in the province, apart from the recent mining operations, and the export of wool has for some years very rapidly increased.

The settled part of the province, comprehending principally the eastern and southern portions, is divided into 24 counties. *Melbourne*, the capital of the colony, is described under MELBOURNE, *S.* 2; but we may add here that in 1854 the receipts were 654,664*l*., of which a great part was raised by loan; and the expenditure was 569,772*l*., of which 291,500*l*. were expended on public works in the city. There are 8 daily newspapers, 8 bi-weekly, 3 tri-weekly, and 21 weekly newspapers published in the colony, the greater number of them in Melbourne. Most of them are of a large size, extremely well printed, and some of them edited with great ability.

The second town in the colony is *Geelong*, now an important shipping port, pleasantly situated on the south-western shore of Port Phillip, at the head of Coria or Geelong Bay. It is regularly built, well supplied with water, and is steadily advancing in population and trade. Smaller vessels ascend to the town, but those of greater burden discharge at Port Henry, 10 miles down the bay. The increase of the town of Geelong consequent on the gold discoveries is shown by the town revenue in 1851, 1852, and 1854, which stood thus: 1851—2785*l*. 4*s*. 1*d*.; 1852—10,697*l*. 16*s*. 1*d*.; 1854—241,570*l*. The principal part of the receipts has been laid out in public improvements, a large amount of which has been borrowed by the corporation of Geelong for the purpose of carrying out extensive improvements. A railway to Melbourne has been constructed. Near the mouth of the Yarra, on the north-east shore of Port Phillip, are the neat villages of St. Kilda and Brighton, which are resorted to as bathing places by the citizens of Melbourne.

The town of *Portland* is built near the western extremity of the bay of the same name. It has a small population, but occupies a considerable space, being built in streets crossing each other at right angles. There are some whaling establishments in the place, and the wool and other produce of the neighbouring districts are shipped at the harbour, which is inconvenient and exposed. *Belfast*, an active and thriving town, is situated on Port Fairy, some miles east from Portland Bay. It is famed for its butter and cheese, and lies amid some of the best tillage-land in the western division of the province. *Warrnambool*, near Belfast, is a small seaport, having frequent intercourse by trading vessels with Melbourne and Portland. It is the port of a considerable agricultural district. A Presbyterian church, built of stone, replacing a wooden structure, was opened here in the early part of 1855. *Ballarat*, the seat of the gold-diggings of that name, is described by Mr. William Howitt, who visited the place, as containing a large population, who are settling down into regular habits and are constructing a neat, well-laid out, and commodious town.

The principal towns in Victoria colony, in addition to those already mentioned, are:—Alberton, Avoca, Ballan, Beechworth, Benalla, Bendigo, Brunswick, Buninyong, Castlemaine, Chepstow, Colac, Flemington, Kilmore, Kyneton, Mount Alexander, Port Fairy, Prahran, Richmond, Sandhurst, and Wangaratta. Bradshaw's 'Monthly Guide to Victoria' for Feb. 1858, gives the number of post towns as 147.

By an Act of the Legislative Council of Victoria, ratified by the Act of the Imperial Legislature, 18 & 19 Vict., cap. 55, it is provided that there shall be a Legislative Council of 30 members, and a Legislative Assembly of 60 members, for the colony. Members of Council must be 30 years of age, natural born subjects of the Queen, and possessors for at least one year previous to election of lands and tenements in the colony of the value of 5000*l.*, or of the annual value of 500*l.* No judge, minister, traitor, or convicted felon, can be a member. Electors must be 21 years of age, natural born subjects, or naturalised for at least three years, and possessed of freehold property of the clear value of 1000*l.*, or clear annual value of 100*l.*, or leasehold property of 100*l.* yearly. Members of Assembly must be 21 years of age, possessing freehold property to the amount of 2000*l.*, or 200*l.* yearly value. Judges, ministers of religion, and persons who have been attainted for treason, or convicted of felony, are excluded. Electors must be 21 years of age, possessed of freehold property of 50*l.* value, or 5*l.* yearly value, or leasehold property of the clear annual value of 10*l.*, or occupy premises of 10*l.* yearly rent, or have a yearly salary of 100*l.* After the expiration of two years from the passing of the Act no person is to be registered as an elector who cannot read and write. The leading feature of the new charters for Victoria and the other Australian colonies is that, with the exception of a few reserved points in reference to imperial rights, the business of each colony will be managed by its own legislature. In particular the management of the waste lands is committed to the colonial legislature.

The imperial authority is represented by a lieutenant-governor, whose salary is 10,000*l.* per annum, with an allowance of 5000*l.* per annum for salaries of staff, repairs to government-house, travelling, and other expenses. The laws are administered by a chief justice and three puisne judges, who have criminal jurisdiction, and exercise the powers of the Queen's Bench, Common Pleas, and Exchequer courts. There is also a master in equity. Under the new Act, 50,000*l.* a year was to be reserved for the purposes of religious worship, to be distributed in proportion to the respective numbers of the several religious denominations. This sum was to be laid out in assisting to erect places of worship and in payments to ministers, but by a subsequent vote of the Legislative Assembly, this arrangement is to cease at the end of 1858. The religious bodies in the colony are—the Churches of England and Scotland, the Free Church of Scotland, United Presbyterians, Independents, Baptists, Methodists, and Roman Catholics. At the head of the Church of England in the province is the Bishop of Melbourne. At the close of 1852 there were 7841 scholars attending schools in the colony. The colonial revenue in 1851 was 379,824*l.* 12*s.* 4*d.*; in 1852 it was 1,577,181*l.* 8*s.* 1*d.*: the expenditure in 1851 was 409,884*l.* 1*s.* 5*d.*; in 1852 it was 734,961*l.* 18*s.* 2*d.* The estimated income for 1855 was 3,015,683*l.*, and the estimated expenditure 4,801,292*l.*, showing a deficit of 1,785,609*l.*, to provide for which a considerable amount of difficulty was experienced by the government. The estimate for the income, however, was exceeded by more than 100,000*l.*, and the revenue, though in the year showing a considerable decrease in the customs' duty, gave a large increase in the item of land sales, of 12,000*l.* on postage, and in several other branches.

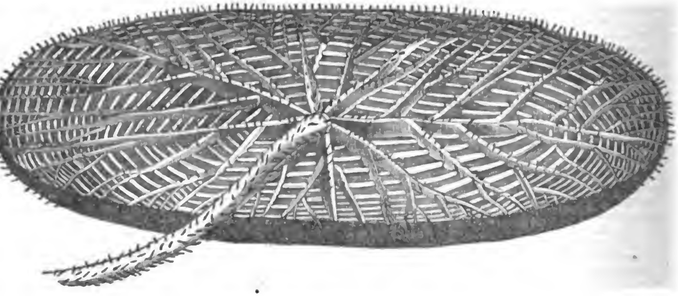
The number of ships entered at the ports of the colony in 1851 was 712, of 129,426 tons; the number in 1852 was 1657, of 408,216 tons. The number of ships registered as belonging to the colony on December 31st 1854 was 272 of 31,985 tons, and 12 steam-vessels of 29,395 tons. The value of the goods imported into the colony in 1851 amounted to 1,422,909*l.*; in 1852 the amount was 7,451,549*l.* From Great Britain alone there was sent to the colony in 1853 goods to the (declared) value of 7,062,387*l.* of British produce and manufactures, besides upwards of 2,200,000*l.* worth of foreign and colonial produce and manufactures. About 21,000,000 lbs. of wool was imported into Great Britain from Victoria colony in 1853. In 1854 the imports had risen to 17,659,051*l.*, but sunk to 12,007,939*l.* in 1855; while the exports had risen in the two years from 11,777,204*l.* to 13,493,338*l.* The imports again decreased in 1856 and 1857.

Port Phillip was discovered and entered by Lieutenant John Murray in January 1802, and was soon after visited by Captain Flinders, who called it Port Phillip, in honour of the first governor of New South Wales. Although occasionally visited in succeeding years, it remained without any settlement till 1835, when the first sales of land took place in the Australian colonies. A settler from Van Diemen's Land having purchased an extensive tract of country from the natives, the government refused to recognise the validity of the purchase, and the entire district adjoining Port Phillip was taken possession of on behalf of the crown. Colonists from Van Diemen's Land, bringing their flocks with them, arrived in great numbers. The New South Wales squatters, with their flocks and herds, came from the north. The district rapidly advanced in population and wealth, and was placed under the control of a superintendent appointed by the governor of New South Wales, till, after repeated representations on the subject, it was, in 1850, separated from that colony, and constituted a distinct province. The bishopric of Melbourne was founded in 1847; the diocese comprises the colony of Victoria. There is one archdeacon, of Geelong.

VICTORIA. [HONG KONG, *S.* 1.]

VICTORIA REGIA, a species of the natural order *Nymphæaceæ.* [NYMPHÆACEÆ.] This splendid plant, in the dimensions of its leaves, their varied tints, the colour, size, and fragrance of its flowers, may deservedly be called the queen of flowers. The following is the account of its discovery by Sir Robert Schomburgk:—"It was on the 1st of January 1837, while contending with the difficulties nature opposed in different forms to our progress up the river Berbice, that we arrived at a point where the river expanded and formed a currentless basin. Some object on the southern extremity of this basin attracted my attention; it was impossible to form any idea what it could be, and, animating the crew to increase the rate of their paddling, we were shortly afterwards opposite the object that had raised my curiosity—a vegetable wonder. All calamities were forgotten; I felt as a botanist, and felt myself rewarded;—a gigantic leaf, from five to six feet in diameter, salver-shaped, with a broad rim, of a light green above and a vivid crimson below, resting on the water. Quite in character with the wonderful leaf was the luxuriant flower, consisting of many hundred petals, passing in alternate tints from pure white to rose and pink. The smooth water was covered with the blossoms, and as I rowed from one to the other I always observed something new to admire." The leaves are very large, measuring five or six feet in diameter. They have an orbicular form, the upper surface is bright green, and they are furnished with a rim round the margin from 3 to 5 inches in height; on the inside the rim has a green colour, and on the outside, like the under surface of the leaf, it is of a bright crimson; they have prominent ribs, which project an inch high, radiating from a common centre; these are crossed by a membrane, giving the whole the appearance of a spider's web; the whole leaf is beset with prickles, and when young is convolute. The stock of the flower is an inch thick, and studded with prickles. The calyx is 4-leaved, each sepal is 7 inches in length and 4 inches broad; the corolla covers the calyx with hundreds of petals; when first opened it is of a white colour, but subsequently changes to pink. It is very fragrant. Like all other water-lilies, its petals and stamens pass into each other, a petal often being found surmounted with half an anther. The seeds are numerous, and imbedded in a spongy substance. This plant has by some botanists been placed in the genus *Euryale*, whilst Lindley thinks it is nearer *Nymphæa*, from which it differs in the sepals and petals being distinct, the papilla of the stigma being prolonged into a horn, and the changing colour of its petals.

This splendid plant has now been successfully cultivated in many of the hot-houses of this country. Beautiful specimens are to be seen in the Royal Gardens at Kew, where it first flowered in September 1849, and at the Crystal Palace, Sydenham.



Leaf of the Victoria Water-Lily (*Victoria Regia*).

VIDOCQ, FRANÇOIS-JULES, the chief of the detective brigade (Brigade de Sûreté), at the prefecture of the Paris police, established in 1812, whatever must be thought of his early life as a thief and inmate of the convict yards, undoubtedly did real service to France, by his active pursuit of the marauders who levy contributions on their neighbours' goods. He was born at Arras, the chief town in the department of the Pas de Calais on the 23rd of July 1775. His father was a baker, and was chosen to supply the local government, during the revolution, with bread, flour, &c. Young François was employed in the business before he was thirteen; but formed acquaintances who led him to purloin his father's money by means of several artful contrivances. These being detected, the boy began to pilfer the stock, spending the proceeds with his companions at a neighbouring wine shop. A watch was at length set over him; which did not prevent his stealing ten silver forks and spoons, and pledging them. For this offence his father gave him in charge, when he was sent to the House of Correction for a few days. While in confinement he was incited by a young fellow-prisoner to rob his father again, by picking the lock of the till, and taking out the whole contents, amounting to 80*l*. Having divided this money with his accomplice, he left Arras, intending to sail for the United States; but the high price of the passage made him change his mind; and being at Ostend a few days after, he was plundered by a sharper of all his ill-gotten gains.

In this state of destitution, he hired himself to an itinerant showman, who kept a small ménagerie. His allotted task consisted at first in sweeping out the cage and the reception room. His master, after promoting him to the rank of tumbler and acrobat, wanted him to play the part of a savage who eats raw flesh and drinks blood. The wretched boy refused to undertake this new character, and was discharged. He next took service with the master of a puppet show; from whom he passed into the hands of a peregrinating quack-doctor. At length weary of this hard probation of vagrant life, which had lasted two years, the seeming penitent returned home, and a kind old priest prevailed on his father to forgive him and receive him. This was in 1791, in his sixteenth year.

But he was too idle and restless for regular work; so he enlisted (after one or two escapades), in the regiment of Bourbon, and set out for Belgium, then the seat of the new war, between France and Austria. He was present in several actions, and was made a corporal; but, having quarrelled with his drum-major, and challenged him to fight, he deserted to avoid a court martial. He then enlisted in the 11th chasseurs, and fought at the battle of Jenappes, November 6, 1792. Having distinguished himself at the capture of Longivy, under Kellermann, October 20, 1792, and being of unusual stature for his age, he was made a corporal of grenadiers. A day or two after he was recognised as a deserter, when he made his escape to the Austrian outposts. Unwilling however to fight against his own countrymen, he counterfeited illness, and began to teach fencing.

After a short stay with the Austrians, he got back to France, entered the 14th regiment, and then returned to the 11th, being present at several actions, and being wounded three times. One of his wounds obliged him to return to Arras, where in consequence of a quarrel he was denounced to the Revolutionary Tribunal as a 'Modéré,' and thrown into prison. However he was soon after released, owing to the good offices of Mademoiselle Chevalier, the daughter of the notorious Joseph Lebon. He married her in 1793, but they separated almost immediately. The next year he went to Brussels, became a professed gambler, made love to a countess under a feigned name, and repenting of his treachery or fearing punishment for bigamy, just as he was about being married to her, confessed the imposture, was rewarded with a considerable sum of money, and took the diligence for Paris, which he entered for the first time in 1796, at the age of twenty-one.

He had not been in the capital many weeks, before the dangerous society of gamblers, swindlers, and loose women, left him once more penniless; which compelled him to return to the army of the north. Several fresh instances of folly, three imprisonments, and as many escapes, succeeded; after this he was confined in the prison of Douai, where he remained eight months. During his confinement, he was mixed up in a case of forgery, which in his autobiography he tries to explain as an act of inadvertence, rather than of guilt. For this however he was tried, convicted, and sentenced to eight years' penal servitude at the galleys. As they conducted him, bound to the chain, he excited a revolt among the convicts, but the attempt to escape having failed, he reached Brest, and remained six years at the bagne. In this place he completed his studies of the manners, the crafts, the habits, of every class of thief. Two years before the expiration of his penalty, he contrived to escape from the convict-yard, assumed the name of Duval, and returned to his own neighbourhood, where he became an usher to a school at Ambricourt, near Lille. He was soon re-captured, and sent to Toulon. From this convict-yard, he then made what he calls "his finest escape." After this he joined a band of freebooters in the south, who plundered the stage-coaches on the highroads. But these malefactors having detected the brand of the convict on his shoulder, dismissed him from their company, having first made him swear not to betray them. He resolved to be revenged; and this incident became the turning-point in his fortune.

As he was making for the north, Vidocq, having no passport, was arrested and taken before a magistrate, to whom he offered to give such intelligence as would enable him to surprise his late comrades in the act of plunder. For this purpose, he applied for a temporary release. But the magistrate demurred. "Suppose, on my way to prison," said Vidocq, "I get away from my keepers, come back to you, and resume my bondage, will you then grant me the provisional freedom I now solicit?"—"Yes," replied the judge. He escaped, and made good his offers to assist justice. This service was followed by others far more considerable. These events took place in 1804, but he continued for several years the slave of his antecedents. In 1806 he went to Paris again, where he maintained himself by following the handicrafts which he had learned during the course of his nomadic life. He became a toy manufacturer, a dealer in hardware, and a tailor; but other thieves, who had known him in prison, and who were well acquainted with his embarrassments, left him no peace: sometimes they wanted money, at others they proposed a good bargain; next it was some plunder to be hid. On one occasion they borrowed his cart, to convey the body of a murdered victim to a place of safety. His state in the end became intolerable.

In 1809, driven to extremity, Vidocq presented himself before M. Henri, the commissioner of the secret police of Paris, acknowledged his critical condition, and offered to give valuable information in case he might be allowed to come and go freely. This proposal was not accepted until his solicitations had been several times renewed, in the midst of which he was once more arrested. On this occasion he was sent to Bicêtre, when M. Henri, interested by his perseverance, and struck with the pointed nature of his proposals, which he continued to make by correspondence, at last consulted the Minister of Police, Pasquier, who returned a favourable answer, in which Vidocq was instructed to furnish information. His revelations then became so numerous and so important, that his liberty was granted him not long after.

The qualities he displayed in his new functions soon attracted attention. Few detective officers ever possessed so much presence of mind, keen intelligence, bodily strength, courage, and diligence; besides that fluency of slang and banter, which is the eloquence of the vulgar. He made it a point, from the outset of his new vocation, to produce at once the culprit and the proofs of his crime. The receivers of stolen goods found in him a more relentless enemy than the thief. At first he held but a humble employment under the regular police officers; but in 1813 he was withdrawn from their control, and placed under the order of M. Henri alone. His captures were extraordinary. The famous thief Delzève, and Folard, the robber who afterwards stole the medals of the Royal Library, were surprised at their work, and handed over by this secret agent to justice. La Courtelle, a sort of St. Giles's, infested with the worst vagabonds, was purged; the great burglar, Desnoyers, and thirty-two of his accomplices, were taken. About the same time, the famous brigade of detective police (Brigade de Sûreté), directed by Vidocq, was formed, consisting at first only of four men; in 1817 the number rose to twelve; and in 1824, when its complement was full, it contained twenty-eight detectives. "It was with this limited force," says Vidocq, "that I had to watch and look after 1200 returned transports, and issue every year from four to five hundred writs." In the single year 1817, he effected 772 arrests, and 39 seizures of stolen goods. His useful brigade cost but 2000*l.* a year, of which he enjoyed a salary of 200*l.* During the whole term of his official employment, he was the butt of continual charges, suspicions, and open accusations. He was said to take part in every crime, to incite robberies for the sake of arresting his dupes, and to have a share in all the plunder. This obloquy rose so high as at length to alarm the government, and in 1825 he was superseded in his functions by Lacour, whose antecedents resembled his own. In 1826 he established a paper manufactory at Saint-Mandé; and in 1827 he wrote his autobiography, which was published in Paris, by the bookseller Tenon, in 1829, in 4 vols. In 1831-32 he was employed to detect some of the political agitators of the day, but his vocation was not either permanent or precise. Then, in 1834, he set up an office for information on behalf of Trade and Commerce, the object being to enable the fair trader, when applied to for credit, to ascertain the degree of trust to which his new customer was entitled. In 1844, stimulated by the success of Eugène Sue's 'Mysteries' at Paris, and certain works of the same questionable character, which had appeared in London, he republished his Mémoires, under the title of 'Les Vrais Mystères de Paris.' The morbid taste for notoriety of any kind which then seemed to exist, induced Vidocq to visit London, and exhibit himself, with many curious articles used by French burglars, in the rooms of the Cosmorama in Regent Street. But this speculation did not answer his expectations. Soon after he fixed himself in Belgium, where he died in 1850.

VILLARSITE. [MINERALOGY, *S.* 1.]

VINET, ALEXANDRE-RODOLPHE, was born at Lausanne on the 17th of June 1797. His father, who held an official appointment in his native canton, a man of superior attainments, but a somewhat stern disciplinarian, was himself Alexandre's earliest instructor. While still a youth, his studies were chiefly directed to theology, he having been devoted to the service of the church; but then, as throughout life, literature possessed for him a predominant attraction, and so diligently had he laboured in this field, that at the age of twenty he was appointed professor of the French language and literature at the gymnasium of Basel. Two years later, 1819, he was ordained at Lausanne a minister of the protestant church, and the same year he married; but he continued to reside at Basel, where he, during the ensuing years, took an active and prominent part in the great religious movement or 'revival' which occurred amongst the Swiss protestant churches. Besides various pamphlets which he put forth in connection with this movement and with the proceedings of those who were opposed to it, he published in 1826 an elaborate 'Mémoire en faveur de la Liberté des Cultes,' and he gradually came to be regarded as one of the leaders of the evangelical party.

M. Vinet remained at Basel till 1837 diligently fulfilling his scholastic duties as professor of French literature and eloquence, the latter chair having been created for him in 1835, and in 1829 he published, as a text-book for his class, his 'Chrestomathie Française,' a work of great taste and knowledge, which, in the later editions, consists of 3 volumes: 1, 'Littérature de l'Enfance,' 2, 'De l'Adolescence,' 3, 'De la Jeunesse et de l'Age Mûr,' and including a rapid but admirable survey of French literature. In 1831 the literary journal 'Semeur' was commenced, and for several years M. Vinet was one of its chief contributors; and in 1837 he published a selection of his essays contributed to it, with other miscellanies, under the title of 'Essais de Philosophie Morale.' In 1837 Vinet was invited by the authorities to take the chair of practical theology in the academy of his native city of Lausanne, and, with some regret at leaving Basel, he accepted the invitation. The religious discussions in the canton had decided the government to appoint a commission of the four classes of clergy to draw up a new constitution of the church, and M. Vinet was chosen a delegate for the class of Lausanne and Vévay. He took a part in all the protracted discussions which followed, but he could not bring himself to acquiesce in the decisions of the majority, and, accordingly, upon the promulgation of the new constitution which was to come into operation in 1841, he, at the end of 1840, formally seceded from the national church, and resigned his professorship of theology. His opinions had in fact from the publication of his 'Mémoire en faveur de la Liberté des Cultes' in 1826, been approximating more and more closely towards 'voluntaryism,' and from this time he became a decided, and, among French Protestants, perhaps the most distinguished advocate of the entire separation of church and state. His matured views on this subject he gave to the world in 1842 in an 'Essai sur la Manifestation des Convictions religieuses, et sur la Séparation de l'Église et de l'État, envisagée comme conséquence nécessaire et comme garantie du principe,' a work which was translated into English in 1843 under the title of 'An Essay on the Profession of Personal Religious Conviction, and upon the Separation of Church and State, considered with reference to the Fulfilment of that Duty.' But Vinet was far from being the harsh or bigoted advocate of extreme opinions. Whilst firmly adhering to his own views, he exhorted to a wide tolerance of the honest convictions of others, and his later years were spent in preaching peace and brotherly love, and seeking by the amenities of literature to soften the asperities of theological controversy.

His last labour was the elaboration of a constitution for the Free Church of the canton of Vaud, formed by the ministers who seceded from the establishment in 1845, and which he induced the committee appointed by the Church in 1846 to prepare the constitution, to adopt in its integrity. With the Synod however, in which the ultimate adoption of the constitution was vested, he was less successful, and the material alterations there introduced, are said to have preyed severely on his frame, already enfeebled by protracted ill-health. He continued however with increased diligence his professional duties and literary studies till his powers gave way: he died on the 10th of May, 1847.

A list of the chief works, not already mentioned, of M. Vinet, will sufficiently indicate the character of his mind and the range of his pursuits. Among his theological works may be named his 'Discours sur quelques sujets religieux' (1831, of which a fourth edition appeared in 1845), and 'Nouveaux Discours,' &c. (1841), from which two works selections have been translated into English and published in America and Edinburgh under the title of 'Vital Christianity;' and the posthumous publications 'Théologie Pastorale,' and 'Homilétique ou Théorie de la Prédication,' of both of which English versions have appeared; 'Liberté religieuse et Questions ecclésiastiques:' 'Études sur Blaise Pascal;' 'Études Evangéliques,' and 'Nouvelles Études Evangéliques,' which have been rendered into English as 'Gospel Studies.' His two chief literary works are his 'Histoire de la Littérature Française au XVIIIe Siècle,' 2 vols., which appeared in an English version in 1854, and 'Études sur la Littérature Française du XIXe Siècle,' 3 vols. 8vo: 1, 'De Staël et Châteaubriand;' 2, 'Poëtes Lyriques et Dramatiques;' 3, 'Poëtes et Prosateurs.' All these works are accurate reflections of the mind and character of the author. Pure in sentiment, elegant and finished in style; clear, eloquent, brilliant rather than profound in thought; and everywhere pervaded by an earnest and conscientious spirit, they are works which will be read with pleasure and respect even by those who differ widely from their opinions. As a preacher, M. Vinet bore a high character for eloquence and earnestness; and as a teacher, he greatly increased the reputation of the schools of Basel and Lausanne, while his personal character was in every way admirable.

(E. Scherer, *Alexandre Vinet—Notice sur sa Vie et ses Écrits*, Paris, 1853; and an excellent essay on the *Life and Writings of Vinet*, in No. 42 of the 'North British Review,' Aug. 1854.)

VIOLET. [Viola.]

VIPER'S GRASS. [Scorzonera, *S.* 2.]

VISCONTI, LOUIS JOACHIM, son of Ennio Quirino Visconti, was born at Rome in 1797. His father was compelled at the close of 1799 [Visconti, E. Q.] to remove with his family to Paris, and there the young Visconti was carefully educated. Having selected architecture as his profession, his father, as soon as he was of sufficient age, placed him with the architect Percier [Percier, Charles, *S.* 1], so well known by his works on the Louvre, a building with which the name of the pupil was to become still more intimately associated. Under Percier, Visconti made a distinguished progress, carrying off at the Architectural School five medals, and a second prize for the plan of a library. Shortly after the termination of his pupilage, he obtained an appointment as inspector of public buildings; and subsequently that of architect and surveyor of the third and eighth arrondissements of Paris, an office he held for above a quarter of a century. He was further, in 1825, appointed architect of the Bibliothèque Royale, and he is said to have made no less than twenty-nine plans and elevations in the hope of being directed to give to that building an architectural character equal to the grandeur of its contents, but his ambition was not gratified. Although not called upon to construct any important edifice, M. Visconti found ample employment in connection with the offices he held; and to him was entrusted some of the public monuments with which Paris has of late years been adorned. Several of the finest fountains in Paris, including those of St. Sulpice, the Place Louvois, Gaillon, and Molière, were executed from his designs. The tomb of Napoleon I. is also by him, and is his grandest work of the kind, but he also designed the monuments of Marshals Soult, St. Cyr, Suchet, Lauriston, and those of some other generals and eminent men. He was likewise called upon to design innumerable triumphal arches and other temporary structures for fêtes and occasions of public rejoicings and ceremonies, and his taste and fertility of invention were generally admired. He also designed several hotels and private residences. But the work with which his name will be most permanently connected is, perhaps, the completion of the Louvre, and its connection with the Tuileries. The Emperor Napoleon III. having decided on completing this the favourite project of the first Napoleon, M. Visconti was directed to prepare the necessary plans, and these having met with the emperor's approval, the first stone of the new works was laid on the 25th of July 1852. The operations were pressed forward with the greatest vigour, but Visconti did not live to see this his greatest work completed. He died on the 29th of December, 1853, having been struck with apoplexy, which is said to have been brought on, or hastened, by over-exertion and anxiety. Visconti's plans were carried out to completion under the superintendence of M. Lefuel, who was appointed to succeed him, and on the 14th of August, 1857, the vast undertaking was declared finished, and the junction of the Louvre and the Tuileries was inaugurated with great pomp by the Emperor. Of course in such a work, the new buildings having to be rendered uniform in their elevation with those already existing, there was little room for originality, but it is admitted that Visconti has overcome the difficulties arising from the peculiarities of site, &c., in a very masterly manner, and that he has by his additions,—which while harmonising with the older portions, are more ornate and sumptuous in style,—rendered it one of the most magnificent royal residences in Europe.

VITALITY, a term equivalent to that of Life, and applied to the functions performed by living bodies, that is, plants and animals. Linnæus defined the three kingdoms of nature as follows:—Minerals grow; Plants grow and live; Animals grow, live, and feel. Here the fact of living is made to distinguish between minerals and plants, and the inquiry is naturally made for a definition of life. It is often assumed to be a set of actions under the controlling influence of a vital principle, but, as such a principle has never been demonstrated, it must only be regarded as an assumed cause. Some writers have supposed that all the phenomena of life may be resolved into the action of chemical and physical forces acting upon special forms of matter, and that in plants and animals are presented the results of chemical and physical activity in forms in which it does not exist amongst minerals. Coleridge, in his 'Idea of Life,' contends that the collective activities of the material universe is as much a life, and its parts as much entitled to be regarded as living, as a plant in its special organs.

Setting aside however the idea of a vital principle, or confining this term to the force which regulates and produces the specific form in each individual animal or plant, and which is then applicable as well to minerals, there are a certain set of phenomena in plants and animals to which the term 'vital' seems especially applicable. This term may be thus applied without in any manner assuming the existence of any force independent of those which are known to influence all matter upon the surface of the earth.

Thus, the growth and reproduction of cells may be regarded as a vital process; also the contractibility of the muscular tissue, and the sensibility of the nervous tissue. These processes are called collectively Vital Processes. The force by which cells grow has been called the Organising Force, the Plastic Force, the Assimilative Property, and the Metabolic Property. The contractibility of the muscles has been properly called Muscle-Force, whilst the sensibility of the nerves has been called Nerve-Force.

That these forces are dependent on physical forces is seen in the fact that plant-cells will not grow without light. Muscle-force and nerve-force are not producible but by the assimilation of materials that have been formed by chemical actions produced by heat and light.

The natural philosopher has demonstrated that electricity, galvanism, and magnetism, are different manifestations of the same force. He has rendered it probable that motion, heat, light, and chemical affinity, are also convertible forces. The physiologist has followed this train of thought, and rendered it probable that, with regard to muscle-force and nerve-force, they are but differentiations or other manifestations of the physical forces. Muscle-force and nerve-force depend upon the destruction (chemical change) of cells which are formed out of materials (protein) which have been formed by the influence of heat and light upon the carbonic acid and ammonia supplied to the cell of the plant. A certain amount of protein is the expression of a certain amount of chemical change, and this again in decomposition is the expression or the amount of vital force, which a part composed of protein will exhibit. Vital phenomena are found to be but the expressions of chemical and physical change, and result in one or other of the physical forces. This view of the nature of vitality does not lead to materialism, as the consciousness of man exists independently of the physical changes which go on in his body, and the character of his mind is formed in virtue of its retaining impressions from the ever-active changes which go on in his body through the agency of the vital forces. [MUSCLE; NERVE and NERVOUS SYSTEM; MOTIONS OF PLANTS; VEGETABLES, VEGETABLE KINGDOM; CELLS, *S.* 2.]

(Matteucci, *Electro-Physiological Researches*, in *Philosophical Transactions;* Matteucci, *On the Physical Phenomena of Living Beings;* Grove, *On the Correlation of the Physical Forces;* Reynolds, *Objects and Scientific Position of Physiology; British and Foreign Medical Review,* vol. xxx.)

VIVIANACEÆ, *Vivianads*, a natural order of Exogenous Plants with free stamens, no disc, albuminous seeds, a curved embryo, permanent petals, and a ribbed calyx. The species are herbaceous or half-shrubby plants, with opposite or whorled leaves, without stipules. They are related to *Tiliaceæ* and *Tropæolaceæ*. All the species inhabit Chili and South Brazil. There are 4 genera and 15 species.

VOGEL, DR. EDUARD, was born March 7, 1829, at Leipzig, where his father, Dr. Carl Vogel, was master of one of the principal schools. He was educated at Leipzig, and afterwards studied astronomy at Berlin under Professor Encke. He resided in London about two years at Mr. Bishop's Observatory, Regent's Park. It having been deemed expedient to send out another person to assist Drs. Barth and Overweg in making their scientific observations in Central Africa [AFRICA, *S.* 2; OVERWEG, *S.* 2], a suitable person was found in Dr. Vogel, who volunteered his services with enthusiasm. He left London accompanied by two volunteers from the corps of Sappers and Miners, in February 1853. Dr. Vogel was provided with astronomical, magnetical, and other instruments suitable for his own purposes, and also to supply the place of those of the other two travellers which might have been injured or lost in their journeys. Dr. Vogel and his companions reached Mourzuk, in Fezzan, August 8, 1853, and remained there till the middle of October. They accomplished successfully their journey across the Great Desert, and reached Lake Tchad on the 6th of January 1854. A revolution had taken place at Kuka, and there was a new sultan and also a new vizir, by whom however Dr. Vogel was received kindly. Dr. Vogel continued his explorations in Central Africa after the return of Dr. Barth to Europe. He visited Yacoba, and on the 30th of April 1855 crossed the Chadda at the same place where the Pleiad steamer, under the command of Dr. Baikie, had anchored the previous year. In the early part of 1857 a despatch received by the British government enclosed a copy of a letter from Corporal Maguire to the British consul at Tripoli, dated Kuka, November, 1856, which announced the reported assassination of Dr. Vogel in the kingdom of Wadai. Corporal Maguire was one of the two volunteers from the corps of Sappers and Miners, who accompanied Dr. Vogel to Central Africa, and he then stated that he was coming home with the observations and instruments. A paragraph in 'The Times' newspaper, of the date of August 21, 1857, stated that "the official confirmation of the murder of Dr. Vogel, at Wara, the capital of Wadai, has just been received. He was beheaded by order of the Sultan. Corporal Maguire was murdered by a party of Tuaricks some six miles to the north of Kuka." The other engineer had previously returned to London.

VOLBORTHITE. [MINERALOGY, *S.* 1.]

VOLTAITE. [MINERALOGY, *S.* 1.]

VOLVOX, a genus of organic beings referred by Ehrenberg to his family of *Infusoria*. Siebold was the first to doubt the correctness of Ehrenberg's classification, and the result has been that through the subsequent researches of Williamson, Busk, and Cohn, the species of *Volvox* are now regarded as forms of the vegetable kingdom.

Ehrenberg describes three species of *Volvox: V. globator*, *V. aureus*, and *V. stellatus*. A fourth form is described by Ehrenberg under the name of *Sphærosira Volvox*.

The following is Mr. Busk's account of these forms of *Volvox:—*

"The more common and best known form of *Volvox globator*, to the naked eye, or under a low power, appears as a transparent sphere, the surface of which is studded with numerous regularly placed green granules or particles, and which contains in the interior several green globules, of various sizes in different individuals, though nearly always of uniform size in one and the same parent globe.

"These internal globes, which are the young or embryo *Volvox*, at first adhere to the wall of the parent cell, although the precise mode of connection is not very apparent. When thus affixed, they are in a different concentric plane to the smaller green granules. At a later period, and after they have attained a certain degree of development, these internal globes become detached, and frequently exhibit a rotatory motion, similar to that of the parent globe.

"In the form of *Volvox*, termed *V. aureus* by Ehrenberg, the outer sphere, or cell, exhibits precisely the same structure as the above, the only apparent difference between them consisting in the deeper green colour of the internal globules. These however soon exhibit a more important distinctive character in the formation of a distinct cell-wall of considerable thickness around the dark-green globular mass. This wall becomes more and more distinct; and, after a time, the contents, from dark-green, change into a deep orange-yellow; and simultaneously with this change of colour the wall of the globule acquires increased thickness, and appears double.

"The third form, or *Volvox stellatus*, differs in no respect from the two former, except in the form of the internal globules, which exhibit a stellate aspect, caused by the projection on their surface of numerous conical eminences, formed of the hyaline substance of which the outer wall of the globule is constituted. The deep green colour of the contents of these stellate embryoes, and their subsequent changes into an orange colour, at once point out their close analogy with those of *V. aureus*. I have no doubt of their being merely modifications of the latter: and in fact the two forms are very frequently to be met with intermixed, and on several occasions I have observed smooth and stellate globules in the interior of one and the same parent globe.

"The organism described and figured by Ehrenberg, under the name of *Sphærosira Volvox*, also presents the appearance of a transparent globe set with green spots, but it differs from the foregoing in two important respects:

"1. In the absence of any internal globules or embryoes.

"2. In the irregular size of the green granules lining the wall, which, instead of being of a uniform size, are of various dimensions."

Mr. Busk and Professor Williamson, in the first volume of the new series of the 'Microscopical Society's Transactions,' have furnished in great detail an account of the development of these curiously organised granules. From their observations, it appears that the green ciliated granules which stud the surface of the *Volvox* are produced from a central embryonic mass of protoplasm by successive division by segmentation. Mr. Busk observed in these green granules a curious phenomenon.

"It will also be observed, that each ciliated cell or zoospore, as it may analogically be termed, contains a green granular mass or masses, composed, for the most part probably, of chlorophyll granules and a more transparent body, which I suppose may be regarded as a nucleus, and derived, as it would appear, from one of the bright spherules which have been noticed before. At an early period after the maturity or completion of the zoospores they exhibit a minute circular clear space, or sometimes, but I think rarely, more than one, which is worthy of very attentive consideration. This space is of pretty uniform size in all cases, and about 1-9000th of an inch in diameter. It may be situated in any part of the zoospore, or not unfrequently in the base, or even in the midst of one or other of the bands of protoplasm connecting it with its neighbours. Its most important character consists in its contractility—a property already known to be possessed by similar spaces or vacuoles in vegetable spores; but what appears to me a very curious, and as yet unnoticed, peculiarity of this contraction, consists in the fact that it is very regularly rhythmical. In several cases in which I have watched the phenomenon in question, uninterruptedly, for some time, the contractions or pulsations occurred very regularly at intervals of about 38″ to 41″. In one case, however, if I was not misled in the observation, the interval was about twice this, namely, 1′25″. The contraction, which appears to amount to complete obliteration of the cavity of the vacuole, takes place rapidly or suddenly, as it were, whilst the dilatation is slow and gradual." This contraction of vacuolar spores has since been observed by Cohn in a species of *Protococcus*.

Mr. Busk thus sums up the result of his observations upon *Volvox globator*:—

"1. That it originates in an apparently nucleated discoid cell, which is generated in the interior of the parent, and liberated in a perfect though not fully matured form, within which are contained similar germs.

"2. That the contents of this apparently nucleated discoid cell, consisting of a grumous material, and refractive amylaceous (?) spherules, after a time undergo segmentation, at the same time exhibiting a distinct wall, beyond which is a delicate areola, apparently of a gelatinous consistence.

"3. That this segmentation, attended with a corresponding augmentation in the number of the refractive spherules, terminates ultimately in the formation of numerous contiguous particles or segments.

"4. That these ultimate segments are gradually separated from each other, remaining connected only by elongated processes or filaments, and constituting the ciliated zoospores of the mature *Volvox*.

"5. That these zoospores at first are simple masses of protoplasm, containing a transparent nuclear body, and that afterwards they present for a time clear circular spaces, which contract rhythmically at regular intervals; and are subsequently furnished with a brown eye-spot; and at a very early period with two long retractile cilia, which arising from an elongated hyaline beak penetrate the parent cell-wall, and exert active movements external to it.

"6. That in a concentric plane internal to these ciliated zoospores are placed the germs of future individuals destined to follow the same course."

VÖRÖSMARTY, MIHALY or MICHAEL, an eminent Hungarian poet and prose writer, was born at Nyér, in the county of Fejervár, called by the Germans Stuhlweissenburg, in the year 1800. His father, whom he lost early, was steward to a nobleman. Michael went in 1817 to Pesth to study law, and in 1824 he was admitted as an advocate, but he early adopted literature as a profession. In 1821 appeared his first drama, 'King Solomon,' founded on the History of King Solomon of Hungary, and in 1824 another drama, 'King Sigismund,' between which, in 1822, was published his romantic poem of the 'Triumph of Fidelity.' It was as an epic poet that he attained the greatest celebrity: his 'Zalan Futása,' or Flight of Zalan, his 'Cserhalom,' and his 'Tündervölgy,' or Enchanted Valley, the first published in 1824 and the last in 1827, are considered the finest narrative poems in the Hungarian language.

For some years Vörösmarty was editor of the 'Tudomanyos Gyüjtemény,' or Repository of Science, a monthly magazine, which lasted under his guidance and that of others for a quarter of a century, and was during its continuance the chief organ of Hungarian periodical literature. He was afterwards concerned with Bajza and Schedel in the editorship of the 'Athenæum,' a periodical not unlike the London 'Athenæum,' which had for a time great and deserved success. In 1830, on the establishment of the Hungarian Academy at Pesth, he was appointed one of its members, and soon afterwards its secretary, and for some years his life flowed in an unbroken course of literary labours and literary fame. In general his reputation stood higher among the educated classes than among the people; but one of his lyric poems, the 'Szózat,' or Appeal, written in 1840, enjoyed a double success; it rose at once to a strong popularity among the people, like that of the 'Marseillaise' in France, and the Hungarian Academy presented the poet with a ducat for every line. Some of the lines of the 'Szózat,' the subject of which is the fate and prospects of the Hungarian nation, have since acquired a melancholy increase of significance:—

> "For come there will, and come there must,
> To us a better time.
>
> "And if it come not, then come Death
> To end our dark career,
> And be our country, drenched in blood,
> Laid on a glorious bier."

It was natural that at the outbreak of the revolution in 1848 the poet of the 'Szózat' should be called on to take a part, and he was elected deputy for the county of Bacska. His course in the Assembly however was far from meeting the approval of some of the more fiery patriots. The popular and impetuous Petöfi, the Hungarian Burns, was so indignant at one of Vörösmarty's votes that in a poetical address to him he renounced his friendship. [PETÖFI, *S.* 2.] On the final triumph of the Austrians Vörösmarty was brought to trial, and condemned as a member of some of the revolutionary committees, but was released and pardoned after a short imprisonment. Such however was the effect produced upon him by the calamities of his country, that he sunk into a deep melancholy, and lived for two or three years in retirement, without suffering pen and paper to come in his sight. At length, in 1854, his friends roused him in some degree from this state of depression, and he undertook a translation of Shakspere, some of whose plays he had rendered into Hungarian in happier days. The task was still not completed when Vörösmarty died at Pesth, on the 9th of November 1856.

An edition of the works of Vörösmarty was issued by his friends Bajza and Schedel as part of the collection of the Hungarian classics, entitled the 'Nemzeti Könyvtar,' or National Library. It was published in 1847. The divisions adopted for the writings are Lyric Poetry, Narrative Poems, Dramas, More Recent Poetry, Novels and Tales, and Miscellaneous Writings in Prose, which are subdivided into Essays on Language and Literature, and Dramatic Criticisms. The whole are comprised in one thick octavo volume, printed in double columns, but would occupy nine or ten ordinary octavos. Vörösmarty's writings are more distinguished for classical correctness of form than for striking originality of substance. His narrative poems are written in hexameters on the classical model, for which the Hungarian is perhaps better adapted than any other modern language. His lyric as well as his epic poetry is estimated at a high value by native critics; but the very qualities that excite their admiration render their beauties difficult of transfer.

W

WACKÉ, a barbarous name formerly much employed by German geologists, and thence introduced into English geology. It is regarded as a soft and earthy basalt, but has been used in other senses, and rather indefinitely. (Ansted, *Elementary Geology*.)

WAGHORN, LIEUT. THOMAS, R.N., was born in the early part of the year 1800, at Chatham, in Kent. He entered the royal navy as a midshipman, November 10, 1812. Before he had quite completed his sixteenth year he had passed in navigation for a lieutenant before the Royal Naval College, at Portsmouth. He was paid off in 1817, and after serving some time as a mate in a free trader to Calcutta, was appointed in 1819 to the Bengal Pilot Service, in which he remained till 1824. He then volunteered for the war in Arracan, and was appointed to the command of the Matchless, East India Company's cutter, and of a division of the gunboats connected with the flotilla and army. He was employed in much service by land as well as by sea, was in five engagements, and was once wounded in the right thigh. He returned to Calcutta in 1827, and soon afterwards entered into communication with the government authorities there with respect to a project which he had conceived of communication by steamers between Great Britain and the East Indies. Having returned to England with recommendations from some of the chief members of the Bengal government he immediately began to advocate in London, Liverpool, Glasgow, and other large towns, as he had previously done at Madras, Mauritius, and the Cape of Good Hope, the great project which he had in contemplation, and to the accomplishment of which he applied the whole force of his energetic mind and will. Unfortunately the chief authorities of the post-office, as well as nearly the whole of the East India directors, were averse to the project. But in October 1829 Lord Ellenborough, president of the Board of Control, and Mr. Loch, chairman of the Court of Directors, engaged him to proceed through Egypt to Hindustan with despatches for Sir John Malcolm, governor of Bombay, and he was directed to join the Enterprise steamer at Suez on the 6th of December. The Enterprise however having broken her machinery on the voyage from Calcutta to Bombay, was not there, and Mr. Waghorn, rather than return to England with the despatches, sailed down the Red Sea in an open boat, without chart or compass, directing his course by the sun and stars. In six days and a half he reached Jiddah, on the coast of Arabia, a distance of 628 miles, whence he proceeded by ship to Bombay. This journey convinced him of the advantages of the line of communication through Egypt, and by Suez down the Red Sea to Bombay. With unabated energy and perseverance, supported only by the Bombay Steam Committee, he was enabled to complete the overland route three entire years before it was taken up by the British government. He accomplished the building of the halting-places and the establishment of the hotels on the desert between Cairo and Suez. He supplied carriages, vans, and other necessary means of conveyance, and also placed small steamers on the canal of Alexandria and on the Nile, as well as suitable steamers on the Red Sea. From 1831 to 1834 the overland mails to and from the East Indies were worked by himself. In 1832 he brought under the notice of the Pasha of Egypt the advantages which would result to that country from the formation of a railway between Cairo and Suez, but that improvement of the overland route has not yet been undertaken. He attained the naval rank of lieutenant March 23, 1842, after which he retired on half-pay. In the winter of 1847 Lieutenant Waghorn effected a saving of thirteen days by performing the journey by the way of Trieste, instead of through France, and he also explored other routes, by Genoa, and through the Papal States, taking steamer at Ancona. The prosecution of the Trieste line in 1846 involved Lieutenant Waghorn in pecuniary engagements, from which the sacrifice of his entire property was insufficient to release him. A short time before his death a pension was granted him by the British government, of which he lived to receive only the first quarterly payment. He died January 7, 1850, at Pentonville, London, in the forty-ninth year of his age, worn out by a life of anxious labour and exposure to inclemencies of weather and climate. A small pension was granted by the British government to his widow, to which a small addition was made by the East India Company from a fund at their disposal.

WAGNERITE. [MINERALOGY, *S.* 1.]

WALES, NEW SOUTH. Under this head was given a description of the whole country when it formed but one colony, and before the rapid expansion, the exploration of the interior, the discovery of gold, and the vast increase of the population, made it necessary to divide the territories into four colonial governments. New South Wales, however, still maintains a sort of metropolitan character, and as its boundaries now vary from those formerly mentioned, and as its geographical features have become better known, it will now be fully described, even at the risk of an occasional repetition of what had been previously stated. Where the accounts disagree the present is to be taken as founded on better information.

New South Wales extends over the south-eastern portion of Australia. Its western boundary has been fixed by the grant of the colony of Southern Australia, whose eastern boundary extends from the shores of the Southern Sea along 141° E. long. to 26° S. lat. The northern boundary-line of New South Wales has not yet been definitely fixed, but is generally taken as 26° S. lat., the same as Southern Australia, as there are settlements, particularly since the gold discoveries, north of Moreton Bay, which is in 27° S. lat. On the east New South Wales is washed by the Pacific. On the south the Murray forms the boundary between it and the newly-constituted province of Victoria from South Australia to its source, whence the line turns southerly through the Australian Alps west of Mount Wellington, and then takes an arbitrary straight line south-easterly to Cape Howe, which is the most southerly point of the province, in 37° 5′ S. lat., 150° E. long. The extreme ength is 893 miles, the average breadth about 600 miles, which gives an area of 535,800 square miles. The most north-western portion of the country, extending over perhaps one-third of the whole surface, has scarcely been visited by any European. The population of the colony was estimated in 1856 at 266,189, of whom 147,091 were males.

Surface, Soil, and Climate.—The physical constitution of this country is very peculiar. The interior consists of wide plains, interrupted only by comparatively short ranges of high hills or low mountains. The waters collected in these plains are all united into one river, the Murray, which disembogues within the territories of South Australia. On the east and south the plains are surrounded by higher land, which constitutes the watershed between the rivers joining the Murray and those which run into the sea. This watershed is in general about 100 miles from the shores.

The Australian Alps commence at Wilson's Promontory, and extend into New South Wales by Mount Wellington. In this range rise the Murray and the numerous streams which, flowing more or less westward, ultimately fall into it and form it into a river, having abundance of water all the year round, whilst most of the large rivers which run into the interior become dry during the summer months. Farther north, in the Warragong Chain, the Murrumbidgee with its affluents takes its source, and is likewise a perennial river; east and north of this are Yass Plains and the hilly tract inclosing Lake George. The elevated plains extend, under the name of Goulburn and Breadalbane Plains, about 40 miles farther north, to the southern extremity of Cockbundoon Range, which constitutes the southern part of the Blue Mountains, east of which runs the Shoalhaven river to the sea. The Blue Mountains commence in 34° 30′ S. lat., and run northward to the Monundilla Range, in 32° 40′ S. lat. From the eastern side descend the Nepean, the Colo, the Wollondilly, and the Macdonald rivers, all of which find their way to the sea through the Hawkesbury at Bullen Bay; on the west side descends the Lachlan and its affluents, which join the Murrumbidgee. The mountains are of sandstone; the highest point, King's Table Land, attains a height of 3400 feet above the flat country. At the distance of from 60 to 70 miles north of the Monundilla Range is the Liverpool Range, running east and west. This range extends to about 32° S. lat. On its northern side are Liverpool Plains, between 150° and 151° E. long. In these parts its southern slope rises with a precipitous acclivity, and in some places nearly perpendicular above the plains which lie south of it. Its elevation is probably 1500 or 2000 feet above the base. Where the slope is not too rapid it is thinly wooded. On account of the steepness of the ascent, only two places have been found at which it can be traversed with ease: the western called Pandora Pass, near 150° E. long.; and the eastern, called Hecknadüey, west of 151° E. long. When the summit of the passes is attained, a short descent brings the traveller to the Liverpool Plains. A ridge from the Monundilla Range to these mountains divides the affluents of Goulburn River, a tributary of Hunter River which falls into the Pacific, from those of the Cudgegong and Talbragar, which fall into the Macquarie. A considerable portion of this ridge is without trees, overgrown with bushes, and grassy; but on the rising grounds are forests composed mostly of apple trees, iron-bark, stringy-bark, and box.

The coast-line on the east extends in a general direction of north-north-east from Cape Howe to Cape Byron, when it recedes a little to the west. There are numerous harbours formed by the mouths of the rivers flowing into the Pacific. The chief of these, proceeding from south to north, are—Twofold Bay, at the mouth of the Towamba, immediately north of Cape Green, one of the boldest promontories along the coast; Barmouth, Bateman Bay, Sussex Haven, Jervis Bay, Shoalhaven, Port Hacking, Botany Bay, Sydney, Port Jackson, Broken Bay, Port Hunter, Port Stephens, Farquhar and Harrington Inlets at the mouths of the Manning and Lansdowne rivers, Port Macquarie, Trial Bay, Shoal Bay at the mouth of the Clarence River, in 29° 5′ S. lat. whence there is no other till we come to Moreton Bay, with its group of islands extending 70 miles from north to south. In this extent the shore presents every variety of appearance. From Cape Green to Shoalhaven River the cliffs are generally low; from Shoalhaven River, north of 30° S. lat., to Hunter River, north of 35° S. lat., they present a range of bold perpendicular cliffs of sandstone lying in horizontal strata, occasionally interrupted by sandy beaches, the high land retiring to a considerable distance. Numerous sand-hills occur along the remaining part of the coast. Port Stephens is a bar-harbour, so that small vessels only can enter it; those of larger description are compelled to anchor outside. In some parts especially north of Trial Bay (30° 50′ S. lat.) and south of the mouth of Clarence River, are tracts of coast many miles in length, where it is rocky and rises to a considerable elevation. The harbours are only found at the mouths of the numerous rivers.

Rivers.—The larger rivers which drain the country between the Pacific and the watershed have water all the year round. They generally flow in beds which are deeply depressed below the common level of the country, and between banks which rise perpendicularly, or nearly so, from 100 to 200 feet and frequently higher, so that the streams are inaccessible, except at a few places. They are of little use either for irrigation or for transport. The *Shoalhaven River*, the most southern of the considerable rivers of this region, rises on the table-lands east of the Warragong Mountains, and runs about 90 miles northward, measured in a straight line, and then about 40 miles eastward. About 20 miles from its mouth occurs the last rapid, up to which the tide flows. The mouth of the river is much obstructed by shoals and sand-banks. The *Hawkesbury* falls into Broken Bay. It rises under the name of Wollondilly, on the connecting table-lands, and receives nearly all the waters which are collected on them. It flows into a deep bed, sinking into a deep ravine, when it is no longer accessible. The last rapids occur near Windsor, from which place it is navigable for moderate vessels. Windsor is only 40 miles from the sea in a straight line, but 100 miles at least following the windings of the river, whose waters are fresh for 30 miles below the town. Its estuary, Broken Bay, is surrounded by rocks, and has several good anchorages even for large vessels, the best of which is called Pittwater. The whole course of the river exceeds 250 miles. Sometimes the floods of this river rise to 90 feet above its usual level, and the inundations then lay waste the fertile tracts on its banks. *George's River* falls into Botany Bay. It runs hardly 60 miles, but is navigable for boats from Liverpool, downwards, a distance of about 12 miles in a direct line, but 24 miles following the windings of its course. *Hunter River* disembogues into Port Hunter. It has two great branches, one called Hunter and the other Goulburn. The first rises in the Liverpool Range, the other in the connecting ridge, and both have very tortuous courses. The navigation begins at Maitland, about 20 miles from Port Hunter by land, but nearly 40 miles by water, and a steamboat plies regularly between that town and Sydney. This river often rises rapidly after heavy rains, and in some places to the height of 50 feet.

The navigable rivers which drain the countries north of the Hunter are the Manning, Hastings, Apsley, Clarence, and Brisbane. The Manning and the Hastings both fall into Port Macquarie, which is a bar-harbour, admitting only vessels of 100 tons burden; and it is dangerous to enter, except at full tide, on account of the rapid current, which sets the vessels ashore upon the shoals on the northern side of its entrance. Outside the bar is good anchorage for ships of the largest class, except when the wind blows strong on the shore. Within the bar is secure anchorage for a great number of vessels.

North of Port Macquarie is the valley which is drained by the *Apsley* or *Mac Leay River*, which divides about 12 miles from the sea into two branches, inclosing a large island. The main branch at the northern end forms the harbour of Trial Bay, which has a bar across, having from 12 to 17 feet of water upon it. This river is navigable to a distance of more than 50 miles from the sea, when farther progress is impeded by a fall, which occurs where the river issues from a narrow glen, whose sides rise 900 feet above its bed. Below this place the river runs through a wide valley, in which there are some plains destitute of timber, and gently-rising hills covered with opening forests and grassy pastures. Farther north is the valley of the *Clarence River*. The mouth of the river is at Shoal Bay, 29° 20′ S. lat. The bar across its entrance has 12 feet of water on it at high tides. *Brisbane River* falls into Moreton Bay, and is navigable by ships drawing 16 feet of water 20 miles up, at which point a ridge of rocks crosses the bed, but to a distance of more than sixty miles from the sea it may be navigated by boats. Several of its tributaries are also navigable for some miles from their mouths. The country on both banks of the river presents an alternation of hills and level tracts. The soil, which is very good, is overgrown with high trees, among which are cedars and cypress-trees of great magnitude. The highest hills lie on the north side of the river, where some rise from 700 to 800 feet. The farthest sources of the Brisbane are in the Coast Range, which here offers an easy passage to the interior by a gap which occurs south of 28° S. lat., north of Mount Mitchell, which is 4120 feet above the sea.

All the rivers draining the interior of New South Wales, as far as it is known, appear to belong to the river basin of the Murray. The rivers composing this extensive system consist of numerous streams that flow westward from the high lands running north and south through New South Wales. The Murray itself we have noticed as dividing the colony from Victoria, and it enters South Australia at Table-Land Cliffs, and after flowing in a westerly direction about 90 miles in a direct line, it turns to the south and enters the sea at Encounter Bay. The Murrumbidgee, after it has itself received the Lachlan, falls into the Murray in 143° E. long. The Darling, by its upper branches, drains the country extending from 32° to 28° S. lat. Its most northern branch, the Condamine, rises on the Darling Downs, in 28° S. lat., runs northward as far as 26° S. lat., 151° 4′ E. long., then turns westward to 149° E. long., and then south-westward till it joins the Darling on its left bank. From the south it receives the Bogan, a considerable stream, rising in the Harvey Range; and it is probable that the Macquarie, at least during the rainy season, disembogues into it part of its water from the marsh in which it is lost.

Geology, Mineralogy, &c.—The general account of the geology of the island has been given under Australia, *S.* 2. Sir R. I. Murchison had asserted that gold must exist in the country under certain formations; and the same theory had been promulgated in the colony by the Rev. W. B. Clarke, on the ground that the strata of the Australian mountains running north and south through Victoria and New South Wales, were of the same formation as those of the Sierra Nevada in California, and the Ural Mountains in Russia, namely, granite mixed with quartz and schistose slate; but it was not till 1849 that the actual existence of gold was discovered. In 1851 further discoveries were made, Mr. Hargraves disclosed the places where he had found gold, and when the government officer was sent to examine the places, he found persons already working them. On May 22nd instructions were given by the governor to grant licences to diggers at 30*s.* per month. The first discoverers obtained the gold by washing the detritus from the beds of the creeks, and the earth from the shores; but it was soon found that the richest deposits were in the quartz, and means were found to crush the rock and obtain the gold. On August 5th the governor issued a notice that the licences would only apply to the gold-washers, and that on gold obtained by crushing, a royalty must be paid of from 5 to 10 per cent. Policemen were appointed to the various stations, and escorts furnished for bringing the gold from the diggings to the ports of Sydney or Melbourne. In a short time the towns and villages were deserted, all the usual avocations abandoned, the ships in harbour left unmanned, and every one capable of labour repaired to the diggings. An immigration ensued almost without a parallel.

Respecting other metals we have little to add to what is said under Australia, *S.* 2.

Iron-ore is known to exist in several places, especially on the west of Blue Mountains. Several extensive coal-measures have been found, two of which are worked. Those found near the mouth of the Hunter River, near Newcastle, are extensively worked, and their produce is shipped to Sydney. The coal-beds near Western Port are also very large, and have been worked for several years. Limestone is abundant in some places, and some kinds of marble are worked on the banks of the Wollondilly.

Soil, Agriculture, and Agricultural Productions.—The soil of so extensive a country must necessarily vary greatly. Many parts are distinguished for their fertility, and it is probable that at least one-fourth part is well adapted for cultivation, and that one-half would afford good pasturage for sheep and cattle. In addition to the various species of grain and artificial European fruits and vegetables, that succeed well in various places, the sugar-cane, the vine, and tobacco are raised. Although the growth of grain has been constantly on the increase, New South Wales has always been an importing country, and the influx of population in consequence of the discovery of the gold-fields must render it for a considerable time still more so. The colonists have been at some pains to introduce many kinds of fruit-trees and vegetables, and they have in most cases done it with tolerable success. There are oranges, lemons, citrons, nectarines, apricots, peaches, plums, cherries, figs, quinces, pears, apples, mulberries, pomegranates, grapes, raspberries, strawberries, bananas, guavas, pineapples, gooseberries, currants; almonds, walnuts, chestnuts, and filberts. Gooseberries succeed in the colder and more elevated countries, as near Bathurst. In the kitchen-gardens are raised melons, water-melons, pumpkins, capsicums, cabbages, turnips, and some other vegetables.

The first sheep introduced into the colony were from England, and the wool was of indifferent quality; but as soon as it became evident that wool might become a source of wealth, and yield an important article of export to the mother country, several landed proprietors were at considerable expense to get merino sheep. The quality of the wool has been much improved. The wool imported into Great Britain from New South Wales in 1855 amounted to 17,671,684 lbs. The breed of cattle is a mixture of the Bengal buffalo variety with humpy shoulders, and various English breeds which have been introduced. They are fine large animals. In some parts, especially on the Plains of Bathurst, the dairies are well attended to, butter being made to a great extent, and also cheese not inferior to the common cheeses of England. Bullocks are mostly used for draught. The horses are remarkably hardy and can undergo great fatigue. Pigs find abundant food in the uncultivated tracts, and are easily fattened with maize. Goats have been introduced, and thrive amazingly in those parts which have a barren soil, and are overgrown with shrubs.

Poultry is in great abundance: geese, ducks, turkeys, guinea-fowls, and common fowls thrive surprisingly, without any particular care being taken of them.

Industry and Manufactures.—The manufacturing industry of the colony has made considerable progress, though the production and export of native commodities form the staple of the occupation of the inhabitants. The most numerous manufacturing establishments are the mills for grinding and dressing corn, turned by wind, water, horses, or steam. There are also manufactories of woollen-cloth, hats, soap and candles, and of articles of furniture; distilleries, breweries, iron- and brass-foundries, rope-yards, and ship-building yards. As spermaceti-whales and black whales frequent the sea adjacent to the eastern entrance of Bass's Strait and the strait itself, and a great number of seals are found on the islands in the same part of the sea, the whale and seal fishery became a source of gain to the colonists, and is still carried on, though it has fallen off considerably.

Commerce.—New South Wales, considered as a commercial country, holds a very high rank among our colonies, if its population is taken into account. Including the large quantities of wool, tallow, hides, and sheep-skins, Great Britain imported goods from New South Wales, in 1854, to the value of 4,050,126*l.*; and exported articles to the value of 5,981,003*l.* These amounts have decreased in the years 1856 and 1857, but are still very large. Considerable quantities of gold also pass through Sydney.

Divisions of the Country.—The more closely-settled portion of the colony is divided into 37 districts, 21 of which were added in 1847. Out of these are formed 40 counties, of which the first settled 21 are conterminous with the districts. The other counties do not occupy the whole of the districts, nor do the districts occupy the whole of the territory, but it is a regulation of government that no land can be sold beyond their limits. The extreme boundaries of county lands have come therefore to be called the boundaries of location, and according as lands lie within or beyond these boundaries, a different system is followed in the management and civil government of them.

Within the boundaries the whole country is divided into police districts, each having a bench of petty sessions and a magistrate; and of these districts, which are of unequal size, there are at present about 40. Beyond the boundaries the country is also roughly divided into districts, in each of which there is a commissioner of crown lands, who is the chief magistrate of it, and has under his command a small force of mounted constables, who are called the Border Police. Within the limits of location, land is either sold or let on lease; beyond the limits it is neither sold nor let, but licences are granted, at the discretion of the crown commissioner, for the occupation of such portions of land as may be desired by proprietors of stock, on each of which licences a fee of 10*l.* is payable annually, and an assessment is levied on the stock depastured there. Each allotment of land for which a licence is thus given is called a station, and the stations may vary in extent from 5000 to 30,000 acres. The amount received for licences in 1852 was 36,928*l.*, and land was sold to the amount of 41,273*l.* In 1856 the land revenue including licences and sales, amounted to 298,158*l.*

New South Wales is divided into two bishoprics, Sydney and Newcastle, the Bishop of Sydney being the metropolitan of Australia; the other bishops are those of Melbourne, Adelaide, Tasmania, New Zealand, and Christchurch, which forms a second bishopric in New Zealand. There is an archdeacon in New South Wales who is styled Archdeacon of Cumberland, one of the districts. In 1853 the number of clergymen in the colony was 163, of whom 47 were supported wholly by voluntary contributions. Of the whole number, 78 belonged to the Church of England, 32 were Presbyterians, 32 Roman Catholics, 16 Wesleyans, 4 Independents, and one was of the Jewish persuasion.

There is a considerable number of roads within the boundary of location. Various lines of roads, which have been made at considerable expense, traverse these districts, and various others have been made or are making in consequence of the gold discoveries, to facilitate transport to and from the commercial towns and ports. A regular post is established, and all letters not exceeding half an ounce in weight are delivered at a uniform rate of twopence. Newspapers are exempted from postage.

Education.—Sydney University, incorporated and endowed by the Act of Council, 14 Victoria, No. 31, was inaugurated on October 11th 1852. In 1858 the degrees conferred by it were declared by order in council to give the same privileges as those conferred by the universities of Great Britain. There are three colleges or Grammar schools—two at Sydney, called Sydney College and Australian College, and King's School at Paramatta. These schools are supported by the payments of the students. The elementary schools are mostly maintained by government. In 1855 there were attending school only 18,975 children, and many of these irregularly.

History.—The history of a colony so recently established may be soon told. New South Wales was discovered by Captain Cook in 1770, though the western and northern coasts of the island had been previously visited by Dutch navigators. In 1787 the British government decided to form a convict establishment in Australia, "to empty the jails and houses of correction" of the mother-country, and eleven ships were therefore sent, which arrived at Botany Bay, where it was intended to form the settlement, on January 20th 1788. Botany Bay was found inconvenient, and the establishment was removed to Sydney by the governor, Capt. A. Philip, who had been sent out with the fleet. The early progress of the colony, owing to the circumstance that the first settlers were only convicts, was so slow that its population in 1810 did not exceed 10,000 individuals. About that time one of the landed proprietors ascertained that the climate and soil of the colony were favourable to the rearing of sheep, and many persons consequently went to the colony to settle; but they soon found themselves embarrassed for want of room, and it appeared impossible to extend the settlements farther westward, as several attempts to pass over the Blue Mountains had been frustrated by the nature of the range, which consists of sandstone masses, furrowed by numerous ravines, whose sides are so steep that it is impossible to ascend them. In 1813 three enterprising individuals, Blaxland, Wentworth, and Lawson, succeeded in passing over the mountains; and in the same year followed the discovery of that fine pastoral country the Downs of Bathurst. In the following year a practicable line of road was constructed over the mountain ranges by convict labour. Mr. Oxley, in 1817, began the task of exploring the interior. Since this period some portion of the country has been nearly every year discovered and explored. Among the discoverers may be particularly mentioned Allan Cunningham, Lieut. Sturt, Count Streletzki, (who first asserted that gold was to be found in the mountains), Mr. Eyre, Mr. Windsor Earle, Messrs. Landor and Lefray, Sir Thomas Mitchell, and Dr. Leichardt, who, leaving New South Wales, reached the Gulf of Carpentaria, and who, on a second journey, lost his life in the interior. The results of their discoveries have been given in the geographical notices of Australia and of the several colonies.

The system of transportation has been discontinued of late years.

Towns.—The capital is SYDNEY. *Bathurst* is a thriving town, 198 miles W.N.W. from Sydney, on the west of the

Blue Mountains, situated on the upper part of the Macquarie. It derived its importance at first from being the chief place of trade of the rich pasturage, Bathurst Plains, which surround it. It has since become of still greater importance from its vicinity to the gold diggings of Ophir, which lie from 20 to 28 miles west from it. *Boyd*, or *East Boyd*, as it is sometimes called, is a small but rising port-town, near the southern border of the colony, on the mouth of the river Towamba, which here falls into Twofold Bay. *Brisbane* is at the northern extremity of the colony, situated on the river Brisbane, about 10 miles from its mouth. It is a flourishing town, in an agricultural district. Tobacco and wine are produced. *Campbellton* is on the coast, about 20 miles S. from Sydney, and has considerable trade and manufactures, particularly of leather. *Liverpool* is about 16 miles W. from Sydney, on the left Bank of George's River. It is an inland town, surrounded by a rich and well cultivated country, which secures it much retail business. *Macquarie*, or *Port Macquarie*, is a small but increasing town, at the mouth of the river Hastings, which a little higher up receives the Wilson and Maria rivers, and forms a tolerably safe bay. It is about 120 miles N. from Hunter River. *Maitland* is on the right bank and about 40 miles from the junction of Hunter River, at the junction of the Wallis creek. The river here first becomes navigable for sloops. The coal-mines in the neighbourhood have greatly contributed to the prosperity and increase of this place, which is properly two towns, East Maitland and West Maitland. In East Maitland are a court-house and jail, and in West Maitland are numerous stores and some good hotels. A steamer runs regularly from Maitland to Sydney. *Newcastle*, about 70 miles N. by E. from Sydney in a direct line, is built at the mouth of the Hunter River, which forms a harbour deep enough for merchant vessels, but the entrance is narrow and crooked. The town owes its importance chiefly to the collieries in its neighbourhood, which are extensively worked. It gives title to a bishop. *Paramatta* is situated at the mouth of the small river Paramatta, and at the head of the harbour of Port Jackson. It is 18 miles by water and 15 miles by land from Sydney. The principal street is a mile long; at the end farthest from the harbour is the country residence of the governor of the colony. Daily communication is kept up with Sydney by means of stage-coaches and steam-boats. The observatory at Paramatta (founded in 1821) was the private property of Lieut.-General Sir Thomas Brisbane, an active and well-informed astronomer, during his residence in the colony as governor. At his return to England, the government adopted it as a public establishment, and it is now under the superintendence of an observer appointed by the Admiralty. At Paramatta are two lunatic asylums, one of which is for convict lunatics and invalids. *Windsor*, about 30 miles N.W. from Sydney, stands on the right bank of the Hawkesbury, which is navigable for a few miles above the town for coasting vessels. This circumstance and the fertility of the country which extends along both sides of the river above the town have raised it to some commercial importance. There are at Windsor mills for grinding grain, breweries, and tanneries.

The Government.—This consists of a governor-in-chief, with a secretary, treasurer, and auditor-general, with the necessary subordinates, and an executive council, all appointed by the imperial government at home. In accordance with the 18 & 19 Vict., cap. 54, passed in August, 1855, there is a legislative council, consisting of such number (not fewer than 21) as the governor and council may determine, and a legislative assembly of 54 members. For the legislative assembly, the qualifications of electors are, that they must be natural-born or naturalised subjects of her Majesty, of the age of 21, possessing a freehold estate within the district of 100*l.* clear value above all incumbrances or charges on it, for at least six months before the date of the writ or the last registration, or occupying a dwelling-house for six months of the clear annual value of 10*l.*, or a lodging of 10*l.* yearly rent, or having a salary of 100*l.* a year, or holding a licence to depasture lands within the district, or holding a leasehold estate in the district of the yearly value of 10*l.* of which the lease has not less than three years to run, and on which in all cases the rates and taxes due to within three months of such election or registration have been paid, and who is not attainted of treason, or convicted of felony, &c. By a recent act of the legislature the election of members now takes place by ballot. No minister of religion can be a member. The legislature administers, in conjunction with the governor, the affairs of the colony, without reference to the mother country, except in such cases as the governor may think doubtful or important enough to require to be brought under the special consideration of the home government. The amount of the civil list specified in the Act, including the expense of the civil and judicial establishments of the colony, is 64,300*l.*; and a sum of 28,000*l.* a year is appropriated for the purposes of public worship. The waste lands in the colony are under the management of the colonial legislature.

The governor and council are empowered to levy customs on goods imported, but no duty is to be imposed on any article from one country that is not alike imposed on the same article from other countries. No duties however are to be levied on articles imported for the supply of her Majesty's land or sea forces; nor has the colonial government the power to grant any exemption, or impose any duty, at variance with any treaty concluded by her Majesty with any foreign power.

In the administration of justice there are a chief judge and three puisne judges, with an attorney-general, a solicitor-general, and a crown solicitor. Magistrates are appointed in the various districts by the governor, and quarter sessions and petty sessions are held in various places at frequent intervals.

WALL-PELLITORY. [PARIETARIA, *S.* 1.]

WALL RUE. [ASPLENIUM, *S.* 1.]

WALLACHIA, with its neighbouring principality of MOLDAVIA, has become interesting from the discussion which has arisen respecting the government of what are called the Danubian Principalities: whether they are to be united under one governor, with an almost nominal dependence on the Turkish emperor: or whether with separate governments under the immediate suzerainty of Turkey. The following are the present administrative districts of both provinces, with the chief towns and the population according to the latest available returns, those of 1850.

Wallachia is divided into 18 districts, administered by officers called Isprovniks. Ten of these districts are in the mountainous and hilly parts of the country; eight in the plain and low country along the Danube.

	Districts.	Population.	Chief Town.
Upper Wallachia.	Romnik Sarat	111,342	Romnik Sarat
	Buzeo	137,645	Buzeo
	Sacineni	121,230	Bucovu
	Pracova	130,434	Ployesci
	Dambovitza	116,987	Turguvici
	Muscelu	123,438	Campulungo
	Arges	137,753	Pitesci
	Romnik Valcea . . .	126,928	Romnik
	Gordji	148,728	Turgudjilu
	Mehedinti	187,850	Cernetz
Lower Wallachia.	Doldji	136,819	Krajova
	Romanati	128,432	Caracala
	Oltu	115,917	Slatina
	Tele-orman	116,453	Zimnicea
	Vlasca	102,310	Giurgevo
	Jalomiza	111,612	Calaras
	Ilfovu	175,000	Bukharest
	Ibraïla	95,606	Ibraïla

Moldavia is divided into Upper Moldavia, or Tzara-de-Suss, which is subdivided into 6 districts, and Lower Moldavia, or Tzara-de-Shoss, which is subdivided into 7 districts. Each district is governed by an officer called Ispravnicks.

	Districts.	Population.	Chief Town.
Upper Moldavia.	Neëmts .	90,219	Piatra
	Dorohoi . .	80,222	Mihaïlin
	Suciava . .	71,044	Falticeni
	Rôman . .	80,677	Rôman
	Botoshani .	146,361	Botoshanl
	Jassy . . .	128,566	Jassy
Lower Moldavia.	Bakeou . .	132,244	Bakeou
	Putna . .	124,217	Fokshani
	Cocarlen .	67,293	Galatz
	Tacutsi . .	86,505	Tacutsi
	Vaslui . .	84,703	Vaslui
	Tutova . .	83,674	Burlatu
	Falsii . .	78,722	Us
	Total . . .	1,254,447	

WALLICH, NATHANIEL, M.D. and Ph.D., F.R.S., London and Edinburgh, a celebrated botanist, was born at Copenhagen on Jan. 28th, 1786. He commenced his botanical studies under the direction of Professor Vahl, and went to India in 1807 at the age of one-and-twenty in the capacity of surgeon to the Danish settlement in Serampore. n 1815 he was nominated to the temporary charge of the Calcutta Botanic Garden, which appointment was subsequently permanently confirmed on the recommendations of Dr. Fleming, Mr. Colebrooke, and Sir Joseph Banks. Dr. Wallich's exertions during the thirteen years that elapsed before his first return to Europe added greatly to the extent and value of the previously extensive collections of this garden. He also transmitted to Europe and America a vast quantity of hitherto unknown and beautiful plants. In 1820 Dr. Wallich made a botanical excursion to Nepaul, in the course of which he collected a great variety of plants, many of which he forwarded to London. A severe fever, caught on his descent to the plains, confined him to his bed for two months and compelled him to seek benefit from a voyage to Penang, Singapore, and some other places in the Straits of Malacca, from which, after an absence of five months, he returned on the last day of the year 1822, rich in botanical collections and with renewed health. In 1824 he commenced the publication of a selection from his Nepaul colections under the title of 'Tentamen Floræ Nepalensis llustratæ,' of which two numbers, containing 25 plates, were ssued. These plates were the botanical first fruits of the new art of lithography in India, and both drawings and ithographs were executed by native artists under Dr. Wallich's direction.

In the following year he was deputed by the government to inspect the timber forests of the Western Provinces, and availed himself of this opportunity to examine and collect plants in the kingdom of Oude, the valley of Degra, &c. Excursions to other parts of India were undertaken at various times by Dr. Wallich, which enabled him still further to increase the immediate stores of botanical treasure he had accumulated. His health had now however suffered so severely from repeated attacks of illness that, in 1828, he visited England, bringing with him the great bulk of his colections. He then with the consent of the East India Company proceeded to distribute his duplicate specimens amongst the public and private herbaria throughout the world. The type collection, containing a complete series of all the species, was presented by Dr. Wallich to the Linnæan Society of London. At this time he completed his work, entitled 'Plantæ Asiaticæ Rariores,' consisting of 300 beautifully executed coloured plates. In 1833 Dr. Wallich returned to India and resumed the charge of the Botanical Garden, which however his health obliged him finally to resign in 1847, when he again arrived in England. He was the author of numerous papers and reports on horticultural and botanical subjects, published in the 'Transactions of the Asiatic Society of Calcutta,' Sir W. J. Hooker's 'Journal of Botany,' and the 'Linnæan Transactions.' He became a Fellow of the Linnæan Society in 1818, and in 1849 one of its vice-presidents. He was a man of warm affections, ready wit, and pleasing manners, and devoted in his attachment to his favourite science. It must not be forgotten that he did more than any one else, to introduce into the gardens and greenhouses of England the beautiful and luxuriant plants of India, and it is from his collections and descriptions, and presentations to our public and private gardens that we are indebted more than to any other source for our acquaintance with the Flora of that district.

He died at his house in Upper Gower-street, London, on the 28th of April 1854, in the 69th year of his age.

WALTER, JOHN, late manager and principal proprietor of 'The Times' newspaper, was born in 1784. His father, John Walter, who was born in 1739, was known as the ogographic printer, from his having obtained a patent for an nvention named Logography, or the art of printing with entire words, their roots, and terminations, instead of the arrangement of single letters. On the 1st of January, 1788, he published the first number of 'The Times,' and was during eighteen years printer to the Board of Customs, but that employment was taken from him about 1805, in consequence of the opinions expressed in 'The Times' with reference to Lord Melville's administration at the Admiralty. He died November 16, 1812, at Teddington, Middlesex.

The late John Walter became a joint proprietor and the exclusive manager of 'The Times' at the commencement of the year 1803. It would not be easy to describe the improvements which were made in 'The Times' under his management. The munificent sums paid to the editor and to those literary gentlemen of the highest class who furnished the leading articles, the large staff of reporters at liberal salaries for parliamentary debates, law proceedings, and public meetings, the large amount and accuracy of information, the almost universal correspondence, the competition even with the government for priority of intelligence, the distinct arrangement of the matter, the application of steam power for the printing, and the marvellous rapidity with which the whole is produced, have raised 'The Times' to a position of social and political importance in which it is without a rival not only in Great Britain but in Europe.

The invention of the printing-machine, and the use of the steam-engine as a moving power have produced so great a revolution in the process of printing, as to require a brief statement of the origin and progress of the invention. As early as 1804 an ingenious compositor named Thomas Martyn had made the model of a machine for printing, which met with the approval of Mr. Walter, who expended a considerable sum in the attempt to complete the machine; but having exhausted his own funds, and his father, who had hitherto assisted him, having refused him any further aid, the attempt was abandoned. About the same period Mr. Kœnig, a native of Germany, had made some progress in the contrivance of a machine for printing. Having met with no encouragement in his own country, he came to London, where he was introduced to Mr. Bensley, a well-known printer, who being satisfied as to the feasibility of the projected improvement, supplied the necessary funds. An ingenious assistant of the name of Bauer was also engaged, and the work proceeded till the year 1809, when Mr. Bensley, requiring additional funds, invited the late Mr. George Woodfall, and Mr. Richard Taylor, both well known printers, to join him and Mr. Kœnig in taking out a patent, which they did, the machine even then being so far advanced as to satisfy them as to the prospect of success, and to enable them to have the specifications drawn up. The first patent bears date March 29, 1810. It was taken out in the name of Frederic Kœnig, and was assigned by articles of partnership to the firm of Bensley, Kœnig, Woodfall, and Taylor. Mr. Kœnig states ('The Times,' December 8, 1814) that "sheet H of the 'New Annual Register' for 1810, 'Principal Occurrences,' was printed by machine, and it is, I have no doubt, the first part of a book ever printed by a machine." The machine was set to work regularly in April, 1811. Another patent for a machine on an improved plan was taken out October 30, 1812. It was completed in December that year, and printed about 800 copies an hour. A third patent for another improved machine was taken out July 23, 1813. Mr. Kœnig's first machines were worked by hand, the machines in fact being independent of the motive power. Mr. Perry, of the 'Morning Chronicle' was applied to, but declined to purchase a machine. Mr. Walter, however, seeing the invention accomplished and the machine in full operation, gave an order for two machines, which were to be worked by the power of a steam engine. Notwithstanding violent opposition from the pressmen, the machines were completed on adjoining premises, and on the 29th of November, 1814, 'The Times' was printed for the first time by machines worked by steam-power. The number impressed in the hour was then about 1100. Great improvements have since been made by the late Professor Edward Cowper and others, in the machines for printing books as well as newspapers. About 12,000 per hour is the number now printed of 'The Times,' and the total number per day is upwards of 50,000.

Mr. Walter married in 1818. Having purchased a fine estate in Berkshire, he became a candidate for the representation of that county in December, 1832, and was returned. He was re-chosen in 1835, but in 1837 resigned his seat in consequence of the opinions of the majority of those who had elected him being opposed to his own on the question of the new Poor Laws. In 1840 he offered himself for the borough of Southwark, but was rejected. In April, 1841, he was returned for the borough of Nottingham, and at the general election the same year announced himself as a candidate, but in consequence of serious rioting, withdrew half an hour before the poll was opened. He died July 28, 1847, at his residence, Printing-House Square, Blackfriars, London.

WARBURTON, ELIOT BARTHOLOMEW GEORGE, eldest son of the late Major G. Warburton, of Aughrim, county Galway, Inspector-General of Constabulary in

Ireland, was born in 1810: he represented a branch of an old Cheshire family. He received his early education at home and under the care of a tutor: then entered Queen's College, Cambridge, but after his second term he migrated to Trinity, where he took his degree. He was subsequently called to the bar, but soon ceased to practise, and turned his attention to the care and improvement of his Irish estates. He first became known to the world as an author by his captivating work on the East and Eastern Travel, entitled the 'Crescent and the Cross,' which was first published in 1845. This work at once acquired unusual popularity, and is now (1858) in the 13th edition. It was followed in 1849 by his 'Prince Rupert and the Cavaliers,' a brilliant history and vindication of the gallant prince, who so chivalrously distinguished himself in the civil war under Charles I. He next published 'Reginald Hastings,' a romance referring to and illustrative of the same period. Shortly afterwards he edited the 'Memoirs of Horace Walpole and his Contemporaries.' His last work, which was published after his death, is entitled 'Darien, or the Merchant Prince;' it is a tale founded on the colony established about the middle of the 17th century by a Scottish adventurer named Paterson, on that portion of the northern coast of South America which abuts on the Isthmus of Panama, and is known by the appellation of Darien. Mr. Eliot Warburton married a daughter of the late E. Grove, Esq., of Shenstone Park, Staffordshire, and niece of Sir E. Cradock Hartopp, Bart., by whom he left issue, two sons. He was lost in the ill-fated ship Amazon, which was burnt off the Land's End, January 4, 1852.

WARD, ROBERT PLUMER, was the sixth son of Mr. John Ward, a Spanish merchant resident at Gibraltar, who had married a Miss Raphael, a Spanish Jewess; and was born on the 19th of March, 1765. He was educated at a small school at Walthamstow and at Christchurch, Oxford, under Dr. Cyril Jackson. He was called to the bar at the Inner Temple in 1790. Having gone the Northern Circuit without much success, he secured employment in cases before the Privy Council. In 1805 he was appointed by Mr. Pitt one of the Welsh judges, but soon afterwards retired from the legal profession in order to undertake the more congenial duties of under-secretary of State for Foreign Affairs. From 1807 till 1811 he was a Lord of the Admiralty under the late Lord Mulgrave and the Right Hon. Charles Yorke; he served the office of Clerk of the Ordnance from the latter date till 1823, when he was appointed one of the auditors of the Civil List—a post which has since been abolished. He served as high sheriff for the county of Herts in 1832, and for many years held a seat in parliament, which he entered in 1802 as member for the borough of Cockermouth, and subsequently for the since disfranchised constituency of Haslemere. Amongst all his political and official duties, Mr. Ward found time and leisure for the composition of several works of history and of fiction. Of the former, the best known is his 'History of the Law of Nations in Europe from the time of the Greeks and Romans to the age of Grotius,' which was published in 1795, and was praised for its research, its breadth of view, and soundness of principle. Of his novels, 'Tremaine' and 'De Vere' are those which have attained the widest circulation. The former was published anonymously in 1825, and the latter in 1827. His other works are—'An Inquiry into the Conduct of European Wars,' 1803, a pamphlet which first enlisted on his side the patronage and favour of Pitt; 'Illustrations of Human Life,' 1837; 'Pictures of the World,' 1838; an 'Historical Essay on the Revolution of 1688,' 2 vols. 8vo, 1838; and, lastly, 'De Clifford,' a novel, published in 1841.

From the middle of 1809 till late in life Mr. Ward kept a political diary, which has since been published down to the year 1820. It is valuable as an historical document, and as throwing some light on the state of things under the Perceval and Liverpool administrations. Mixing largely with the world of politicians, and being equally skilful in gathering and prompt in recording the gossip of the day, Mr. Ward was able to collect many really curious public facts relating to Canning, Castlereagh, the much-debated question of the Regency, and the proceedings against Queen Caroline, which are not to be found in any other publication. The later portion of the 'Diary' is at present withheld from publication, owing to the warmth of its political partisanship and the severity of its comments on living statesmen. The 'Diary' will be found in the 'Memoirs of the Political and Literary Life of Robert Plumer Ward, Esq.,' published in 1850 by his friend and relative the Hon. Edmund Phipps, 2 vols. 8vo.

Mr. Ward was thrice married: first, in 1796, to a daughter of C. J. Maling, Esq., by the Dowager Countess of Mulgrave; secondly, in 1828, to Jane, daughter of the Hon. and Rev. George Hamilton, son of the seventh Earl of Abercorn (by his countess Anne, daughter of Colonel John Plumer, M.P. for Herts in the 17th century), and in consequence assumed the additional name and arms of Plumer; his third wife was a Mrs. Okeover, a daughter of the late General Sir George Anson, G.C.B. He had the misfortune to see nearly all his children carried off by consumption, with the exception of his only son by his first wife, now Sir Henry George Ward, governor of Ceylon. He died at Okeover Hall, on the 13th of August, 1846.

WARDLAW, RALPH, D.D., was born at Dalkeith, in the county of Mid-Lothian, Scotland, on the 22nd of December, 1779. His father, William Wardlaw, was in business as a merchant, his mother, Anne Fisher, was daughter of James Fisher, and granddaughter of Ebenezer Erskine, two of the founders of the Scotch Secession Church. Ralph received his early education at the public schools of Glasgow, to which city his parents removed shortly after his birth. He entered the University of Glasgow in October, 1791, and at the close of the first session, before he was thirteen years of age, carried off the Muirhead prize in the Humanity class. He was distinguished as a diligent and careful student, and gained several other prizes in his university course. He was at first inclined to adopt the medical profession, but finally decided in favour of the Christian ministry. With this view he attended from 1795 till 1800 the divinity hall of the Secession Church, then conducted at Selkirk by the Rev. George Lawson. Mr. Wardlaw decided to join the Scottish Independent denomination, which was then being organised by Messrs. Haldane, Aikman, and Ewing, and from the first he took a respectable, and very soon a leading position among the ministers of that body. A building having been erected by a number of his friends in Glasgow, with a view of obtaining him as their minister, a church was formed, and Mr. Wardlaw commenced his services on February 16, 1803. This position he maintained with much credit to himself, and usefulness to the Independent body and to the dissenting community at large, till his death, a period of more than fifty years. On August 23rd 1803, he married his cousin, Miss Jane Smith, daughter of the Rev. Mr. Smith, of Dunfermline, by whom he had a family of eleven children. In 1811 Mr. Wardlaw was elected Professor of Systematic Theology in the Theological Academy of the Independent body, which was then established in Glasgow. In 1818 he received the Diploma of D.D. from Yale College, Connecticut, and in December of that year his congregation removed to a large and handsome chapel in West George-street, the erection of which had been rendered necessary by the increasing attendance on his ministry. In 1848, Dr. Wardlaw's health being somewhat impaired, the Rev. S. T. Porter was chosen as copastor, a connection which existed for about two years, when differences arose in consequence of charges made or supported by Mr. Porter against Dr. Wardlaw, the result of which was, the separation of Mr. Porter and a portion of the members from West George-street church, and the formation of a new church under Mr. Porter's pastoral charge. In this case, the deacons and the great body of the congregation adhered to Dr. Wardlaw, and a crowded meeting was held in the City Hall to express sympathy for him, and to present to him a piece of plate as a testimonial. In February 1853, the completion of the fiftieth year of his ministry was celebrated by special services and a public meeting, in connection with which a large sum of money was collected, and expended in erecting 'The Wardlaw Jubilee School and Mission House,' at Dovehill, a destitute part of the city. He died on December 17th, 1853, within a few days of completing his seventy-fourth year.

Dr. Wardlaw took an active part in various public questions, and engaged in several controversies, chiefly theological, which gave rise to some of his most elaborate publications. He was frequently invited to London to preach anniversary sermons, and speak at public meetings of the great religious societies. On several occasions he declined invitations to accept professorships in the Independent Theological Academies in England. In April 1833, he delivered in London eight lectures in defence of Congregationalism, forming the first series of an annual course called 'The Congregational

Lecture.' In April 1839, at the request of the Protestant Dissenting Deputies, he delivered eight lectures in Freemasons' Hall, London, in answer to the Lectures on Church Establishments, which had been delivered in London the previous year by Dr. Chalmers. As a preacher, Dr. Wardlaw was much esteemed by members of all denominations. His discourses, which were very carefully prepared, were generally written out, and read with a clear and silvery voice, and a calm but impressive elocution. The following list contains the titles of his principal productions: many single sermons, including several funeral discourses for distinguished ministers, and other friends, were likewise published by him. In 1803 he edited a Hymn Book for the Congregationalists in Scotland, containing several hymns of his own composition. In 1807 he published 'Three Lectures on Romans IV., v. 9-25,' on the question of infant baptism; in 1810, 'Essay on Mr. Joseph Lancaster's Improvements in Education;' in 1814, in one volume, 8vo, 'Discourses on the Socinian Controversy,' in answer to Mr. Yates, the Unitarian minister in Glasgow; in 1816, in 8vo, 'Unitarianism incapable of Vindication,' in reply to Mr. Yates's 'Vindication of Unitarianism;' in 1817, 'Essay on Benevolent Associations for the Poor;' in 1821, in 2 vols. 8vo, 'Expository Lectures on the Book of Ecclesiastes; in 1825, 'A Dissertation on the Scriptural Authority, Nature, and Uses of Christian Baptism;' 'The Divine Dissuasive to the Young against the Enticements of Sinners;' 'Man Responsible for his Belief,' in answer to Lord Brougham's inaugural discourse; in 1829, 'Introductory Essay to Doddridge's Practical Discourses on Regeneration;' a volume of Sermons; in 1830, 'Two Essays: I. On the Assurance of Faith; II. On the Extent of the Atonement and Universal Pardon;' in 1832, 'Discourses on the Sabbath;' 'Civil Establishments of Christianity tried by the Word of God; in 1833, 'Christian Ethics; or Moral Philosophy on the Principles of Divine Revelation;' in 1835, 'Two Lectures on the Voluntary Church Question;' in 1836, 'Friendly Letters to the Society of Friends; in 1839, 'National Church Establishments considered;' being the lectures delivered in London in reply to Dr. Chalmers; 'Sketch of the Life and Character of the Rev. Dr. McAll of Manchester,' prefixed to Dr. McAll's Sermons, edited by Dr. Wardlaw; in 1841, 'Letters to the Rev. Hugh M'Neile, M.A., on some portion of his Lectures on the Church of England;' in 1842, 'Lectures on Female Prostitution; in 1845, 'Memoir of the Rev. John Reid,' Missionary at Bellary in the East Indies, and Dr. Wardlaw's son-in-law; 'The Life of Joseph and the Last Days of Jacob: a book for Youth and for Age;' 'Strictures on Dr. Halley's Congregational Lecture on the Sacraments,' in reference to Infant Baptism, &c.; in 1848, 'Congregational Independency, in contradistinction to Episcopacy and Presbyterianism, the Church Polity of the New Testament;' in 1852, (his last work) a 'Treatise on Miracles.' Dr. Wardlaw was likewise a contributor to various religious periodicals. Of Dr. Wardlaw's sons, one is a missionary in India, another a merchant in Glasgow.

(W. L. Alexander, D.D., *Memoirs of the Life and Writings of Ralph Wardlaw, D.D.*)

WARNEFORD, REV. SAMUEL WILSON, was the son of the Rev. Francis Warneford, vicar of St. Martin's York, f an old and wealthy North Wiltshire family, and he was born at Sevenhampton, near Highworth, in Wiltshire, in 758. At the usual age he was sent to University College, Oxford. Ill-health prevented his attaining any academical onours, but he graduated M.A. 1786, and B.C.L. in 1790. n 1796 he married a daughter of Loveden Loveden, Esq., with whom he acquired a considerable fortune; but a few ears left him a widower without issue. In 1809 he was resented by his college to the rectory of Lydyard Milicent, Wilts, valued at 500*l.* per annum; in 1810 he was presented o the rectory of Bourton-on-the-Hill, in Gloucestershire, alued at 700*l.* per annum; and in the same year he took he degree of D.C.L. He lived at Bourton very plainly and moderately, and from an early period devoted a great part of is property to the promoting of large establishments bene- cial to the public, for which purpose he carefully abstained om the common practice of bestowing trifling eleemosynary ms, refusing, it is said, assistance even to the poorer embers of his own family. But there was no ostentation his princely gifts; many indeed were anonymous. He unded schools and almshouses in his own parish. He was contributor to schools, colleges, and hospitals throughout e kingdom. On the Clergy Orphan School, at various times, he bestowed 13,000*l.*; and he contributed large sums for church purposes, particularly in his own county of Gloucester, and in Nova Scotia. He founded an hospital at Leamington, which bears his name; and one for lunatics on Headington Hill, near Oxford. To King's College in London he presented anonymously several donations of 500*l.* each; but to Queen's College, Birmingham, the total amount of his contributions was upwards of 25,000*l.* This institution was commenced by Mr. Sands Cox as a school of medicine, and Dr. Warneford liberally afforded pecuniary assistance, thereby enabling him to expand the school into a college, which was ultimately patronised by royalty. When it was found desirable to add other departments of education, Dr. Warneford was again the chief contributor; and desirous that religious instruction should be afforded, he founded the college chapel, and furnished the means for ensuring permanent religious teaching. In 1844, in recognition of his wide-spread beneficence, the bishop of Gloucester conferred on him an honorary canonry in Gloucester Cathedral; and in 1849 a statue of him was erected in the Warneford Lunatic Asylum at Oxford, the expense being defrayed by public subscription. He died at Bourton on January 11, 1855, enjoying good health till within a few days of his death. He bequeathed 2000*l.* to the Christian Knowledge Society, and 2000*l.* to the Society for the Propagation of the Gospel, in addition to previous gifts.

WART-CRESS. [SENEBIERA, *S.* 1.]

WARWICKITE. [MINERALOGY, *S.* 1.]

WASHINGTON, a Territory of the United States of North America, lies between 45° 25′ and 49° N. lat., 110° 30′ and 124° W. long. It is bounded E. by the Rocky Mountains, which separate it from the Territory of Nebraska; N. by the parallel of 49° N. lat., which separates it from British North America; W. by the Pacific Ocean; and S. by the Territory of Oregon. The area is 123,022 square miles. The population in 1857 was estimated at 10,000. At the Census of 1850 Washington formed a part of the Territory of Oregon, which contained 13,294 inhabitants. The country separated from Oregon, in order to form the Territory of Washington, then contained less than 2000 inhabitants, exclusive of the native Indians, who probably number about 7000 or 8000.

In its general character Washington has a marked resemblance to OREGON. The surface is greatly broken, it being traversed from south to north by three parallel ranges of mountains, the northern prolongation of the Oregon ranges, while the Rocky Mountains, as in that Territory, form its eastern boundary. The coast from the mouth of the Columbia to the entrance of Gray's Harbour, or, as it was named by Vancouver, Whidbey's Bay, a distance of 45 miles, is rocky and almost unbroken. The entrance to Gray's Harbour is about 2½ miles across, but the harbour itself opens to a width of 5 or 6 miles, and is 12 miles deep. It affords well-sheltered anchorage in some places, but it is everywhere encroached on by sand-banks, and its mouth is obstructed by a bar, which only admits the passage of vessels drawing under 10 feet of water. From Gray's Harbour to Cape Flattery, or Cape Classet, a lofty promontory at the southern side of Juan de Fuca Strait, a distance of about 80 miles, the coast is high, rocky, and only broken by two or three unimportant streams. The Strait of Juan de Fuca, which forms the northern boundary of the coast of Washington, is a vast arm of the sea, about 10 miles wide at its mouth and 100 miles deep. [VANCOUVER ISLAND, *S.* 2.] The southern coast consists of perpendicular sandy cliffs of moderate elevation, from which the land gradually rises towards the craggy mountains of the interior. About 70 miles from the mouth of the strait is a long low sandy point which forms a good anchoring-ground; and beyond this is a deep bay about 9 miles across, and 3 miles from its eastern point is Protection Island, so named by Vancouver from its position at the entrance to Port Discovery. Immediately beyond Port Discovery is Port Hudson, an equally safe and good though somewhat smaller harbour: Vancouver and Wilkes unite in describing these as among the very finest harbours on the western coast of North America. Beyond this harbour is a deep inlet named Admiralty Inlet, which soon divides into two arms—the smaller one named Hood's Canal, bearing to the south-west, and stretching far into the interior; while the main arm proceeds due south for about 40 miles, where it terminates in a broad sound named Puget's Sound. Both these branches afford good anchorage; but Puget's Sound is broken by several inlets, and affords the greatest possible security and ample space. Vancouver speaks of these harbours and the contiguous country in such terms as might suggest the suspicion that he had been carried away by the ardent feelings of a discoverer; but Mr. Wilkes, the commander of the U. S. Exploring Expedition, fully corroborates all that Vancouver had asserted: he says, that "nothing can exceed the beauty of these waters and their safety: not a shoal exists within the straits of Juan de Fuca, Admiralty Inlet, Puget's Sound, or Hood's Canal, that can in any way interrupt their navigation by a 74-gun ship. I venture nothing in saying there is no country in the world that possesses waters equal to these." It is around Puget's Sound that the commerce of the Territory is chiefly establishing itself. Numerous settlements have been already formed along its shores. The tides rise 18 feet in Puget's Sound. The Sound is full of islands, and receives several small rivers.

Like Oregon, this Territory is naturally divided into three nearly parallel districts, determined by the course of the mountain ranges: a western, or coast section; the middle section, lying between the Cascade and the Blue Mountains; and the Rocky Mountains' region. The western section lies between the Cascade Mountains and the sea, and is much broken in surface, being intersected by spurs from the Cascade Mountains. The greater part of this section is covered with forests of lofty trees; pines often occur from 200 to 300 feet in height, and of corresponding girth, and some of the pines rise to a height of 200 feet without a branch. The most prevalent trees besides pines are firs, oak, ash, spruce, cedars, arbor vitæ, &c., with a dense undergrowth of hazels, roses, &c. The hills are generally of basalt, and some, like Mount Olympus, near Juan de Fuca Strait, are of considerable altitude. The soil is in parts a light brown loam, in others a light vegetable mould with a sandy and gravelly subsoil. Generally, it has considerable fertility. The river-bottoms afford good farming-land, the prairies and the uplands excellent pasture-ground. The climate is mild and salubrious, though somewhat moist; the winters are short, and snow seldom lies long on the ground. Game abounds.

The Cascade Mountains continue, as in Oregon, in a generally northern direction, and about 150 miles from the coast. Their highest cones rise to an altitude of upwards of 13,000 feet, and they form a barrier of very difficult passage between the western and middle sections of the territory. The country between the Cascade and Blue Ranges is wider than the corresponding district in Oregon. Between the Snake and the Flathead or Clarke rivers is a plain, or rather a rolling prairie, which extends nearly 200 miles in length and 100 miles across in its widest part. The soil is arenaceous, and the country little fitted for tillage; but the plain is covered with a good grass, and can afford pasturage for immense flocks and herds. The river-bottoms have an alluvial soil of various quality, but generally productive. The hills are comparatively bare of wood, and infertile. The climate of this middle section is cooler, drier, and more salubrious than in the western section; but the varieties of temperature are much greater. No dew falls here. The Blue Mountains are considerably broken and interrupted, but generally run north and south. The country east of them to the Rocky Mountains is interrupted throughout by offsets from the Rocky range, and transverse ranges connecting the main chains. Nothing can well exceed the wild magnificence of much of this country, with its vast and snow-clad mountainous tracts, deep valleys, tremendous gorges, lofty cataracts, and rushing torrents. It is of course little suited for agricultural operations, but the bases of the hills are generally covered with timber, and about the lakes, from which flow the head streams of the Columbia, the Spokane, and the Flathead rivers, are spots of remarkable fertility as well as of surpassing beauty. But all this district is left to the native Indians, who are a warlike and implacable race. The chief dependence of these Indian tribes is on hunting, and they barter the furs to the servants of the Hudson's Bay Company for tobacco and articles of European manufacture; but the fur-bearing animals are rapidly decreasing in number. The Rocky Mountains are described elsewhere. [ROCKY MOUNTAINS; NEBRASKA, *S.* 2.] There are two or three practicable passes in this range along the territory of Washington, but they are much more difficult than the Great South Pass.

The principal river is the Columbia, which belongs equally to Washington and Oregon; it is described under COLUMBIA RIVER. Its northern branches rise in the Rocky Mountains within the Hudson's Bay Territories, and unite in Washington; the united stream traversing the Territory in a generally southern direction, and receiving numerous tributaries. It forms the Columbia by the junction of the Saphin or Lewis River. The principal tributaries of the northern branch of the Columbia are the Kootanie or Flat Bow, the Flathead or Clarke, and the Spokane rivers: they are all very rapid streams, but navigable by boats for some distance. The chief river north of the Columbia is the Chekalis, which rises in the Cascade Mountains, and pursues a very tortuous course to its outfall in Gray's Harbour. Its course is very rapid, and it is only navigable by canoes; it receives several small streams from the high grounds about Hood's Canal and Puget's Sound. The Nisqually and Tenalquit, or Shute's rivers, fall into Puget's Sound; they are both navigable for some distance, but will probably prove of greater value for their mechanical power. In the interior are numerous lakes, the larger being chiefly expansions of the northern branches of the Columbia, the Spokane, and the Clarke rivers.

At present the rearing of horses and cattle has attracted most attention from the settlers, but agriculture is rapidly extending. The productions are similar to those of OREGON [*S.* 2]. Wheat is the chief grain crop; maize has not been much grown hitherto. The forests will for many years supply an unlimited quantity of fine timber. Coal is found in the neighbourhood of Puget's Sound, and near the Chekalis and Monticello rivers. Iron and other metals have been found; but mining operations have as yet been little heeded. A few manufactories have sprung up. The fisheries will probably become an important part of the industry of Washington. All the rivers abound in fish; salmon being especially abundant. Fish also abound on the coasts. Whales frequent the coasts and the mouth of Juan de Fuca Strait. Shell-fish are very abundant. The commerce of Washington is yet in its infancy, but it is steadily increasing. Nearly all the commerce centres in the district of Puget's Sound.

Washington has as yet no town of many inhabitants. The political capital, principal commercial town, and port of entry is *Olympia*, on the right bank of the Tenalquit or Shute's River, at its entrance into Puget's Sound. This town boasts of its hotel, stores, saw- and grist-mills—the first in the Territory—newspaper, &c.; and contains 600 inhabitants. The other more important places are: *Columbia City*, on the right bank of the Columbia, below Fort Vancouver; *Monticello*, the capital of Lewis county, and the place where the convention was held which led to the separation of Washington from Oregon; *Nisqually*, on the east side of Puget's Sound, the property chiefly of the Puget's Sound Agricultural Company, whose farms supply provisions to the servants of the Hudson's Bay Company west of the Rocky Mountains; and *Pacific City*, on the right bank of the Columbia at its entrance into the Pacific Ocean, which appears likely to become a place of some trade.

Washington was separated from Oregon, and received a territorial constitution, by Act of Congress, March 2, 1853. By this Act the right of voting is vested in every free white male 21 years old then resident in the territory. The Legislative Assembly consists of a council of 9 members, chosen for three years, but one-third to vacate their seats each year; and a House of Representatives of 18 members, elected annually. The governor is appointed by the president and senate for four years. All laws passed by the legislature must be submitted for confirmation to Congress. No law can be passed interfering with the primary disposal of the soil; or taxing the property of non-residents higher than that of residents. Sections 16 and 36 in every township are to be reserved for schools.

(Vancouver; Wilkes; Lewis and Clarke; Fremont, &c.; *Gazetteers of United States; United States Census; American Almanac*, &c.)

WATER-CROWFOOT. [RANUNCULUS, *S.* 1.]

WATER-FLY. [GYRINIDÆ, *S.* 2.]

WATER-MELON. [CUCUMIS.]

WATER-MILFOIL. [MYRIOPHYLLUM, *S.* 1.]

WATER-PEPPER. [ELATINACEÆ, *S.* 1.]

WATER-RAT. [MURIDÆ.]

WATERSHIELDS. [HYDROPELTIDÆ, *S.* 2.]

WATT, JAMES, the eldest son of the celebrated James Watt, was born on 5th of February, 1769, and died, unmarried, at his seat, Aston Hall, in Warwickshire, near Birmingham, on the 2nd of June 1848.

Mr. Watt had early directed his son's attention to natural philosophy and chemistry, and he had also applied himself to the practical study of mineralogy. It is scarcely known, and has not been recorded in any previous biographical work, that he was for a short time, when in his twentieth year only, one of the secretaries of the Literary and Philosophical Society of Manchester, then just founded, one of the earliest, and perhaps still the most distinguished of the provincial scientific associations. To the 'Memoirs' of this society he communicated two papers in 1789, one on the mine (at Anglezark, near Chorley, in Lancashire) "in which the aërated [carbonate of] barytes is found," and the other "on the effects produced by different combinations of the Terra Ponderosa [barytes] given to animals." Though he was not, as has been said, the actual discoverer of the carbonate of barytes at Anglezark, he was the first to describe, in the paper here alluded to, the circumstances under which it occurred, and to make known the fact that the specimens examined and the supplies of the mineral from which was prepared the muriate, which had been recently introduced into medical use by Mr. Adair Crawford, F.R.S., had been obtained from that locality. His also were some of the earliest experiments on the poisonous effects of the combinations of barytes.

A remarkable episode now occurred in the life of the young philosopher—for such, at this period, we may call him. Mr. Watt had directed his son's attention to the study of science on the Continent; and—accompanied, as it would appear, by his friend Thomas Cooper, one of the vice-presidents of the Manchester Society, and who afterwards became professor of chemistry in Columbia College, in America—he proceeded to Paris. But here, carried away by the enthusiasm then prevalent in what was termed the cause of liberty, he sympathised with the Girondists and Jacobins, and even took some open and avowed part in their earlier tumultuous agitations, in company with Cooper, and subsequently with Wordsworth the poet also. Southey has recorded, from the information of James Watt himself, that so highly was he at first regarded by the French leaders, that he was the means of preventing a duel between Danton and Robespierre. A more public exhibition of zeal in the cause he had espoused, in which Cooper also took part, was afterwards denounced by Burke in the House of Commons. The licence and excesses of the revolutionary parties however opened the eyes of the young enthusiast to the real nature of the principles he was supporting, and he then endeavoured to mitigate as far as possible the violence which he foresaw he must in future deplore. This became eventually the cause of his quitting Paris and abandoning his French associates and their objects; for Robespierre, at the club of the Jacobins, insinuating that Cooper and his compatriot were emissaries of Pitt, the British prime minister, James Watt indignantly silenced his formidable antagonist from the tribune in a brief but impassioned harangue, delivered in excellent French, carrying with him the feelings of the rest of the audience. On returning home he learned that his life was no longer safe for a day, instantly left Paris, succeeded with difficulty in making his way to the south, and did not rest until he arrived in Italy.

Not long afterwards he returned to England, and in 1794, as already intimated, began to be actively engaged as a partner in the management and direction of the steam-engine manufactory at Soho, which necessarily withdrew him from political and also from scientific pursuits, strictly so called, and what he effected in the latter has almost escaped notice.

Mr. James Watt took a part in the progress of steam-navigation, especially as regarded the requisite adaptations in the construction of the engines, not unworthy of his name and of the reputation of the firm of which he became the leading partner. Mr. Henry Bell of Glasgow, who had in 1811 taken the enterprising step of himself trying, in Scotland, at his own risk and under his sole direction, an experiment similar to that which, in the hands of Fulton (whom he had aided), had succeeded so well in America, built several steam-vessels propelled by engines of his own construction. Among these was the Caledonia, of 102 tons and 32-horse power, which was launched in 1815, but from defects in her engines had been little used. In April 1817 she was purchased by Mr. James Watt, who had her machinery taken out and replaced by two new engines of Soho manufacture, of 14-horse power each. In October he went over in her to Holland, and ascended the Rhine as far as Coblenz; having thus been the first to leave the British shores and cross the Channel by so novel and, as it was then esteemed, so hazardous a mode of transit. On her homeward voyage she entered the Scheldt and visited Antwerp, and was then laid up for part of the winter in the harbour of Rotterdam for repairs and alterations. "After her return to the Thames in the spring of 1818," it is stated by Mr. Muirhead, to whose Memoir we are indebted for these particulars of the history of steam-navigation in this country, "Mr. James Watt made no fewer than thirty-one series of experiments with her on the river (the whole number of those experiments amounting to 250), which resulted in the adoption of many most material improvements in the construction and adaptation of marine engines, and in an immense though gradual extension of that branch of the manufacture at Soho." The marine engines manufactured there down to the year 1854, "were in number 319, of 17,438 *nominal*, or 52,314 *real* horse-power."

Some further particulars of Mr. James Watt may be gleaned from the two later publications of Mr. Muirhead. He wrote, in 1823, the Memoir of his father in Macvey Napier's Supplement to the 'Encyclopædia Britannica' (subsequently transferred, in substance, to the seventh edition of that work); and in 1846 he addressed a letter to Mr. Muirhead on his father's claims as to the composition of water, which is prefixed to the 'Correspondence' of the latter on that subject. The publication of his father's specifications of patents and documents relating to them was originally designed and, to a considerable extent, prepared by him; but, from the infirmities of age, confided prior to his decease to Mr. Muirhead, by whom it has been accomplished in the work already cited and described.

WAX PALM. [Ceroxylon Andicola.]

WAX WING. [Bombycilla.]

WEALDEN FORMATION. The Wealden beds comprise a series of layers of clay, sand, and shale, with subordinate beds of limestone, grit, and sandstone, which are more or less regularly distributed, and contain remains of fresh-water *Mollusca*, as species of *Cyrena*, *Unio*, *Paludina*, &c. Fishes, *Sauria*, and Plants, are also found in these deposits, with a few marine *Mollusca*. The following are the characters of the subordinate groups of the formation:—

1. Weald Clay.—Average thickness 140 to 200 feet.

Stiff clay of various shades of blue and brown; with subordinate beds of limestone and sand; *Septaria*.	*Paludinæ*, *Cypris Valdensis*, *Cyrena*, &c., the bones of reptiles rarely; scales and bones of fishes.	The Wealds of Sussex, Surrey, and Kent; forming the vale between the Downs and Forest Ridge.

2. Hastings Sands.—Average thickness 400 to 500 feet.

a. Horsted Sand.

Gray, white, ferruginous, and fawn-coloured sand, and friable sandstone, with abundance of small portions of lignite.	Traces of carbonised plants.	Little Horsted, Uckfield, Framfield, Buxhill, Chailey, Fletching, Eridge Park, Tunbridge Wells, &c.

b. Strata of Tilgate Forest.

Sand and friable sandstone, of various shades of green, yellow, and ferruginous, surface oftentimes furrowed. Tilgate stone, very fine, compact, bluish or greenish gray grit, in lenticular masses, surface oftentimes covered with mammillary concretions; the lower beds frequently conglomeritic, and containing large quartz pebbles.	Ferns, and stems of vegetables, bones of Saurian animals, birds, turtles, fishes, &c.; shells of the genera *Unio*, *Cyclas*, *Cyrena*, *Paludina*, &c. Lignite wood.	Loxwood, Horsham, Tilgate Forest, St. Leonard's Forest; Chailey, Ore near Battle, Hastings, &c., Rye, Winchelsea.
Clay or marl; of a bluish gray colour; alternating with sand, sandstone, and shale.	Bones, and shells but rarely. Ferns; and stems of vegetables.	Tunbridge Wells.

c. Worth-Sandstone.

White and yellow friable sandstone and sand.	Ferns and Arundinaceous plants. Lignite, &c.	Worth near Crawley, St. Clement's Caves. Hastings, &c.

3. Ashburnham Beds.

A series of highly ferruginous sands, alternating with clay and shale, containing ironstone and lignite.	Ferns, Lignite, &c.	Lower part of Hastings Cliffs; near Buxted; West Hothly; Crawley, &c.
Shelly limestone, alternating with sandstone, shale, and marl; and concretional masses of grit.	*Cypris*. Shells of the genera *Cyclas* and *Cyrena*; lignite carbonised vegetables.	Archer's Wood, near Battle; Brightling, Pounceford, Burwash, Hurst Green, Eason's Green.

The Dover Railway traverses the beds of the Wealden between Red Hill and the branch-line to Tunbridge Wells, exposing the Weald Clay and Upper Hastings Sands.

The fossils of this group are as follows:—

Plantæ.

Carpolithes Mantelli.
Clathraria Lyelli, Mant.
Endogenites erosa, Mant.
Equisetites Lyelli, Mant.
Lonchopteris Huttoni, Presl.
Lonchopteris Mantelli, Brong.
Pterophyllum Brongniarti, Mant.
Sphenopteris Mantelli, Brong.
S. Phillipsi, Mant.
S. Sillimani, Mant.

Insectæ.

Carabus elongatus, Brod.
Cerylon striatum, Brod.
Acheta Sedgwickii, Brod.
Blatta Stricklandi, Brod.
Cixius maculatus, Brod.
Ricania fulgens, Brod.
Asiraca Egertoni, Brod.
Aphis Valdensis, Brod.
Cicada punctata, Brod.
Delphax pulcher, Brod.
Termes grandævus, Brod.
Æshna perampla, Brod.
Simulium humidum, Brod.
Platyura Fittoni, Brod.
Tanypus dubius, Brod.
Sciophila defossa, Brod.
Macrocerca rustica, Brod.
Culex (?) *fossilis*, Brod.
Chironomus extinctus, Brod.
Rhiphus priscus, Brod.

Crustacea.

Cypris, 5 species.

Conchifera Dimyaria.

Corbula alata, Sow.
Cyclas, 7 species.
Mytilus Lyelli, Sow.
Psammobia Tellinoides, Sow.
Unio, 10 species.

Monomyaria.

Gryphæa bulla, Sow.
Ostrea distorta, Sow.

Gasteropoda.

Actæon Popii, Sow.
Bulla Mantelliana, Sow.
Melanopsis, 2 species.
Neritina Fittoni, Sow.
Paludina, 4 species.
Potamidum carbonarium.

Pisces.

* *Placoides.*

Acrodus Hirudo, Ag.
Hybodus, 6 species.
Sphenonchus, 2 species.

** *Ganoides.*

Tetragonolepis mastodontus, Ag.
Lepidotus, 3 species.
Pholidophorus ornatus, Ag.
Ophiopsis penicillatus, Ag.
Gyrodus, 2 species.
Pycnodus Mantelli, Ag.

Reptilia.

Cetiosaurus, 2 species.
Chelonia, 2 species.
Goniopholis crassidens, Owen.
Hylæosaurus armatus, Mant.
Iguanodon Mantelli, Meyer.
Megalosaurus Bucklandi, Mant.
Platemys Mantelli, Owen.
Poikilopleuron Bucklandi, Desl.
Streptospondylus major, Owen.
Suchosaurus cultridens, Owen.
Trionyx Bakewelli, Mant.
Tretosternon punctatum, Owen.

(Tennant, *Stratigraphical List of British Fossils.*)

WEAVER, THOMAS, F.R.S., an eminent geologist, was one of the band of scientific men, who, with the late Professor Jameson, the late Leopold von Buch, and Alexander Humboldt, learned the rudiments of mineralogy and geology under the tuition of Werner at Freiberg, where he commenced his studies in 1790. He was long a distinguished and active member of the Geological Society of London, particularly in its earlier days; and was elected a Fellow of the Royal Society on the 9th of March 1826. From 1795 to 1798, and again in 1801, he was concerned, with the gentlemen mentioned below, in the exploration, on account of the government, of the deposits of gold which had been discovered at Croughan Kinshella, in the county of Wicklow, in Ireland. An account of the discovery was given by John Lloyd, Esq., F.R.S., and a mineralogical account of the gold itself by Abraham Mills, Esq., both referring to Mr. Weaver, were published in the 'Philosophical Transactions' for 1796. A particular history of the proceedings of himself and his colleagues, in reference to the gold workings, was given by Mr. Weaver in his Memoir on the 'Geological Relation of the East of Ireland, inserted in the 'Transactions of the Geological Society,' first series, vol. v. He afterwards communicated a paper on the Gold-workings to the 'Philosophical Magazine' for July 1835 (Series 3, vol. vii., p, 1), giving some extracts from the Memoir, with new matter. In the 'Philosophical Transactions' for 1825, is a paper by Mr. Weaver, On the Fossil Elk of Ireland, in which he infers that that animal lived and flourished in the countries in which its remains are now found at a period of time which, in the history of the earth, may be considered as modern. In the Second Series of the 'Trans. Geol. Soc.,' vol. i., is an elaborate memoir by him, entitled 'Geological Observations on Part of Gloucestershire and Somersetshire,' and in vol. v., another, 'On the Geological Relations of the South of Ireland.' He communicated other papers, all on geological subjects, to the 'Annals of Philosophy,' Old and New Series, and subsequently to the 'Philosophical Magazine,' in which (Series 3, vol. ix.) appears a paper on the 'Carboniferous Series of the United States of North America,' a portion of the results of the geological and mining researches in Mexico and the United States in which he was engaged from 1831 to 1834. He died at his residence in Stafford-place, Pimlico, London, on the 2nd of July 1855, having retired from the field of science some years before.

WEBSTER, DANIEL, was born January 18, 1782, in the township of Salisbury, New Hampshire, United States of America. His father, Ebenezer Webster, was descended from Thomas Webster, a Scotchman, who settled at Hampton, on the coast of New Hampshire, in 1636. Ebenezer Webster served as a common soldier against the French and Indians, but rose to the rank of captain before the war terminated. He received in 1763 the grant of an allotment of land in the township of Salisbury, on the upper course of the river Merrimac, and there in 1764 built his log-cabin, when there was no other white man's habitation between it and the settlements at Montreal. He afterwards built a frame-house not far from his log-cabin, on the Elms Farm, and there Daniel Webster was born, and spent his childhood and much of his boyhood. His opportunities for early education were very scanty, working on the farm in summer, and trudging two or three miles through the snow to school in winter. In 1796 he was sent to an academy at Exeter, where he commenced his classical and literary studies. After remaining there a few months, which were well spent, he was placed by his father under the Rev. Samuel Wood, minister of the neighbouring town of Boscawen, with whom he remained from February till August 1797, when he entered Dartmouth College. He remained there four years, completing his college course in August, 1801. He then returned to Salisbury, and immediately commenced his law-studies in the office of a neighbouring attorney; but not long afterwards, in order to assist his elder brother, Ezekiel Webster, to obtain a college education, he took charge of a school at Fryeburg, in the State of Maine; and while this duty occupied him by day, he spent his evenings in copying deeds for the registrar of the county. In September 1802 he returned to the attorney's office at Salisbury, and there remained eighteen months.

In July 1804, Daniel Webster removed to Boston, and entered the office of Mr. Gore, an eminent lawyer, afterwards governor of Massachusetts, with whom he remained eight months, studying chiefly the common law, and particularly special pleading. When about to commence practice he was offered the situation, which had become vacant, of clerk in the Court of Common Pleas for the county of Hillsborough, New Hampshire, a situation to which a large salary was attached. By the advice of Mr. Gore, and in opposition to the wish of his father, who was a judge in the court, he rejected the offer. "Once a clerk," said Mr. Gore, "and always a clerk, with no prospect of obtaining a higher position." Immediately afterwards, in the spring of 1805, he was admitted to the practice of the law in the Court of Common Pleas for Suffolk county, when, in order to be near his father, whose health was then infirm, he opened an office at Boscawen, not far from the paternal residence. His father died in 1806. In May 1807, he was admitted as an attorney and counsellor of the Superior Court of New Hampshire, and in September the same year, relinquishing his office to his brother Ezekiel, he removed to Portsmouth, which was the largest town of New Hampshire as well as the seat of foreign commerce. Ezekiel Webster continued in the successful practice of the law till 1829, when, while pleading a cause in the court at Concord, he suddenly fell down, and expired instantaneously.

Daniel Webster remained at Portsmouth nine years. His practice, mostly in the circuit courts, was very large, but by no means lucrative. In 1808 he married his first wife, by whom he had two sons and two daughters, of whom only one son, Fletcher Webster, survived him. He is a naval officer of the port of Boston. In May 1813 Daniel Webster took his seat in congress as a representative of the Federal party of New Hampshire. Placed by Mr. Clay, the speaker, on the committee of foreign affairs, he made his first speech in the house of representatives, June 10, 1813, in moving a series of resolutions on the Berlin and Milan decrees. In a great fire which occurred at Portsmouth in December 1813, his house, furniture, library, and manuscript collections, were all destroyed. In August 1814 he was again returned as a representative to congress. From March to December 1815 he was busily engaged in the practice of the law at Plymouth, whence, in August 1816, after the adjournment of congress, he removed to Boston, where the causes for trial were of higher importance and the practice was more lucrative.

Mr. Webster retired from congress in 1817. He had purchased an estate of about 2000 acres at Marshfield, about thirty miles from Boston, and his time during the next six years was partly occupied with law business at Boston and partly with the cultivation of his estate. His favourite amusements were angling in the streams and fishing in his yacht. At the end of 1822 he was again elected for Boston, as he was also in 1824 and 1826. In 1827 his first wife died. In January 1828 he took his seat in the senate of the United States, having been elected by the legislature of Massachusetts. He was a candidate for the dignity of president in 1836, but received only the twelve votes of Massachusetts. In the spring of 1839 he visited Europe for the first and only time in his life, and made a hasty tour through England, Scotland and France. When General Harrison became president in 1841 Mr. Webster was appointed secretary of state. In 1842 he negotiated with Lord Ashburton the Oregon boundary, and the treaty which settled that question between Great Britain and the United States was ratified August 20, 1842. In May 1843 he resigned his situation as minister, and retired to private life, but was again elected senator in 1845. He opposed the war with Mexico in 1846, as he had previously opposed the annexation of Texas. In 1848 he was again a candidate for the Presidency, but was unsuccessful. On the death of General Taylor in July 1850, he was appointed secretary of state by Mr. Fillmore, and he continued to perform the duties of that high office till his death, which occurred October 24, 1852, at his country residence, Marshfield.

Daniel Webster, as a statesman, an orator, and a lawyer, was one of the greatest men that the United States of America have produced. As a statesman his principles were founded on comprehensive views and a wide range of information, legal, constitutional, and historical, but during his later years he was suspected of shaping his course too generally with a view to the presidency. He was a decided Federalist. He expressed his belief that if ever the union of the States should be dissolved, the internal peace, the vigorous growth, the prosperity of the States, and the welfare of their inhabitants, would be blighted for ever; but that while the Union endures, all else of trial and calamity which may befall the nation may be remedied or borne. He was undoubtedly the greatest American orator of his day. His power of fixing the attention and producing an overwhelming effect on a deliberative assembly was unequalled. His style was generally argumentative and solid, never deficient of imagery where suitable, but never flowery. Both as a parliamentary orator and a pleader his speeches were distinguished by extraordinary clearness, compactness, and condensation of statement, sound logic, and, when he was excited, by intense earnestness and vehemence. 'The Works of Daniel Webster,' 6 vols. 8vo, Boston, 1851, consist of his speeches in congress, at the bar, and at public meetings, his diplomatic papers, a few letters, and a Biographical Memoir by Edward Everett.

WEIGHTS AND MEASURES. [STANDARD, *S.* 2.]

WEISSITE. [MINERALOGY, *S.* 1.]

WELLINGTON, DUKE OF. Arthur Wellesley was born, as commonly stated, on the 1st of May, 1769, at Dangan Castle, in the county of Meath, Ireland; but in the registry of St. Peter's Church, Dublin, it is recorded that "Arthur, son of the Right Honourable Earl and Countess of Mornington," was there christened by "Isaac Mann, archdeacon, on the 30th of April 1769." It is probable therefore that he was born in March, at Mornington House, Dublin, the town residence of his parents. After the battle of Waterloo he kept his birthday on the 18th of June, the anniversary of that important victory. He was the third son of the first Earl of Mornington. [MORNINGTON, EARL OF.] The family name was originally Wesley, derived from Garret Wesley, of Dangan Castle, and so continued till 1797, when the name was altered to Wellesley by the first Marquis Wellesley. Arthur Wellesley was educated at Eton College, whence he was transferred to private tuition at Brighton, and afterwards to the military academy at Angers in France.

On the 7th of March 1787, the Hon. Arthur Wellesley received his first commission as an ensign in the 73rd regiment of foot. He was gazetted under the name of Wesley, and the young officer is so designated in contemporary descriptions of his early services. In December 1787 he was promoted to the rank of lieutenant in the 76th foot, from which, in the following month, he exchanged into the 41st, and on the 25th of June 1788 was appointed to the 12th Light Dragoons. On the 30th of June 1791 he became captain in the 58th Foot, and on the 31st of October 1792, obtained in exchange a troop in the 18th Light Dragoons. Captain Wellesley was gazetted as major in the 33rd Foot, April 30, 1793, and in the following September obtained by purchase the rank of lieutenant-colonel of that regiment. Before he commenced his career of active service he was attached as aide-de-camp to the staff of the Earl of Westmoreland, then lord-lieutenant of Ireland, and in 1790, having just come of age, he was returned as a member to the Irish parliament for the family borough of Trim, in the county of Meath.

Lieutenant-Colonel Wellesley, in command of the 33rd regiment, sailed from Cork for Flanders, on his first active service, in May 1794, and landed at Ostend to join the British army under the Duke of York, then in the Netherlands. The advance of the French army under Pichegru obliged the British, after several engagements, to retire into Holland, and take up a position on the right bank of the Waal. In January 1795 the retreat was continued by the town of Deventer, through Guelderland and Overyssel, to the river Ems, and thence to Bremen, where the army was re-embarked for England in the spring. During this arduous retreat through a frozen and cheerless country, in the middle of a winter remarkably severe, Lieutenant-Colonel Wellesley commanded a brigade in the rear-guard, and his able dispositions in checking or assaulting the enemy are specially noticed in contemporary accounts of the events.

In the autumn of 1795 the 33rd regiment embarked for the West Indies; but the ships, after being tossed at sea for six weeks, were obliged to put back into Portsmouth, and the 33rd regiment was landed again, and in April 1796 was embarked for India. Colonel Wellesley (for he had been promoted to the rank of Colonel in May of that year) was detained at home through illness, but he joined his regiment at the Cape of Good Hope, and proceeded with it to Calcutta, where he arrived in February 1797, and was placed on the Bengal establishment.

In May 1798, the Earl of Mornington, Colonel Wellesley's elder brother, arrived at Calcutta, having been appointed governor-general of India on the 4th of October 1797. One of the first objects that required his attention was the equivocal attitude of Tippoo Saib, sultan of Mysore, towards the English. In the month of June a proclamation of the French governor of the Isle of France announced the arrival of two ambassadors from Tippoo, to propose an alliance offensive and defensive for the purpose of expelling the English from India, in consequence of which a number of Frenchmen volunteered to join the sultan, and were taken to Mangalore in a French ship of war. These movements of Tippoo were connected with the French expedition to Egypt. The Earl of Mornington wrote several conciliatory letters to Tippoo, to induce him to settle any pending controversy between him and and the East India Company by means of negociation, but at the same time he did not neglect to prepare for offensive operations, and in November an army was assembled at Vellore, under the command of General Harris, ready to enter the territory of Mysore at the first notice. Colonel Wellesley, with his regiment, formed part of this force. The army was joined by a large contingent from the Nizam of the Deccan, an ally of the English; and as the court of Hyderabad expressed a wish that the brother of the governor-general should be appointed to the command of the contingent, General Harris ordered the 33rd regiment to be attached to the Nizam's force, the general command of which was given to Colonel Wellesley. As Tippoo declined to enter into negociations, and was evidently trying to gain time, the allied British and native army was ordered to advance into Mysore, which they entered early in March 1799. On the 27th an engagement took place, in which the left wing of the allies, under Colonel Wellesley, routed a body of Tippoo's choice infantry. The army then advanced to Seringapatam, Tippoo's capital, and Colonel Wellesley was employed to dislodge the enemy from some strong posts in front of the town, which he executed in gallant style, and without loss. The siege of Seringapatam followed, and on the 4th of May the place was stormed by a party under General Baird. After the storming was over, and the confusion began to subside, General Baird desired to be relieved, and Colonel Wellesley was ordered to take the command of the place. By his exertions and firmness he succeeded in stopping the plunder within the town. Tippoo Saib was slain.

In July 1799 Colonel Wellesley was appointed governor of Seringapatam, then the capital of Mysore. During several years that he held almost vice-regal command in Mysore he was fully occupied in organising the civil and military administration of the country, and in the execution of this task he improved his natural talents for business, military and civil, and displayed that quickness of perception and decision of character which have characterised him throughout the whole course of his military career. From the beginning also he paid particular attention to the wants of his soldiers, to the regularity of the supply of provisions, to the management of the hospitals, and to all the particulars of the Commissariat and Quartermaster-General's departments, which constitute half the business of an army, and, to use his own words, if neglected, "misfortune and disgrace will be the result." In the mean time also, by his justice and humanity, and the strict discipline that he maintained among the troops, he acquired the confidence and respect of the native population of Seringapatam.

Whilst thus employed in Mysore he was obliged to take the field against one of those bold adventurers, once common in India, named Dhoondia Waugh, who had got together 5000 horsemen, partly from Tippoo's disbanded cavalry, and partly from other predatory bands, and who styled himself 'King of the Two Worlds.' Colonel Wellesley, after a harassing chase of two months, came up with him on the 10th of September 1800, immediately attacked him, and put his army to the rout by a single charge, in resisting which Dhoondia himself was slain. In December of the same year Colonel Wellesley was appointed by the governor-general in council to command a body of about 5000 troops assembled at Trincomalee, in the island of Ceylon, for foreign service, and he accordingly proceeded from Mysore to Trincomalee. The expedition was said to be intended either for Batavia or the Isle of France. Meantime despatches from England arrived, directing 3000 men to be sent to the Red Sea to act against the French in Upper Egypt, whilst an expedition from Europe, under Sir Ralph Abercrombie, was attacking Lower Egypt. The governor of Madras sent Colonel Wellesley a copy of the despatches from home, and as he knew that his brother, the governor-general, when he ordered the assembling of the force at Trincomalee, had some expectation of its being required for Egypt, Colonel Wellesley, upon his own responsibility, moved at once the whole force to Bombay, where it could be supplied with provisions and other necessaries previous to sailing to the Red Sea, and where he would be ready to receive final orders from the governor-general. He sailed from Trincomalee about the middle of February 1801, and arrived at Bombay about the middle of March. The governor-general had appointed General Baird to command the Egyptian expedition, leaving to his brother the choice of going under him as second in command, or retaining his own command in Mysore. When Lord Mornington learnt that Colonel Wellesley was at Bombay with the whole Trincomalee force, he could not disapprove of this movement, as he had himself intended to send to the Red Sea a larger body of men than that mentioned in the home despatches, but still he thought it ought not to be set up as a precedent, and he required an official explanation of the grounds and motives which had induced his brother thus to act upon his own judgment, without waiting for orders. Colonel Wellesley stated his motives at full length, in a letter, dated Bombay, March 23, 1801. ('Despatches,' vol. i.) He intended to have proceeded to the Red Sea, and to have served under General Baird; but on the 25th of March he was seized with fever, and soon afterwards returned to his government in Mysore. Before leaving Bombay he transmitted to General Baird a memorandum which he had written concerning the operations in the Red Sea, evincing the research and reflection which he had bestowed on his anticipated command.

Colonel Wellesley made a second stay in Mysore of nearly two years. He was raised to the rank of Major-General in April 1802, and in February 1803 he was appointed to command a force intended to march into the Mahratta territory.

Civil war raged between the Mahratta chiefs Holkar and Scindia. The Peishwa, the nominal head of the Mahratta confederation, was looked upon as an instrument in the hands of the strongest. Dowlut Rao Scindia, who ruled over Malwa and Candeish, had an army of regular infantry and artillery, which had been formed by his father, with the assistance of M. de Boigne, a native of Savoy, and was now under the direction of a French officer of the name of Perron. Scindia exercised paramount influence over the Peishwa at Poonah. Holkar, another ambitious chieftain, who had long been at variance with Scindia, suddenly crossed the Nerbudda and marched with a large cavalry force on Poonah, which he entered after defeating the combined army of Scindia and the Peishwa. The Peishwa escaped to the coast, and put himself under British protection, whilst Holkar placed one of his relations on the seat of power at Poonah.

The Madras army, under Lieutenant-General Stuart, was ordered to advance into the Mahratta territory for the purpose of re-instating the Peishwa, and Major-General Wellesley was appointed to command a select corps in advance, with which he marched rapidly upon Poonah. Having received information on the road that Holkar's people intended to burn the town on his approach, he moved on with the cavalry, and, performing a march of 60 miles in 30 hours, reached Poonah on the 20th of April, and thus saved the town. Holkar's people retired without fighting, and in the following month the Peishwa re-entered his capital. Scindia however and the Raja of Berar, another powerful Mahratta chief, were together in the field making hostile demonstrations against the English and their ally the Nizam, and they were understood to be in correspondence with Holkar, who was to join the league. Seeing this state of affairs, which was yet more dangerous at a moment when by the peace of Amiens the French had just recovered their Indian possessions, the governor-general appointed General Wellesley to the chief command of all the British and allied troops serving in the territories of the Peishwa and the Nizam, with full power to direct all the political affairs of the British government in the same district. ('Despatches,' Fort William, 26th and 27th of June, vol. ii.) The force at his command consisted of about 10,000 troops of all arms, Europeans and natives, including the 19th Dragoons, and the 74th Foot. After some fruitless negociations with Scindia, General Wellesley marched from Poonah to the north, and took by escalade the town of Ahmednuggur, which was garrisoned by Scindia's troops. On the 24th of August he crossed the river Godavery, and entered Aurungabad on the 29th. The enemy manifested an intention to cross the river to the eastward and steal a march upon Hyderabad, but were prevented by General Wellesley marching along the left bank of the river, and placing himself between them and that city. On the 12th of September the British general was encamped 20 miles north of the Godavery. Colonel Stevenson, with the Nizam's auxiliary force, was at some distance from him. Scindia, who had a large mass of irregular cavalry, avoided a general engagement, being afraid of British discipline, and only thought of carrying on a predatory warfare.

About the middle of September, General Wellesley learnt that Scindia had been reinforced by 16 battalions of infantry commanded by French officers, and a large train of artillery, and that the whole of his force was assembled near the banks of the small river Kaitna. On the 21st of September General Wellesley had a conference with Colonel Stevenson, in which a general plan of attack on the enemy was concerted. The General and the Colonel advanced by two parallel routes round the hills, so as to fall at the same time upon the enemy. General Wellesley on the 23rd received a report that Scindia and the Raja of Berar had moved off in the morning with their cavalry, and that the infantry were about to follow, but were still in camp at the distance of about six miles. General Wellesley determined to march upon the infantry, and engage it at once. He sent a messenger to

Colonel Stevenson, then about eight miles on his left, to inform him of his intention, and directing his advance. He moved forward with the 19th Light Dragoons and three regiments of native cavalry to reconnoitre. The infantry, consisting of two British and five native battalions, followed. After a march of about four miles he saw from an elevated plain not only the infantry, but the whole Mahratta force, consisting of nearly 50,000 men, encamped on the north side of the river Kaitna; the right, consisting of cavalry, was about Bokerdon, and extended to their corps of infantry, which was encamped near the village of Assaye, with 90 pieces of artillery. General Wellesley determined on attacking the infantry on its left and rear. He moved his little army to a ford beyond the enemy's left, and, leaving the Mysore and other irregular cavalry to watch that of the enemy, he crossed the river with his regular horse and infantry, and having ascended the bank, which was steep, formed his men in three lines, two of infantry, and the third of cavalry. This was effected under a brisk cannonade from the enemy's guns. Scindia at the same time made a corresponding movement in his line, by giving a new front to his infantry, which was made to rest its right upon the river Kaitna, and its left upon the village of Assaye and the Juah stream. His numerous and well-served cannon did fearful execution among the British advancing lines. General Wellesley, seeing this, gave orders to abandon the artillery, and for the infantry to charge with the bayonet. The charge proved irresistible on the right and centre of the enemy; the British took possession of the guns, and the enemy's infantry gave way. But the British right suffered a very severe loss from the guns at the village of Assaye, and the enemy's cavalry, seeing the gaps thus made in the ranks, charged the 74th regiment, when Colonel Maxwell, with the 19th Dragoons, rode to its rescue, and drove back the assailants with great loss. The native infantry in the British service proceeding too far in the pursuit, many of the enemy's artillerymen, who had thrown themselves down among the carriages of their guns, as if they were dead, turned their pieces against the advancing infantry, and at the same time several of Scindia's battalions formed themselves again, thus placing the sepoys between two fires. Colonel Maxwell charged and dispersed those battalions, but he lost his life. The 78th British regiment, which was on the left of the line, remained firm with unbroken ranks in the midst of the confusion, and contributed greatly to check the enemy. General Wellesley led the regiment in person against the village of Assaye, where the enemy made the stoutest resistance, but at last gave way. It was near dark when the firing ceased. The enemy retired in great disorder, leaving behind the whole of his artillery, ammunition, and stores. Colonel Stevenson arrived on the field after the battle, and undertook the pursuit. The loss of the united army, British and native, in this splendid victory consisted of 22 officers and 386 men killed, and 57 officers and 1526 men wounded, in all nearly one-third of the force engaged, exclusive of the irregular cavalry. The enemy left more than 1200 dead, and a great number of wounded on the field of battle. General Wellesley had two horses killed under him, and his orderly's head was torn away by a cannon-ball as he rode beside him.

While General Wellesley was defeating the Mahrattas in the south, General Lake gained a complete victory at Allyghur, in the plains of Hindustan, over another part of their force under M. Perron, which had occupied Delhi. The Mahratta power was now broken, and after several marches and countermarches, and desultory negociations, Scindia asked and obtained a truce at the beginning of November; but the Raja of Berar still kept the field, and General Wellesley, coming up with him in the plains of Argaum, found Scindia's cavalry, together with the Raja's forces, drawn up in battle array. The battle of Argaum was fought November 29, 1803. The British line advanced in the best order. The 74th and 78th regiments were attacked by a large body of Persian mercenaries in the service of the Raja of Berar, which was entirely destroyed. Scindia's cavalry charged one of the Company's regiments, and was repulsed, when the whole Mahratta line retired in disorder, leaving 38 pieces of cannon and all their ammunition in the hands of the British. The British cavalry pursued the enemy for several miles, taking many elephants, camels, and much baggage. Colonel Stevenson soon after took by storm the strong fort of Gawilghur, and this exploit concluded the campaign. The Raja of Berar now sued for peace, and General Wellesley drew up the conditions of the treaty, by which the Raja ceded to the Company the province of Cuttack with the district of Balasore, and dismissed his European officers. Scindia was glad to follow the example, and on the 30th of December he signed a treaty of peace, by which he ceded to the Company all the country between the Jumna and the Ganges, besides numerous forts. In February 1804, General Wellesley crossed the Godavery to put down the independent freebooting parties which were carrying devastation through the West Deccan. Following them rapidly from hill to hill, he gradually dispersed them, and took their guns, ammunition, and baggage. Peace was thus restored to the peninsula of India.

In March, 1804, General Wellesley paid a visit to Bombay, where he was received with marked honour and loud acclamations, and an address of the British inhabitants of Bombay was presented to him, as a commander "equally great in the cabinet as in the field." The British inhabitants of Calcutta voted him a sword of the value of 1000*l.*, and the officers of the army of the Deccan presented him with a service of plate of the value of 2000 guineas, with the inscription, "Battle of Assaye, September 23, 1803."

On the 24th of June 1804, General Wellesley broke up the army in the Deccan, in pursuance of orders from the governor-general, and the following month he returned to Seringapatam, where he received from the native inhabitants an affecting address, in which they "implored the God of all the castes and all nations to hear their constant prayer, whenever greater affairs might call him away from them, to bestow on him health, glory, and happiness." ('Dispatches,' vol. iii., p. 420.) It may be here observed that during the whole of his career in India, as afterwards in the Spanish peninsula, General Wellesley, ever firm and just, shewed himself always inclined to humanity and mercy whenever they could be exercised without detriment to justice or to the safety of others; and of this humane disposition his 'Dispatches' contain numerous instances.

In July 1804, General Wellesley was called to Calcutta to assist in military deliberations. Several important memoranda on the political and military affairs of India, which are given in the third volume of the 'Dispatches,' were written by him about this period. In November of the same year he left Calcutta for Madras, whence he returned to Seringapatam. In February 1805 he again repaired to Madras, and obtained leave to return to England. About the same time his appointment by the king to be a Knight Companion of the Order of the Bath was known in India, and published in the general orders; and in the following March the thanks of both Houses of Parliament to Major-General Wellesley, for his services, were likewise published in the general orders in India. On the 10th of March 1805 Sir Arthur Wellesley sailed from Madras for England.

General Sir Arthur Wellesley landed in England in September 1805. In November of the same year he was sent to Hanover in command of a brigade in the expedition under Lord Cathcart, which was intended to make a diversion whilst the French army was engaged on the banks of the Danube against Austria and Russia. The tergiversation of the Prussian cabinet, and the disastrous battle of Austerlitz (December 1805), disconcerted the plans of the allies, and the English returned from Hanover to England in February 1806, without having seen any active service. Sir Arthur Wellesley was now appointed to the command of a brigade of infantry stationed at Hastings. In January 1806, when the news was received of the death of the Marquis of Cornwallis, he was appointed Colonel of the 33rd regiment. On the 10th of April 1806, he married Lady Catherine Pakenham, third daughter of the Earl of Longford. In that year he was elected member for the borough of Rye, and from his seat in the House of Commons he defended the administration of his brother the Marquis of Wellesley in India. In April 1807 Sir Arthur Wellesley was appointed secretary for Ireland, the Duke of Richmond being lord-lieutenant of Ireland, and in that capacity was sworn a member of his Majesty's Privy Council. In August of the same year he was appointed to a command in the expedition sent to Copenhagen, under Lord Cathcart and Admiral Gambier. On the 29th of August General Wellesley's division attacked the Danish troops at Kioge, carried their entrenchments, and entered the town of Kioge, where they took a large military store and nearly 1200 prisoners. This was the only action of any importance which took place by land. The bombardment of Copenhagen having induced the Crown Prince of Denmark to listen to terms, General Wellesley was appointed by Lord Cathcart, together with Lieutenant-Colonel Murray and Sir Home Popham, captain of the fleet, to draw up the articles of the capitulation, which were agreed to by the Danish government on the 7th of September, and by which the Danish fleet and naval stores were delivered to the British government till the general peace. General Wellesley returned to England with the expedition, and resumed his duties as secretary for Ireland. In the following February (1808) he received in his place in the House of Commons, the thanks of that House for his important share in the success of the Copenhagen expedition, by which Napoleon was deprived of the assistance of the Danish fleet, upon which he had reckoned in his plans against England.

In the spring of 1808 a military force was assembled at Cork, intended, it was believed, to act against the Spanish colonies of South America, Spain being, through French influence, at war with England. But the invasion of Portugal and Spain by Napoleon, occurring about the same time, gave a new destination to the English expedition. The people of Spain declared against the invaders, and sent to England to ask for assistance. Juntas, or local governments, were formed, and peace was proclaimed between Spain and England. The main strength of the Spanish patriots appeared to be in the north, in the mountainous provinces of Asturias and Galicia, which were as yet untouched by the French, and the deputies who came to England from those provinces requested the employment of an English auxiliary force to effect a diversion by landing on some point of the coast of Portugal. Sir Arthur Wellesley, who had been promoted to the rank of Lieutenant-General, April 25, 1808, was appointed in the following June to the command of the force intended for the Peninsula, consisting of about 9000 infantry and a regiment of light dragoons, with the promise of an additional force of 10,000 men to follow in a short time. These formed altogether a respectable military force, but the importance of the occasion warranted exertions even greater than these, for the Spanish peninsula had now become the field on which the great question was to be decided whether France was to govern Europe, and dictate to all other states, Great Britain included.

Sir Arthur Wellesley landed at Coruña July 20, 1808. The junta of Galicia asked for nothing but arms and money. They declined the assistance of a British auxiliary force, but they advised General Wellesley to land in Portugal, to rescue that kingdom from the French grasp, and thus to open a ready communication between the north and south of Spain. This was in accordance with Sir Arthur Wellesley's own views, and the general instructions that he had from home. He accordingly sailed on to Oporto, which town had already risen against the French; and there he found the warlike bishop, who was at the head of the insurrection, and had gathered together about 3000 men indifferently armed and equipped. He also learned that 5000 Portuguese regular troops were stationed at Coimbra, on the Mondego. Having made arrangements with the bishop for the supply of mules and horses, General Wellesley sailed to the south as far as the Tagus to get fresh information as to the strength and position of the French troops near Lisbon. On the 30th of July, he anchored in Mondego Bay, which he fixed upon for the landing of the expedition. The landing took place on the 1st of August, near the small town of Figueira, on the south bank of the Mondego. The number of troops landed was about 9000. On the 5th Major-General Spencer joined him from Cadiz with about 4000 more.

The French force in Portugal at the time, under Junot, consisted of 16,000 or 18,000 men, from which deducting the garrisons of Almeida, Elvas, Peniche, Setubal, and other places, there remained about 14,000 men for the defence of Lisbon. Their communications were cut off from their countrymen in Spain, for, since the surrender of General Dupont, the Spanish patriots were masters of Andalucia and Estremadura, and in Old Castile the French troops under Bessières had not advanced westward further than Benavente, being observed by the Spanish army of Galicia. About the same time the French abandoned Madrid and retired to the Ebro. A clear stage therefore was left for the contest in Portugal between Wellesley and Junot, whose respective disposable forces were nearly equal, the French however having the advantage of a considerable body of cavalry.

On the 9th of August the English began their march southward. The advanced guard entered the town of Leiria on the 10th, where it found the Portuguese force of 5000 men under General Freire, who, having appropriated to the wants of his men the stores which, by an agreement between the junta of Oporto and Sir Arthur Wellesley, were intended for the English, further demanded that his corps should henceforth be furnished with provisions by the English commissariat, a preposterous request with which General Wellesley declined to comply. Freire then refused to advance with the English, but remained behind at Leiria, and was with difficulty prevailed upon to allow about 1600 of his men to join Sir Arthur. On the 14th the English entered Alcobaça, and on the 15th Caldas, following the road to Torres Vedras, which runs parallel to the sea-coast. It was near Roliça, about ten miles beyond Caldas, that the first engagement took place. But before relating the operations of the campaign, it will be convenient to describe the position of the French in Portugal.

When the Spaniards had risen against the invaders, the spirit of resistance spread to Portugal, the natives of which country had equal motives for being dissatisfied with the French rule. The French had with their army several Spanish regiments, which were scattered about the country in the several garrisons. The Spanish troops which were at Oporto, forming the principal part of that garrison, hearing of the news from Spain, revolted against the French commander, seized him, together with the few French soldiers that he had with him, and set off with their prisoners for Spain, leaving the Portuguese at liberty to act as they pleased. A junta was then formed, with the bishop at their head, in the name of the Prince Regent of Portugal, and the whole of the provinces north of the Douro rose against the French. The insurrection spread southward into Beira. In the south the people of Algarve rose, and those of Alemtejo followed their example, being supported by a body of Spanish troops. The town of Evora became the centre of the insurrection in that quarter. The French General Loison, who had been sent to repress the insurgents in the north, was quickly recalled by Junot and sent into Alemtejo. He entered Evora after a desperate resistance on the part of the inhabitants, and the town was given up to indiscriminate massacre. General Margaron executed like vengeance at Leiria, sparing neither age nor sex. Similar scenes took place at Guarda in the north, and at Beja and Villaviçosa in the south. In these butcheries however the French were also losing their own men daily, for the peasantry were always hovering about their line of march, ready to cut off stragglers and intercept the communications. "The whole kingdom," observed Sir Arthur Wellesley in one of his first despatches after landing in Mondego Bay, "with the exception of the neighbourhood of Lisbon, is in a state of insurrection against the French. Their means of resistance are however less powerful than those of the Spaniards. The Portuguese troops have been completely dispersed, their officers have gone off to Brazil, and their arsenals are pillaged or in the power of the enemy. Their revolt, under the circumstances in which it has taken place, is still more extraordinary than that of the Spanish nation. They have in the northern part of the kingdom about 10,000 men in arms, of which number 5000 are to march with me towards Lisbon, the remainder are employed in a distant blockade of Almeida, and in the protection of Oporto, which is now the seat of the government. The insurrection is general throughout Alemtejo and Algarve to the southward, and in Entre Douro e Minho, Tras-os-Montes, and Beira, to the northward; but for want of arms the people can do nothing against the enemy."

The French commander-in-chief, Junot, on the news of the landing of the English, determined to abandon the provinces, except the fortresses of Elvas and Almeida, and to collect his force in the neighbourhood of Lisbon. He sent a division of about 5000 men, under De Laborde, towards Leiria, to keep the English in check; and he ordered Loison, who had returned from his expedition into Alemtejo, and had crossed the Tagus at Abrantes, to join De Laborde at Leiria. But the rapid advance of the English obliged De Laborde to fall back before he could be joined by Loison, and now De Laborde determined to make a stand alone in the favourable position of Roliça, hoping every moment to see Loison appear on his right.

General Wellesley, having driven the enemy's pickets from Obidas, marched on the 17th of August to attack De Laborde. He formed his army into three columns: the right consisting of Portuguese was ordered to make a demonstration on the enemy's left; the left to ascend the hills on the nemy's right, and thus watch the approach of Loison; and he centre, which was the column of attack, to march along he valley to the front of De Laborde's position. The French, after a gallant defence, were obliged to retire, which hey did in good order, being protected by their cavalry. They withdrew to Torres Vedras, where they were joined by Loison's corps. The loss of the French in the engagement at Roliça was supposed to be above 600 killed and wounded, besides three pieces of cannon; that of the British was 480. It must be observed here, once for all, that the osses of the French throughout the war were never accuately known, as they published no returns, whilst the British official returns of killed, wounded, and prisoners, made by he respective officers in command of regiments after a battle, were always published in the 'Gazette.'

On the 18th of August General Wellesley advanced to Lourinha, keeping along the coast-road leading to Mafra. On the 19th he moved to Vimiero, where he was joined he next day by Generals Anstruther and Ackland, with wo brigades just arrived on the coast from England, and which raised his force to about 17,000 British, besides 1600 Portuguese. At the same time, however, General Wellesley was superseded in the chief command by Lieutenant-General Sir Harry Burrard, who arrived from England. The government at home had determined, in consequence of the propiions appearance of affairs in the Peninsula, to have there an army of 30,000 British troops, and with that view they ordered the corps of Lieutenant-General Sir John Moore, which had just returned from a fruitless expedition to the Baltic, to proceed to Portugal; and they gave the chief command of the army to Lieutenant-General Sir Hew Dalrymple, governor of Gibraltar, with Sir Harry Burrard under him as second in command; and Lieutenant-Generals Sir John Moore, Sir Arthur Wellesley, the Hon. John Hope, Lord Paget, and Mackenzie Frazer, to command respectively divisions of the army.

Sir Harry Burrard arrived in a frigate in Maceira Bay, near Vimiero, on the evening of the 20th, and General Wellesley immediately went on board, and reported to him he situation of the army, and his own intended plan of operations, which was to march along the coast-road to Mafra, and thus turn the strong position which De Laborde and Loison had taken at Torres Vedras. By this means he would oblige the French either to give battle or retreat to Lisbon under great disadvantages. Sir Harry Burrard however decided not to advance any farther till the arrival of he reinforcements under Sir John Moore. But the enemy n the meantime was bringing the question to a speedy ssue.

Junot, having joined De Laborde and Loison at Torres Vedras with all his force, estimated at about 14,000 men, of whom 1600 were cavalry, attacked the English in the position of Vimiero early in the morning of the 21st of August. The principal attack was made upon the British centre and left, with a view, according to a favourite French expression in hose times, of driving the English into the sea, which was close in their rear. The attack was made with great bravery and steadiness, but was as gallantly repulsed by the British; t was repeated by General Kellerman at the head of the French reserve, which was also repulsed; and the French, being charged with the bayonet, withdrew on all points in confusion, leaving many prisoners, among them a general officer, and 14 cannon, with ammunition, &c., in the hands of the British. The loss of the French in killed and wounded was estimated at about 1800, and that of the British was 720. Sir Harry Burrard landed, and was present on the field during part of the engagement, but he declined assuming the command, or in any way interfering with General Wellesley's dispositions, till the enemy was repulsed. Towards the close of the action, when the French were seen etiring in confusion, General Wellesley wished to follow up his victory; General Ferguson on the left was actually close upon the retreating enemy, and if General Hill and the dvanced guard had marched straight upon Torres Vedras hey would have reached it before the French, who would hus have been cut off from Lisbon, and perhaps obliged to ay down their arms. Such was Sir Arthur's view; but Sir Harry Burrard thought it advisable not to move any farther, especially on account of the superiority of the enemy's cavalry. General Ferguson was ordered to desist from pursuit, and the French officers were thus enabled to rally their men, and make good their retreat to Torres Vedras.

On the 22nd of August Sir Hew Dalrymple, the commander-in-chief, landed in Maceira Bay, and assumed the command. In the course of the day General Kellerman appeared with a flag of truce on the part of Junot to propose an armistice, preparatory to entering upon a convention for the evacuation of Portugal by the French. The terms were discussed between General Kellerman and Sir Hew Dalrymple, who in the end directed General Wellesley to sign the armistice. Among the articles there was one which prejudged the terms of the final convention by stipulating that the French army should not "in any case" be considered as prisoners of war, and that all the individuals composing it should be carried to France with arms and baggage, and "their private property of every description, from which nothing should be detained!" This, of course, would include the church plate and other public and private property which the French had taken either at Lisbon or in the various towns which they had sacked in consequence of the insurrection, and which they had divided among themselves. General Wellesley did not "entirely approve of the manner in which the instrument was worded;" but the articles being laid before the commander-in-chief, were signed by him that same evening. The armistice however was made subject to the approbation of the Admiral, Sir Charles Cotton; and as one article of it stipulated that the Russian fleet in the Tagus, under Admiral Siniavin, should enjoy all the advantages of a neutral port, Sir Charles objected to this, but offered to enter into a separate arrangement with the Russian admiral. On the 25th Sir Hew Dalrymple signified to Junot that the armistice would be at an end on the 28th at noon, unless a convention for the evacuation of Portugal by the French should be agreed upon before that day. In the mean time the army had made a forward movement from Vimiero to Ramalbal, near Torres Vedras, within the boundaries stipulated by the armistice. Sir John Moore had also arrived in Maceira Bay, and his troops were about being landed. Junot, now perceiving the necessity of coming to terms, commissioned General Kellerman to confer with Colonel Murray, quartermaster-general to the British army, about the final convention. The favourable moment for pushing upon the French was now past; and if they could not be brought to evacuate the country by sea, they might either defend themselves within Lisbon, or cross the Tagus to Elvas, which, being a place regularly fortified, would have required a long siege, during which the British army could not have been made available in Spain. ('Dispatches,' iv., p. 120.) General Wellesley handed to Sir Hew Dalrymple a memorandum for Colonel Murray, suggesting, among other things, a separate agreement with the Russian admiral, and the propriety of devising some mode to make the French give up the Church plate which they had seized. On the 29th the draft of the proposed convention was brought to the British head-quarters at Torres Vedras, and, being laid before a meeting of general officers, several alterations were made, and the form so altered was returned to Junot, and was at last signed by him on the 30th, with the omission of several of the alterations, and was ratified by Sir Hew Dalrymple on the 31st. Sir Arthur Wellesley was not present at the final ratification, being then at Sobral with his division. This document has become known by the name of the Convention of Cintra, though it was arranged at Lisbon, and finally ratified at Torres Vedras. The article which gave most offence was that by which the French, under the name of baggage, were allowed to carry off much of the plunder of Portugal. Some limits however were put to this abuse by a commission being appointed, with General Beresford at the head, to superintend the strict execution of the terms of the convention. Through the exertions of the commissioners the spoils of the Museum and the Royal Library were restored, together with the money taken from the public treasury. With regard to the Russian fleet, it was agreed that the ships should be held as a pledge by Great Britain during the war, and that the crews should be conveyed home in British ships.

The French embarked in the month of September, and the British troops took possession of the forts of Lisbon in the name of the Prince Regent of Portugal. The whole country being now free from the enemy, a council of regency was appointed, of which the active Bishop of Oporto was a member. The joy of the Portuguese in general was manifested in the most unequivocal manner. But in England the terms of the convention were the subject of severe and loud censure, and the government appointed a board of inquiry to examine into the matter. Sir Hew Dalrymple and

Sir Harry Burrard were recalled in order to be examined by the Board, as well as Sir Arthur Wellesley, who had already asked and obtained leave to return to England. The court sat in the month of November, and, after a long examination, reported that, the Convention of Cintra having been productive of great advantages to Portugal, to the army and navy, and to the general service, the court was of opinion that no further military proceeding was necessary on the subject, "because, however some of us may differ in our sentiments respecting the fitness of the convention in the relative situation of the two armies, it is our unanimous declaration that unquestionable zeal and firmness appear throughout to have been exhibited by Lieutenant-Generals Sir Hew Dalrymple, Sir Harry Burrard, and Sir Arthur Wellesley, as well as that the ardour and gallantry of the rest of the officers and soldiers on every occasion during this expedition have done honour to the troops and reflected lustre on your Majesty's arms." The king adopted the opinion of the board.

Sir Arthur Wellesley's employment in the Peninsula being now terminated, he resumed the duties of his office as Chief Secretary for Ireland, whither he proceeded in the month of December. Parliament having re-assembled in January 1809, he returned to London to resume his seat in the House of Commons. On the 27th of January he received, through the Speaker, the thanks of the House for his distinguished services in Portugal; and, a few days afterwards, the House of Lords passed resolutions to the same effect, which were communicated to Sir Arthur by the Lord Chancellor.

Campaign of 1809.—Napoleon, with an army of more than 200,000 men, having burst through the Spanish lines, and routed the troops, forced in person the strong pass of the Somosierra on the 30th of November 1808, and four days afterwards was in possession of Madrid. Meantime, Soult, with an overwhelming force, had been sent against Sir John Moore, who had advanced into Spain as far as Salamanca. This movement was followed by the disastrous retreat of the small army under Sir John Moore, the battle of Coruña, January 16, 1809, in which the heroic commander was slain, and the embarkation of the British forces for England. The French, following up their success, spread over Leon and Estremadura to the borders of Portugal, and Soult, having overrun Galicia, marched into the northern Portuguese provinces, and carried Oporto by storm against the native troops. The small British force which had been left in Portugal when Sir John Moore advanced into Spain was concentrated by General Sir John Cradock for the defence of Lisbon. The unfavourable turn of affairs in Spain induced the British government to make another effort to save Portugal from invasion, and at the same time to assist the Spaniards in their momentous struggle. Sir Arthur Wellesley, having previously resigned his office of Secretary for Ireland as well as his seat in parliament, was sent to Portugal to assume the chief command of the British forces in the Peninsula. He arrived at Lisbon April 22, 1809, with his staff. He was followed by reinforcements of infantry and several regiments of cavalry. These, together with the Portuguese regulars under General Beresford, whom the Prince Regent had appointed to the chief command of his army, enabled him to bring into the field a force of about 25,000 men, with which he marched at the end of April to dislodge Soult from Oporto, leaving a division under General Mackenzie on the Tagus to guard the eastern frontiers of Portugal against the French General Victor, who was stationed near Merida, in Spanish Estremadura. The army under General Wellesley, having assembled at Coimbra, moved on the 9th of May in the direction of Oporto, and drove back the French troops, which had advanced south of the Douro. On the 11th of May the English occupied the southern bank of that river opposite the city of Oporto. The French had destroyed the bridges and removed the boats to their own side, and Soult was preparing to retire leisurely by the road to Galicia.

General Wellesley sent a brigade under General Murray to pass the river about four miles above Oporto, whilst the brigade of Guards was directed to cross the river at the suburb of Villanova, and the main body under the commander-in-chief was to attempt a passage in the centre by means of any boats that they could find. The Douro at that spot is very rapid, and nearly three hundred yards wide. About ten o'clock in the morning of the 12th of May, two boats having been discovered, General Paget with three companies of the Buffs crossed the river, and got possession of an unfinished building on the Oporto side, called the Seminario. The French in Oporto were taken by surprise. They sounded the alarm, and marched out to attack the Seminario, but, before they could dislodge the first party that had landed, General Hill crossed with fresh troops, and, protected by the British artillery from the southern bank, maintained the contest with great gallantry, until General Sherbrooke with the Guards crossed lower down into the very town of Oporto, amidst the acclamations of the inhabitants, and charged the French through the streets. Meantime the head of Murray's column, which had crossed at Avintas, making its appearance, Soult ordered an immediate retreat, which was effected in the greatest confusion. He left behind his sick and wounded and many prisoners, besides artillery and ammunition, and retired by Amarante with the view of passing into Spain through Tras-os-Montes; but finding that Loison had abandoned the bridge of Amarante, which was taken possession of by the Portuguese, he marched by Guimaraens, Braga, Salamonde, and Montalegre, into Galicia. In this disastrous retreat the French were obliged to destroy the remainder of their artillery and part of their baggage, and the road was strewed with dead horses and mules, and French soldiers, many of whom were put to death by the peasantry before the advanced guard of the British could save them.

Soult lost about one-fourth of his army, but the retreat was effected with great ability under the most unfavourable circumstances. General Wellesley pursued the French as far as Montalegre, and, having driven them out of Portugal, retraced his steps to the south. The passage of the broad and rapid Douro, effected in broad day, in presence of a French marshal at the head of 10,000 veterans, was one of Wellington's finest achievements. The English lost in the attack of Oporto only 23 killed and 98 wounded.

On taking possession of Oporto, General Wellesley issued a proclamation, strictly enjoining the inhabitants to respect the French wounded and prisoners, and he wrote to Marshal Soult to request him to send some French medical officers to take care of their sick and wounded, as he did not wish to trust them to the Portuguese.

The attention of Sir Arthur Wellesley was now turned towards Spain. It was necessary to strike a blow in that country, and the present occasion appeared favourable. The condition of the national cause of Spain had improved since Napoleon had left that country in January. None of his generals had individually the same means that he had at his disposal, and there was not a sufficient bond of union among them all to make them act in concert. Each had a separate command over a large division of the country, and was in a great measure independent of the others, and Joseph Bonaparte, who had been established in Madrid as king of Spain, had little or no control over them, and had not himself sufficient military skill to direct their movements. Each marshal therefore, and there were five or six in the Peninsula, acted by himself, and the warfare became complicated and irregular. Marshal Victor, Duke of Belluno, commanded the first corps in Estremadura, near the borders of Portugal, having about 35,000 men, of whom however only 25,000 were under arms. General Sebastiani commanded the fourth corps in La Mancha, which mustered about 20,000 men under arms. A division of reserve under Dessolles stationed at Madrid, together with King Joseph's guards, amounted to about 15,000 men. Kellerman's and Bonnet's divisions, stationed in Old Castile and on the borders of Leon and Asturias, comprised about 10,000 more. All the above troops, amounting to about 60,000 disposable men, were considered to be immediately under King Joseph for the protection of Madrid and of Central Spain, and also to act offensively in Andalucia and against Portugal by the Tagus and the Guadiana. Soult had a distinct command. He had mainly to occupy the northern provinces of Spain, and to act through them against Portugal. He had under his immediate orders the second corps, mustering about 20,000 men under arms; the fifth, or Mortier's corps, amounting to 16,000; and Ney, with the sixth corps, also about 16,000. Soult's force in all was about 52,000 men in the field. These were the two French armies with which the English advancing from Portugal were likely to be brought into collision. Besides these there were in Eastern Spain the third and seventh corps, making together about [illegible] men, under Suchet and Augereau, who were pretty fairly employed in Aragon and Cataluña; and 35,000 more was scattered in the various garrisons and lines of communication.

The fortresses and fortified towns in the hands of the French were: 1st, on the northern line, San Sebastian, Pamplona, Bilbao, Santona, Santander, Burgos, Leon, and Astorga; 2nd, on the central line, Jaca, Zaragoza, Guadalajara, Toledo, Segovia, and Zamora; 3rd, Figueras, Rosas, and Barcelona, on the eastern coast. But Soult, after being driven out of northern Portugal, had withdrawn from Galicia; and Ney, following the same movement, completely evacuated that extensive province, including the forts of Coruña and Ferrol. A misunderstanding or disagreement between those two commanders led to the deliverance of Galicia; which was an important event in the war, for the French never regained that part of Spain.

Marshal Soult reached Zamora in the beginning of July, and hovered about the eastern frontiers of Portugal. Ney arrived at Astorga. Victor was posted between the Tagus and the Guadiana, his troops suffering much from malaria. Mortier, with the fifth corps, on the road from Zaragoza to Valladolid, received orders from France to halt; and the Imperial Guards, which Napoleon had ordered into Spain, and which had arrived at Vittoria, were hurriedly ordered to march to the banks of the Danube. This was in consequence of the Austrian war, which had just broken out. The French in Spain were now reduced to a state of inactivity, and Andalucia and Valencia were still untouched by them.

The Spanish armies, though always beaten in the open field, had been reorganised. General Cuesta, commanding the army of Estremadura, reckoned at 38,000 men, was posted on the Guadiana. This was the force with which General Wellesley had to co-operate in an advance from Portugal into Spain for the purpose of attacking Victor and attempting to reach Madrid. The British commander had not as yet seen a Spanish army in the field, and he could have no precise notion of its defective organisation and discipline. He however soon obtained that knowledge when he came in contact with Cuesta. But there was another obstacle which made him hesitate, and that was the difficulty of obtaining provisions and means of transport for his army in Spain. His letters during the whole of this campaign teem with painful details on this subject. The people, the local authorities, the generals, and the Junta, all seemed unanimous in their unwillingness to provide for the English, although sure to be amply repaid for their supplies. While Cuesta's army abounded with provisions and forage, Sir Arthur could not get enough to supply his men with half rations. "The French," he observes, "can take what they like, and will take it, but we cannot even buy common necessaries."

The British army entered Spain in the beginning of July by the road of Zarza la Mayor and Coria, and the head-quarters were at Plasencia on the 8th. Cuesta crossed the Tagus by the bridge of Almaraz, and the two armies made their junction at Oropesa on the 20th. Sir Robert Wilson, with the Lusitanian Legion, one Portuguese and two Spanish battalions, moved on to Escalona, about eight leagues from Madrid, threatening the rear of Victor's army, which was posted at Talavera de la Reyna. On the 22nd the combined Spanish and British armies attacked Victor's outposts at Talavera, and drove them in. The enemy would have suffered more if General Cuesta had not been absent from the field. The British columns were formed for the attack of the French position on the 23rd, as General Wellesley wished to attack Victor before he was joined by Sebastiani, but General Cuesta "contrived to lose the whole of the day, owing to the whimsical perverseness of his disposition."—(Dispatch to J. H. Frere, 24th of July, vol. iv., p. 526.) On the morning of the 24th Victor retired across the Alberche to St. Olalla on the Madrid road, and thence to Torrijos, where he was joined by Sebastiani's corps, and soon after by King Joseph in person, attended by Marshal Jourdan with the Guards and the garrison of Madrid. General Cuesta, who now seemed eager for battle, although General Wellesley recommended him to be very cautious in his movements, followed Victor to St. Olalla, and pushed his advanced guard to Torrijos, when the French attacked him briskly on the 26th, and obliged him to fall back upon the British, on the Alberche. On the 27th General Wellesley, expecting to be attacked, took up his ground in the position of Talavera.

The position of the English army was daily becoming more critical, for Soult was rapidly advancing from Salamanca, by the Puerto de Baños, upon Plasencia, in the rear of the British. General Wellesley had charged Cuesta to guard the mountain-pass of Puerto de Baños, but the Spanish general sent only 600 men thither, a force which of course proved insufficient to arrest Soult's march. General Wellesley did not know that Ney had unexpectedly evacuated Galicia, and was also advancing from Astorga upon the British left. Mortier also, with the 5th corps, was at Valladolid, ready to move forward; so that there were more than 50,000 fighting men of the enemy behind the mountains of Plasencia, ready to act on the left flank and rear of the British, who had besides 50,000 more in front of them. The British force in the field did not exceed 20,000. There were a few more battalions on their march from Lisbon to join the army, but they did not arrive till after the battle. The Spanish army of Cuesta mustered about 34,000 men, such as they were. The Portuguese regular troops, under Beresford, had remained to guard the north-east frontier of Portugal, towards Almeida. It had been previously agreed between General Wellesley, Cuesta, and the Spanish Supreme Junta, or Central Government, that General Venegas, who was at the head of the Spanish army of Andalucia, consisting of about 25,000 men, should march through La Mancha upon Madrid, whilst Wellesley and Cuesta were advancing by the valley of the Tagus. Venegas did advance through La Mancha, but it seems that he received counter-orders from the Supreme Junta which had the effect of slackening his march; he however made his appearance at last towards Aranjuez and Toledo, and it was his approach on that side which induced King Joseph to engage Wellesley and Cuesta, in order to save his capital. If he had kept the Allies in check for a few days longer, Soult's arrival at Plasencia would have obliged the English to retire precipitately. But King Joseph fearing that Venegas from the south, and Sir Robert Wilson, who, with the Lusitanian Legion, was hovering in the neighbourhood on the north, would enter Madrid and seize the stores, reserves, &c., he and Marshal Victor determined to give battle to the Allies in front: for if they were defeated, Madrid could be easily protected. General Wellesley, perceiving, from the movements of the enemy, that a battle was at hand, with much difficulty prevailed upon Cuesta to fall back with him upon the position of Talavera, where there was good ground for defence. He placed the Spanish army on the right near the Tagus, before the town of Talavera, its front protected by redoubts, ditches, mud walls, and felled trees. In this position they could hardly be seriously attacked. The British infantry on whom the general could depend, occupied the left of the line, which was open in front, but its extreme left rested upon a steep hill, which was the key of the whole position. The whole line extended in length about two miles.

On the 27th of July the French moved from St. Olalla, crossed the river Alberche, drove in the British outposts, and attacked two advanced brigades of the English, which fell back steadily across the plain into their assigned position in the line. Victor now attacked the British left, whilst the 4th corps made a demonstration against the Spaniards on the right, several thousands of whom, after discharging their pieces, fled panic-struck to the rear, followed by their artillery, and creating the greatest confusion among the baggage retainers and mules, &c.; and it was with difficulty that Generals Wellesley and Cuesta prevented the rest of the Spanish troops from following the example. Luckily the position of the Spanish army was strong in front, and the French, not knowing exactly what was going on, made no further attack on that side; their efforts were directed against the British left, which they succeeded for a moment in turning, and they gained the summit of the hill; but General Hill, being ordered to that point with more troops, drove the French down after an obstinate struggle which lasted till after dark, and in which the French lost about 1000 men and the British 800. Next morning, the 28th, the French renewed the attack on the hill on the British left, and were again repulsed after losing about 1500 men. After a pause of some hours the attack was renewed upon the whole British front. Heavy columns of French infantry of Sebastiani's corps twice attacked the British right under General Campbell, which joined the Spanish army, but were each time repulsed by the steady fire of the English; a Spanish cavalry regiment charging on their flank at the same time, they retired in disorder, after losing a number of men and 10 guns. In the mean time a French division, supported by two regiments of cavalry, again advanced to turn the British left, and here a cavalry fight occurred in which the 23rd Light Dragoons lost one-half of their number. General Wellesley had taken the precaution of posting the Spanish division of Bassecourt in the rear, together with the cavalry of both armies, and the sight of these effectually precluded any further advance of the French on that side. The principal attack of the French was against the British centre, which consisted of the Guards and the German Legion. The French columns came resolutely close up to the British line, but they were received with a discharge of musketry which made them reel back in disorder. The Guards then charged them, and in the ardour of the moment were carried too far, upon which the enemy's supporting columns and dragoons advanced, and those who had been repulsed rallied and faced again, while the French batteries poured their shot upon the flank of the Guards, who in their turn drew back in some disorder; at the same time the German Legion, which was on the left of the Guards, being hard pressed by the French, got into confusion, and the British centre was thus broken. This was the critical moment of the battle. General Wellesley, who, from the hill on the left of the position, had a clear view of the whole field, seeing the charge of the Guards, and expecting the issue of it, immediately ordered the 48th regiment, under Colonel Donellan, which was posted on the hill on the left, to advance in support of the centre, and at the same time directed General Cotton's light cavalry to advance. The 48th moved on in perfect order amidst the retiring crowds, and wheeling back by companies let them pass through the intervals; then, resuming its line, the 48th marched against the right of the pursuing columns, plied them with destructive discharges of musketry, and closing upon them with a firm and regular pace, checked their forward movement. The Guards and Germans quickly rallied, and the brigade of light cavalry coming up from the rear at a trot, the French began to waver, and at last gave way and retired to their original position, their retreat being protected by their light troops and artillery. The British, reduced to less than 14,000 men, and exhausted by fatigue, were unable to pursue them; and the Spanish army, which had been scarcely engaged, was incapable of making any evolutions; and thus about six in the evening all fighting and firing ceased, each army retaining the position that it had occupied in the morning. The French were repulsed at all points, and lost two generals and nearly 1000 men, and about 6000 wounded, besides the loss of 17 guns. On the side of the British, two generals and 800 men were killed, and three generals and about 4000 men wounded.

The next morning, July 29th, at daybreak, the French army made a retrograde movement, recrossed the Alberche, and took a position on the heights of Salinas. On that day General Robert Craufurd reached the English camp from Lisbon with the 43rd, 52nd, and 95th. This was the light brigade, which afterwards acquired a military celebrity for its gallantry and the quickness of its movements.

Sir Arthur Wellesley passed the 29th and 30th in establishing his hospitals in the town of Talavera, and endeavouring to get provisions, as his men were nearly starving. In this he was not at all assisted by the Spanish authorities or the Spanish inhabitants. "We are miserably supplied with provisions"—thus he wrote to Lord Castlereagh on the 1st of August from Talavera: "the Spanish armies are now so numerous that they eat up the whole country. They have no magazines, nor have we, nor can we collect any, and there is a scramble for everything. I think the battle of the 28th is likely to be of great use to the Spaniards; but I do not think them in a state of discipline to contend with the French." ('Dispatches,' iv., p. 554.)

King Joseph, with the 4th corps and the reserve, moved on the 1st of August farther back to Illescas, on the road between Madrid and Toledo, in order to oppose the army of Andalucia under Venegas; and Victor, who had remained on the Alberche with the 1st corps, retreated likewise on the road to Madrid, from alarm at the movements of Sir Robert Wilson on his flank. Soult was now advancing from the north with no less than three corps, one of which, commanded by Mortier, entered Plasencia on the 31st, having passed, without encountering any resistance, the defile of Baños, which Cuesta had promised to guard. Soult himself, with the 2nd corps, entered Plasencia on the 1st of August, whilst Ney was moving on from Salamanca in the same direction. The French found Plasencia deserted by most of the inhabitants, and they could learn no intelligence of the position of the British and Spanish armies, except vague rumours of a battle having been fought a few days before. On the 2nd of August Sir Arthur Wellesley learnt that the enemy had entered Plasencia. Supposing that Soult was alone with his corps, which he estimated at only 15,000 men, and that his intention was to join Victor, he determined to encounter him before he could effect the junction: he therefore marched on the 3rd of August to Oropesa with the British army, leaving Cuesta at Talavera, particularly recommending him to protect the hospitals; and in case he should be obliged by any advance of Victor to leave Talavera, to collect carts to move away the wounded. The position of the hostile armies was now very singular: they were all crowded along the narrow valley of the Tagus, from the neighbourhood of Madrid to the frontiers of Portugal. King Joseph and Sebastiani were at Illescas and Valdemoro, between Madrid and the Tagus, while the advanced posts of Venegas were on the left or opposite side of the river, opposite Toledo. Victor was lower down on the right bank, at Maqueda, near the Alberche, watching Cuesta, who was at Talavera. General Wellesley was farther down, at Oropesa. Soult was on the Tietar, on the road from Plasencia to Almaraz. Beresford, with the Portuguese, was said to be moving farther west along the frontiers of Portugal. "The allies under Wellesley and Cuesta held the centre, being only one day's march asunder; but their force, when concentrated, was not more than 47,000 men. The French could not unite under three days, but their combined forces exceeded 90,000 men, of whom 53,000 were under Soult; and this singular situation was rendered more remarkable by the ignorance in which all parties were as to the strength and movements of their adversaries. Victor and the King, frightened by Wilson's partisan corps of 4000 men, were preparing to unite at Mostoles, near Madrid; while Cuesta, equally alarmed at Victor, was retiring from Talavera. Sir Arthur Wellesley was supposed by King Joseph to be at the head of 25,000 British; and Sir Arthur, calculating on Soult's weakness, was marching with 23,000 English and Spanish to engage 53,000 French; while Soult, unable to ascertain the exact situation of either friends or enemies, little suspected that the prey was rushing into his jaws. At this moment the fate of the Peninsula hung by a thread, which could not bear the weight for twenty-four hours: yet fortune so ordained that no irreparable disaster ensued." (Napier's 'History of the Peninsular War,' b. ix.)

In the evening of the 3rd of August, Sir Arthur Wellesley learned that Soult's advanced posts were at Naval Moral, and consequently between him and the bridge of Almaraz, on the Tagus, thus cutting his line of communication with Portugal. At the same time letters from Cuesta informed him that King Joseph was again advancing to join Victor, and that Soult must be stronger than was supposed; and that therefore he, Cuesta, would quit Talavera that evening, and join the British at Oropesa. Sir Arthur immediately replied, requesting Cuesta to wait at least till next morning, in order to cover the evacuation of the British hospitals from Talavera. But Cuesta was already on his march, and early on the morning of the 4th appeared near Oropesa. Sir Arthur by this time had learned from intercepted letters that Soult's force was much stronger than he had supposed, though he could not guess its full strength. Cuesta's retreat would immediately bring the King and Victor upon him. He was placed between the mountains and the Tagus, with a French army advancing upon him on each flank; the retreat by Almaraz was cut off; he had seen enough of Cuesta and the Spanish army not to rely upon them on a field of battle; and he could not, with 17,000 British, fatigued and in want of provisions, fight successively two French armies, each much stronger than his own. His only remaining line of retreat was across the Tagus, by the bridge of Arzobispo, below Talavera. By taking up a line of defence beyond that river he might keep open the road by Trujillo to Badajoz. This however must be done immediately, before the enemy intercepted the road to Arzobispo. Sir Arthur communicated his determination to Cuesta, who, according to his custom, opposed it: he wanted now to fight the French at Oropesa; but the English general told him sternly that he might do as he liked—that he, Sir Arthur, was responsible for his own army, and should move forthwith. Accordingly, on that morning, the 4th of August, the British army filed off towards Arzobispo, where it crossed the river with its artillery, stores, and 2000 wounded from Talavera, and took a position on the other side. Thus the British army was saved from impending ruin. Here ended the fighting campaign of the British for 1809.

Sir Arthur Wellesley now moved his head-quarters to Deleytosa, and afterwards to Jaraicejo, on the high road to Badajoz, leaving a strong rear-guard to protect the south bank of the Tagus, and prevent the enemy from passing the river. The bridge of Almaraz had already been broken by the Spaniards. Cuesta, following the British movement, passed to the south of the Tagus by the bridge of Arzobispo, followed close by the French, who, discovering a ford, crossed the river on the 8th with a numerous cavalry, overpowered the Spanish rear-guard, and seized the guns. General Wellesley however caused the remainder of the Spanish artillery to be dragged up the mountain of Meza d'Ibor, a strong position, while the British guarded the equally strong pass of Mirabete, facing the bridge of Almaraz. The line of defence of the Allies was thus re-established. Meantime King Joseph recalled Mortier's corps, which had crossed the Tagus at Talavera, and ordered it to join Sebastiani against Venegas, who had again advanced to Almonacid, near Toledo. Marshal Ney, on the other side, whom Soult had directed to ford the Tagus below Almaraz, could not discover the ford. Soult now proposed to march with his three corps by Coria and Abrantes, and reach Lisbon, by the right bank of the Tagus, before the English; but Ney, Jourdan, and King Joseph opposed the plan, and soon afterwards a despatch came from Napoleon, dated after the battle of Wagram, from the Austrian emperor's palace at Schönbrunn, forbidding further offensive operations till the reinforcements which the termination of the Austrian war placed at his disposal should reach Spain.

The Emperor Napoleon now, to crush his enemies, trusted chiefly to his overwhelming masses, which he recruited so cheaply by means of the conscription. The proportion of cavalry in his armies in Spain was beyond all precedent. Napoleon was resolved to play a sure game. He had already 200,000 men in Spain, and yet he did not think them enough. His generals had adopted the same views. "It is large masses only, the strongest that you can form, that will succeed:" thus wrote Soult to King Joseph before the battle of Talavera. It is worthy of remark that Sir Arthur Wellesley, writing about the same time, said—"I conceive that the French are dangerous only when in large masses."

Soult's army now went into cantonments in Estremadura and Leon, near the borders of Portugal. Sebastiani having defeated Venegas at Almonacid, drove him back upon the Sierra Morena. King Joseph was again residing quietly at Madrid.

In England, on the receipt of the news of the battle of Talavera, Sir Arthur Wellesley was raised to the peerage by the titles of Baron Douro and Viscount Wellington.

On the 20th of August Lord Wellington removed his head-quarters to Badajoz, and placed his army in cantonments on the line of the Guadiana. His chief motive was the neglect of the Spanish authorities in supplying his army with provisions, which obliged him to draw near his magazines in Portugal; and another reason was, the impossibility of co-operating with the undisciplined Spanish armies. Lord Wellington had contrived, notwithstanding Cuesta's neglect, to carry away 2000 sick and wounded from Talavera; the remaining 1500, whom he was obliged to leave there, he recommended earnestly to the French generals, Mortier and Kellerman, and his expectations were not deceived. Marshal Mortier in particular showed the utmost kindness to the British wounded, and would have them attended to before his own men.

In October Lord Wellington repaired to Lisbon, and proceeded to reconnoitre the whole country in front of that capital, for it was then that he resolved upon the construction of the celebrated lines of Torres Vedras, which enabled him to baffle all the efforts of the French in the following year. We can only refer the reader to the 'Memorandum' which he wrote at Lisbon on the 20th of October for Lieutenant-Colonel Fletcher, of the Engineers, in which he clearly points out the double line of position, the entrenchments and redoubts, the number of men required at each post, &c., as if the whole were already in existence before his eyes. This paper, so remarkable considering the epoch and circumstances in which it was written, is a most striking evidence of Wellington's comprehensive mind, his penetration, and foresight. (See 'Dispatches,' vol. v., pp. 234-39). Of his plan however nothing was said or even whispered at the time. He returned to his head-quarters at Badajoz, whence he made an excursion to Seville, where he conferred with his brother the Marquis Wellesley, who was then the British ambassador in Spain, and whom he accompanied to Cadiz. On the 11th of November he returned to his head-quarters at Badajoz. At the same time another fatal blunder was committed by the Spaniards. About the middle of November the Supreme Junta ordered the army of Andalucia, joined by the greater part of the army of Estremadura, to advance suddenly upon Madrid, and this without any previous communication with Lord Wellington, who was at Badajoz, or with the Duke del Parque and other Spanish commanders in the north of Spain. Venegas, the general of the army of Andalucia, had been superseded by Areizaga, an inexperienced young officer, who was in favour with the Junta. Old Cuesta had also retired, and made room for Eguia in the command of the army of Estremadura. These two armies, which constituted the principal regular force of the Spaniards, and which, posted within the line of the Tagus and along the range of the Sierra Morena, protected, and might long have protected, the south of Spain, were thrown away upon a foolish attempt. Areizaga, with nearly 50,000 men and 60 pieces of artillery, advanced into the plains of La Mancha, and was attacked on the 16th of November, in the open fields of Ocaña, by the two French corps of Mortier and Sebastiani; and, although his men fought with sufficient courage, yet he was completely routed, with the loss of more than one-half of his army, and all his baggage and artillery, with the exception of 15 guns. About the same time the Duke del Parque, with 20,000 Spaniards in the north, advanced from Salamanca against Kellerman, but he was beaten, and driven to the mountains of Peña de Francia. The French, north of the Tagus, were thus left at liberty to attack Ciudad Rodrigo and the frontiers of Portugal. "I lament," thus Lord Wellington writes from Badajoz on the news of these mishaps, "I lament that a cause which promised so well a few weeks ago should have been so completely lost by the ignorance, presumption, and mismanagement of those to whose direction it was intrusted. I declare that, if they had preserved their two armies, or even one of them, the cause was safe. The French could have sent no reinforcements which could have been of any use; time would have been gained; the state of affairs would have improved daily; all the chances were in our favour; and in the first moment of weakness occasioned by any diversion on the continent, or by the growing discontent of the French themselves with the war, the French armies must have been driven out of Spain. But no! nothing will answer except to fight great battles in plains, in which the defeat of the Spanish armies is as certain as the commencement of the battle. They will not credit the accounts I have repeatedly given them of the superior numbers even of the French: they will seek them out, and they find them invariably in all parts in numbers superior to themselves. I am only afraid now that I shall be too late to save Ciudad Rodrigo, the loss of which will secure for the French Old Castile, and will cut off all communication with the northern provinces, and leave them to their fate."

Lord Wellington's anxious looks were now directed towards the north-east, for he foresaw that the storm would burst upon Portugal from that quarter. He accordingly retired from Spanish ground altogether into Portugal, and moving through Alemtejo with the mass of his army in December, crossed the Tagus at Abrantes; and thence marching to the Mondego, fixed his head-quarters at Viseu in January 1810, having his outposts along the frontiers of Spain towards Ciudad Rodrigo. He left General Hill's division south of the Tagus to protect Alemtejo. In the mean time both he and Beresford were indefatigable in their endeavours to raise the Portuguese regular army to a state of efficiency in numbers, armament, and discipline.

Campaign of 1810.—By his campaign of 1808 General Wellesley had delivered Portugal from the French. By the campaign of the early part of 1809 he had again repelled a fresh invasion of the northern part of that kingdom. The subsequent Spanish campaign of the same year, which was undertaken with a view to assist the Spaniards in driving the French away from Castile and recovering Madrid, failed through want of good management on the part of the Spanish generals, and of discipline in the Spanish armies. The battle of Talavera, the first fought by Wellington on Spanish ground, though glorious to the British arms, led to no useful result, and the British general was obliged to evacuate Spain. Fresh blunders on the part of the Spaniards led to the conquest of Andalucia by the French. The war in Spain then assumed the character of a partisan warfare, and Wellington saw that it would be in vain for the present to expect that

Spain could make any adequate effort to shake off the French yoke. Portugal however was free, and Wellington thought that she might be preserved by means of a British force of 30,000 men, assisted by an effective Portuguese army, in addition to the militia, even supposing the French should obtain possession of the remainder of the Peninsula. This he stated in a letter to Lord Castlereagh, written from Merida, 25th of August, 1809, soon after his retreat from Talavera. In that remarkable letter he gives his opinion, founded upon facts, of the utter inability of the Spanish armies, as they were then constituted, to keep the field against the French. The following passage, which concludes his exposé of Spanish military affairs, deserves notice:—"I really believe that much of this deficiency of numbers, composition, and discipline, is to be attributed to the existing government of Spain. They have attempted to govern the kingdom, in a state of revolution, by an adherence to old rules and systems, and with the aid of what is called enthusiasm; and this last is, in fact, no aid to accomplish anything, and is only an excuse for the irregularity with which everything is done, and for the want of discipline and subordination of the armies. People are very apt to believe that enthusiasm carried the French through their revolution, and was the parent of those exertions which have nearly conquered the world; but if the subject is nicely examined, it will be found that enthusiasm was the name only, but that force was the instrument which brought forth those great resources under the system of terror, which first stopped the Allies; and that a perseverance in the same system of applying every individual and every description of property to the service of the army, by force, has since conquered Europe." The system by which the French supported their large armies in Spain, as they did everywhere else, was that of taking possession by force of everything they wanted. They ordered rations at every town, and they arrested, shot, or hanged all who put any obstacle in their way. The English generals, the allies of Spain, could not do this.

Wellington's thoughts were now directed to the defence of Portugal, of the practicability of which he entertained little or no doubt. He did not mean that he should be able to defend the whole frontier of Portugal, for that is too extensive, and is open on too many points, but that he could secure the capital and other strongholds, and the mountains and fastnesses, so as to maintain his hold and tire out the invaders. The question whether Portugal was worth defending at the enormous cost which it would entail upon England, he left for ministers at home to decide. As long as the British kept possession of Portugal the French tenure of Spain was insecure; and circumstances might, and indeed must, arise when the British and allied forces could issue out of Portugal to renew a regular war in Spain for the final expulsion of the French. Napoleon was well aware of this, and was anxious to expel the English from Portugal, for that country formed the position of support for all military operations against the French in the Peninsula. ('Dispatches,' vol. vi. p. 368.) The Portuguese in a body had confidence in the British nation and army, they were loyal to their prince, detested the French, and their troops had submitted to British discipline. Portugal was a sincere and tolerably docile ally of England, which Spain was not and could not be. In an official letter to Lord Liverpool, dated Badajoz, 14th of November, 1809, after he had given directions for fortifying the lines near Lisbon, Wellington stated that Portugal might be defended by a British effective force of 30,000 men, in aid of the whole military establishment of Portugal, consisting of about 45,000 regulars, which however were as yet far from effective. And in a confidential letter also to Lord Liverpool, of the same date, he says—"I do not think the French will succeed in getting possession of Portugal with an army of 70,000 or even of 80,000 men, if they do not make the attack for two or three months, which I believe now to be impossible. I conceive not only that they may, but will, make the attack before they will subdue the north of Spain. The centre of Spain, or old Castile, is already subdued. . . . . . My opinion is that the enemy have neither the means nor the intention of attacking Portugal at present, and that they would be successfully resisted. I am likewise of opinion that when they shall receive their reinforcements they can be successfully resisted." And as he had foreseen, so it happened.

Wellington continued in his head-quarters at Viseu till the end of April, 1810, watching the movements of the French in Old Castile, and preparing against their attack upon Portugal, which he expected would be made in earnest that year. The French armies in Spain had received large reinforcements during the winter from Germany, in consequence of the peace between France and Austria. Junot and Drouet, with two fresh corps, had entered Spain, followed by a part of Napoleon's imperial guards. Ney, Kellerman, and Loison, with about 60,000 men, were, in the month of April, in Old Castile and Leon, evidently preparing for an attack upon Portugal. As a prelude they had besieged and taken Astorga from the Spaniards, and were making preparations for the siege of Ciudad Rodrigo, which was defended by a Spanish garrison.

Soult was now in the south of Spain, with Victor and Mortier under his orders, and was busy in organising his military resources and establishing his military command in Andalucia. There is a very interesting report by Soult to the Prince of Wagram, dated Seville, 4th of August, 1810, which is given in the Appendix to Napier's third volume, and which shows the activity and administrative abilities of that commander, and, at the same time, the misunderstandings between him and the nominal King of Spain, Joseph Bonaparte, and his Spanish ministers. General Regnier was in Estremadura, ready to co-operate with his countrymen in the north in the invasion of Portugal by either bank of the Tagus. His movements were anxiously watched by General Hill, with about 12,000 British and Portuguese, stationed on the frontiers of Alemtejo. At the south-western extremity of Spain, Cadiz, strong by its situation, was garrisoned by a British force, of about 7000 men, under General Graham, in addition to the Spanish troops; and the French, under Victor, were blockading the place. In the north, the Spanish patriots remained in possession of Galicia and Asturias, but not in sufficient force to effect any powerful diversion. In the east of Spain, Valencia and Murcia still held out, but Cataluña was the only province in which the Spaniards, under O'Donnell, the best of the Spanish generals, kept up a regular system of warfare against the French. O'Donnell was assisted by the nature of the ground, which was interspersed with numerous fortresses, and also by the English squadron along the coast, and by the organisation and daring spirit of the Catalonian militia. But the struggle in that province was too remote to have any influence on the operations in Portugal and Andalucia. The conquest of Portugal was the great object of the French campaign of 1810.

About the middle of May Marshal Massena, Prince of Essling, arrived at Valladolid, having been sent by Napoleon to take the command of the army assembled in Old Castile and Leon, which assumed the name of the 'Army of Portugal.' He had also military command over the provinces of northern Spain. His force consisted of the 2nd corps under Regnier, 6th corps under Ney, and 8th under Junot, and the reserve cavalry under Monthrun—in all 72,000 men under arms for the field, besides garrisons, detachments, &c., in the provinces of Valladolid, Santander, and Leon. To the above number was afterwards added in the course of the campaign, the 9th corps, under Drouet, consisting of about 18,000 men. Lord Wellington had to oppose the whole of this force with about 54,000 British and Portuguese regular troops. There was moreover a considerable Portuguese militia, employed mostly in the garrisons and in the provinces beyond the Douro, in Alemtejo and Algarve—in short, on the wings of the regular force. It must be observed also that Massena could concentrate his whole force for his attack on Portugal north of the Tagus, whilst Lord Wellington was obliged to leave part of his force south of that river, to guard against any sudden movement from the French army of Andalucia, which was more than 60,000 strong, of which a part might attempt to advance into Alemtejo. Again, Massena's troops were mostly old soldiers, flushed with success and in a high state of discipline, whilst Lord Wellington could only confidently rely upon the British part of his force, about 25,000 men, as the Portuguese regular army was yet untried, and the militia were so defective in organisation as not to be trusted in the open field. Marshal Beresford however had taken great pains with the Portuguese regulars, many of the officers were English, and Lord Wellington had brigaded several of their regiments with the British.

Early in June the French invested Ciudad Rodrigo almost in sight of the British advanced division, which was posted on the Azava. On the 25th they opened their batteries, and the Spanish governor, a brave old officer, defended himself till the 10th of July, when, a practicable breach being made, the French entered the place by capitulation. Wellington could not risk his army for the relief of Ciudad Rodrigo: his object was to defend Portugal, and, above all, Lisbon. He states in the clearest manner his reasons for not attempting to relieve Ciudad Rodrigo in his despatch to Lord Liverpool from Pero Negro, 27th of October 1810, in answer to the charges in the French 'Moniteur.' He remained his position on the left bank of the Coa, and the French advanced to that river, and in so doing the corps of Ney encountered the British light division under General Craufurd, who disputed the ground against a much superior force, and lastly effected his retreat by a bridge across the Coa, which the French unsuccessfully attempted to pass. The fire of the British killed and wounded about 1000 of them. This fight was against Lord Wellington's intentions, for it was useless, but it gave Massena a specimen of the resistance that he had to encounter in his march to Lisbon, which was the declared object of his expedition. On entering the frontiers of Portugal, after taking Ciudad Rodrigo, Massena issued a proclamation to the Portuguese in the usual style of French proclamations of those times, abusing the English as the cause of all mischief, and attributing the presence of an English army in Portugal to the "insatiable ambition" of England. He sneered at the English for not having attempted to relieve Ciudad Rodrigo, which he knew they could not have done in the face of an enemy three times as strong. Massena ended by recommending to the Portuguese population to remain quiet, and receive the French soldiers as friends, assuring them of protection for their persons and property. How this last promise was kept from the beginning is stated by Lord Wellington in a counter proclamation which he issued a few weeks afterwards, dated Celorico, August 4:—"The time which has elapsed during which the enemy have remained upon the frontiers of Portugal has fortunately afforded the Portuguese nation experience of what they are to expect from the French. The people had remained in some villages trusting to the enemy's promises, and vainly believing that, by treating the enemies of their country in a friendly manner, they should conciliate their forbearance, and that their properties would be respected, their women would be saved from violation, and that their lives would be spared.—Vain hopes! The people of these devoted villages have suffered every evil which a cruel enemy could inflict. Their property has been plundered, their houses and furniture burnt, their women have been ravished, and the unfortunate inhabitants whose age or sex did not tempt the brutal violence of the soldiers, have fallen the victims of the imprudent confidence they reposed in promises which were only made to be violated. The Portuguese now see that they have no remedy for the evil with which they are threatened but determined resistance. Resistance, and the determination to render the enemy's advance into their country as difficult as possible, by removing out of his way everything that is valuable, or that can contribute to his existence or facilitate his progress, are the only and certain remedies for the evils with which they are threatened. The army under my command will protect as large a proportion of the country as will be in their power; but it is obvious that the people can save themselves only by resistance to the enemy, and their properties only by removing them. The duty however which I owe to his Royal Highness the Prince Regent, and to the Portuguese nation, will oblige me to use the power and authority in my hands to force the weak and the indolent to make an exertion to save themselves from the danger which awaits them, and to save their country; and I hereby declare that all the magistrates or persons in authority who remain in the towns or villages after receiving orders from any of the military officers to retire from them, and all persons of whatever description who hold any communication with the enemy, and aid and assist them in any manner, will be considered traitors to the state, and shall be tried and punished accordingly." ('Dispatches,' vi. pp. 229, 230.)

Massena remained nearly a month inactive on the line of the Coa before he began the siege of Almeida, the frontier fortress of Portugal on that side. The French broke ground before it on the 15th of August, and Lord Wellington moved his army to the front to take advantage of any opportunity which might be afforded of relieving the place, which was defended by a Portuguese garrison commanded by an English officer. The French opened their fire on the 6th of August, and on the night of the 27th, in consequence of the explosion of a magazine containing nearly all the ammunition in the place, and by which a large part of the town and defences were destroyed, the governor was obliged to capitulate. Wellington was greatly disappointed, for he reckoned on the place detaining the French till the rainy season set in. He then fell back with the main body of his army to the valley of the Mondego. Another considerable pause occurred in Massena's movements, but on the 15th of September the French army began their march down the valley of the Mondego by the right bank of the river, in the direction of Coimbra, through Viseu. "There are certainly," Lord Wellington observed, "many bad roads in Portugal, but the enemy has taken decidedly the worst in the whole kingdom."

Wellington, who had retired by the left bank, then crossed the river, and took up a strong position in front of Coimbra, along a high ridge called the Serra de Busaco, which extends from the Mondego northwards. General Hill joined Wellington with his division from the south, leaving some troops on the left bank of the Mondego to secure the high road to Lisbon on that side. With this exception Lord Wellington's whole army was collected upon the Serra de Busaco. On the 26th of September the French army, consisting of the 2nd, 6th, and 8th corps, assembled before it, and some skirmishing took place. In the morning of the 27th the French attacked in great force both the right and the left of the English position; one French column reached the top of the ridge, and was in the act of deploying when it was repulsed by General Picton's division, as well as another which could not even reach the summit; and on the left the French were likewise repulsed and thrown down the hill by a charge with the bayonet from Craufurd's division and a Portuguese brigade. The French lost one general and about 1000 killed, two generals and about 3000 wounded, and one general and several hundred men prisoners. The loss of the Allies did not exceed 1300. "This movement," says Wellington, "has brought the Portuguese levies into action with the enemy for the first time in an advantageous situation, and they have proved that the trouble which has been taken with them has not been thrown away, and that they are worthy of contending in the same ranks with British troops in this interesting cause, which they afford the best hopes of saving." ('Dispatches,' vi., p. 475.)

One of the motives of Lord Wellington in fighting the battle of Busaco was to give time to the population of the country in his rear to remove out of the way of the enemy with their goods and provisions, especially from Coimbra, a populous and wealthy town, but the orders given to that effect were ill obeyed. Massena did not attempt again to force the position of Busaco, but moved off his army by the pass of Boyalva, in the mountains north of Busaco. Lord Wellington had directed Colonel Trant to occupy this pass with the Portuguese division; but Trant missed the direct road, and arrived too late and with too small a force to arrest the march of the French, who descended into the maritime plains, and seized on the road leading from Oporto to Coimbra in the rear of the British.

On the 29th of September the Allies quitted the position of Busaco, and, crossing the Mondego, began their retreat towards Lisbon. On the 1st of October the British rear-guard, after some skirmishing with the French, evacuated Coimbra, accompanied by all the remaining inhabitants, who ran away with whatever moveables they could carry, and the sick, the aged, and the children, on carts, mules, and donkeys, not knowing whither they were going, and encumbering the road, whilst the French cavalry was hovering on the flank and rear. It was a piteous sight, and one which those who saw it can never forget. The French entered the forsaken city, where they found ample stores of provisions. On the 2nd of October Lord Wellington's head-quarters were moved to Leiria, where he stayed two days, the French following slowly, and the British and Portuguese effecting their retreat with great ease and regularity. General Hill with his division moved by Thomar and Santarem, the centre of the army by Leiria and Rio Mayor, and the left by Alcobaça and Óbidos. Massena followed in one column by the centre or Rio Mayor road. Some skirmishing only took place between his advanced guard and the light division which formed the British rear. On the 8th the allied army entered the lines which had been prepared for them, just as the autumnal rains, which fall very heavily in Portugal, were beginning to set in. Never was a retreat, before a formidable enemy, effected with more ease or so little loss.

On the 10th of October the whole army was within the lines.

The line of defence was double. The first, which was 29 miles long, began at Alhandra on the Tagus, crossed the valley of Arruda, which was rather a weak point, and passed along the skirts of Mount Agraça, where there was a large and strong redoubt: it then passed across the valley of Zibreira and skirted the ravine of Runa to the heights of Torres Vedras, which were well fortified; thence the line followed the course of the little river Zizandre to its mouth on the sea-coast. The first line of defence followed the sinuosities of the mountain tract which extends from the Tagus to the sea about 30 miles north of Lisbon. Lord Wellington's head-quarters were fixed at Pero Negro, a little in the rear of the centre of the line, where a telegraph was fixed corresponding with every part of the position. The second line, at a distance varying from six to ten miles in the rear of the first, extended from Quintella on the Tagus, by Bucellas, Monte Chique, and Mafra, to the mouth of the little river S. Lourenço on the sea-coast, and was 24 miles long. This was the stronger line of the two both by nature and art, and, if the first line were forced by the enemy, the retreat of the army upon the second was secure at all times. Both lines were secured by breastworks, abattis, stone walls with banquettes, and scarps. In the rear of the second line there was a line to secure the embarkation of the troops, should that measure become necessary, enclosing an entrenched camp and the Fort of St. Julian. More than 100 redoubts or forts, and 600 pieces of artillery were scattered along these lines. Lord Wellington had received reinforcements from England and Cadiz; the Portuguese army had also been strengthened, and the Spanish division of La Romana, 5000 strong, came from Estremadura to join the allies, so that the British commander had about 60,000 regular troops posted along the first and second lines (Dispatch to Lord Liverpool, vol. vi. p. 582), besides the Portuguese militia and artillery which manned the forts and redoubts and garrisoned Lisbon, a fine body of English marines which occupied the line of embarkation, a powerful fleet in the Tagus, and a flotilla of gun-boats flanking the right of the British line. Altogether these lines of defence were of stupendous strength, conceived by the military genius of Lord Wellington, and executed by the military skill of the British engineer officers.

Massena seems to have been taken by surprise at the sight of the lines, and he employed several days in reconnoitering them. He made some demonstrations in order to make the British divisions show out their force; but after one or two slight attacks, which were repulsed, he made no further attempt. He put the second and eighth corps partly in the villages and partly in bivouacs in front of the right and centre of the British position, leaving the sixth corps at Otta in his rear. He established his depôt and hospitals, and commenced forming magazines at Santarem, and for this purpose sent moveable columns to scour the country for provisions, for he had entered Portugal without magazines, every soldier carrying fifteen days' bread, which many however threw away or wasted on the road. The country had been partly stripped by the inhabitants, who had retired to the mountains or within the lines, and the French foraging parties destroyed what was left, so that for many leagues in rear of the French the country became a scene of devastation and almost a desert. In addition to this, the Portuguese militia under Trant, Millar, and Wilson, came down from the north and cut off all communication between Massena's army and the Spanish frontier. Whilst the French were in march for Lisbon, as they thought, Colonel Trant surprised Coimbra, seized many prisoners, and all the sick and wounded, between four and five thousand in number, whom he removed to Oporto. Trant and Wilson came down towards Ourem, Thomar, and the banks of the Zezere, hovering in the rear of Massena, who was obliged to move back a whole division to hold them in check. Towards the end of October, Massena sent 2000 men across the Zezere in order to re-open a communication with Spain by way of Castello Branco; and General Foy proceeded with a strong escort by way of Penamacor to Ciudad Rodrigo, whence he hastened to Paris to inform Napoleon of the real state of affairs in Portugal.

Massena had now given up all idea of attempting to force the British lines unless he received large reinforcements. He had entered Portugal with about 70,000 men, of whom 15,000 had been either killed or taken prisoners or were in the hospitals; his army had become very sickly in consequence of privations and of being exposed to inclement weather mostly without shelter, and bivouacking in low grounds. On the 15th of November he began a retrograde movement, with great order and caution, for the purpose of placing his army in cantonments for the winter. On the 17th the French second corps was established at and near Santarem, in a very strong position; the eighth corps at Pernes; and the sixth corps at Thomar, farther in the rear. Massena's head-quarters were fixed at Torres Novas. The British light divisions and cavalry followed the French movements and took some prisoners, but nothing of importance occurred. Lord Wellington, leaving part of his troops in the lines, moved forward the remainder towards the Rio Mayor, which separated him from the French position at Santarem. Hill's division was placed on the left bank of the Tagus, opposite Santarem. Wellington's head-quarters were fixed at Cartaxo. Both armies were now in cantonments for the winter. Thus ended the campaign of 1810. As a defensive campaign on the part of Lord Wellington it was successful, for the French army at the end of that year held no other ground in Portugal than that on which its divisions stood, being hemmed in between the northern bank of the Tagus, the Rio Mayor, and the ridge of the Serra de Estrella, having the allied regular force on its front and flanks, and the Portuguese militia on its rear, and its communications with Spain intercepted.

All the north of Portugal was free from the French, and also the whole of the kingdom south of the Tagus, and the fine country near Lisbon. All the large towns, Lisbon, Oporto, Coimbra, Abrantes, were in possession of the Allies, as well as all the fortresses, with the exception of Almeida. As the French had advanced by the valley of the Mondego and the country west of the Serra de Estrella, the people of that tract of country had in great measure deserted it and carried off the provisions; but the population east of the mountains, and between them, the Tagus, and the Zezere, had remained in fancied security, so that, when Massena withdrew his army to that quarter, he found the towns of Thomar, Pernes, Torres Novas, and Golegão inhabited and untouched. The corn-mills, little injured, were quickly repaired; cattle and corn were procured in abundance, especially from the fine plains of Golegão, which supplied them with Indian corn; and the French thus obtained provisions at least for part of the winter. And, what was worse for the Allies, a number of boats were left behind at Santarem on the right bank of the Tagus, by means of which the French had the power of crossing the river whenever they liked. This annoyed Lord Wellington more than anything else, and he expressed himself strongly concerning the remissness of the Portuguese Regency in neglecting to give or not enforcing the necessary orders for removing everything out of the reach of the enemy, as he had urged them to do months before. "The French could not have stayed if the provisions had been removed. . . . All our military arrangements are useless if they can find subsistence on the ground which they occupy. . . . . Then the boats are left at Santarem in order to give the enemy an opportunity of acting upon our flanks. . . . . It is heart-breaking to contemplate the chance of failure from such obstinacy and folly." (Dispatches to Charles Stuart, the English Ambassador to the Portuguese Regency, October 16 and 18, and November 1.)

The perverse spirit of the Portuguese Regency had manifested itself ever since the fall of Almeida. There was a faction in the Regency, at the head of which was the Patriarch (former Bishop of Oporto), who wanted to control and direct the operations of the British commander, and, as he would not allow himself to be directed by them, they thwarted him in every way. In a remarkable letter addressed to Mr. Stuart from Gouvea, September 7, Lord Wellington had denounced their practices:—"In order to put an end at once to these miserable intrigues, I beg that you will inform the Portuguese Government that I will not stay in the country, and that I shall advise the King's Government to withdraw the assistance which his Majesty affords them, if they interfere in any manner with the appointments of Marshal Beresford's staff, for which he is responsible; or with the operations of the army; or with any of the points which, under the original arrangement with Marshal Beresford, were referred exclusively to his management. I propose also to report to his Majesty's Government, and refer to their consideration, what steps ought to be taken if the Portuguese Government refuse or delay to adopt the civil and political arrangements recommended by me, and corresponding with the military operations which I am carrying on. But it appears that the Portuguese Government have lately discovered that we are all wrong; they have become impatient for the defeat of the enemy, and, in imitation of the Central Junta of Spain, call out for a battle and early success."

In another letter, dated Rio Mayor, October 6, addressed likewise to Mr. Stuart, Lord Wellington says:—"You will do me the favour to inform the Regency, and above all the Principal Souza, that, his Majesty and the Prince Regent having intrusted me with the command of their armies, and likewise with the conduct of the military operations, I will not suffer them, or anybody else, to interfere with them; that I know best where to station my troops and when to make a stand against the enemy; and I shall not alter a system formed upon mature consideration upon any suggestion of theirs. I am responsible for what I do, and they are not; and I recommend them to look to the measures for which they are responsible, and which I long ago recommended to them, viz. to provide for the tranquillity of Lisbon, and for the food of their own army and of the people, while the troops will be engaged with the enemy. As for Principal Souza, I beg you to tell him from me that I have had no satisfaction in transacting the business of his country since he has been a member of the government; that, being embarked in a course of military operations, of which I hope to see the successful termination, I shall continue to carry them on to the end, but that no power on earth shall induce me to remain in the Peninsula for one moment after I shall have obtained his Majesty's leave to resign my charge, if Principal Souza is to remain either a member of the government or to continue at Lisbon. Either he must quit the country or I will; and if I should be obliged to go, I will take care that the world, or Portugal at least and the Prince Regent, shall be made acquainted with my reasons. . . . . I have but little doubt of success; but, as I have fought a sufficient number of battles to know that the result of any one is not certain, even with the best arrangements, I am anxious that the Government shonld adopt preparatory arrangements, and take out of the enemy's way those persons and their families who would suffer if they were to fall into their hands." A perusal of this correspondence is absolntely necessary to enable a person to form a jnst idea of the difficulties which Lord Wellington had to contend with, and of the strength of mind which enabled him to rise superior to them.

Campaign of 1811.—During the months of January and February the armies in Portugal remained in the same respective positions. The low lands being flooded rendered field operations impossible. Meanwhile the 9th corps under Drouet had entered Portugal by the valley of the Mondego, with a large convoy of provisions from Spain, and had reinforced Massena's army, by being posted on its right about Leiria. At the same time Soult, who commanded the army of Andalucia, received orders from Napoleon to act in concert with Massena, by attacking Portugal south of the Tagus; and a new French army was formed in the north of Spain, consisting of about 70,000 men, and placed under Marshal Bessières, duke of Istria, who was ordered to support and furnish all necessary assistance to the army of Portugal. (Letter from Berthier, Prince of Wagram, to the Prince of Essling (Massena), Paris, January 16, 1811; another from the same to the Duke of Dalmatia (Soult), January 24, 1811; and another from the same to the Prince of Essling, February 7, 1811; in Appendix to Napier, vol. iii.) "Make a bridge across the Tagus," said Napoleon, "and let Massena and Soult form a junction. Meantime keep the English in check, and make them lose men every day by engagements of the advanced guards. Their army is small, and they cannot afford to lose many men. Besides, people in London are much alarmed about their army in Portugal; and when the season becomes favourable let the main operations be carried on on the south bank of the Tagus."

Such were the gigantic efforts made by the master of half of Europe to crush an English army of 30,000 men, whilst Lord Wellington, after urgent applications to ministers at home, received reinforcements to the amount of from 6000 to 7000 men only in the beginning of March. But all Napoleon's efforts did not prevail. Massena was waiting for Soult to appear on the left bank of the Tagus opposite to his position, but Soult was obliged to maintain the blockade of Cadiz, in which there was a British garrison of 6000 men; he was obliged to leave Sebastiani on the side of Granada and Murcia to keep in check the Spanish armed parties; and he could not therefore dispose of more than 20,000 men, with whom he durst not enter Alemtejo, leaving the Spanish fortress of Badajoz in his rear. He therefore began by attacking the fortress of Olivença, which he took January 22, and then marched to Badajoz. On the 19th of February he defeated a Spanish force of nearly 12,000 men under General Mendizabal, which was posted on the river Gebora, an affluent of the Guadiana, and then commenced the siege of Badajoz.

In the mean time Massena remained in his position at Santarem, waiting for Soult's appearance on the Tagus, till he became so distressed for provisions that he could wait no longer. All the means of collecting provisions by violence were exhausted, large moveable columns had been sent at different times both on the side of Castello Branco and on that of the Mondego, which scoured the country and carried away cattle and provisions, committing horrible excesses, which were retaliated by the infuriated peasantry upon the French stragglers and wounded. The discipline of the army was broken by this barbarous system of warfare. They had no less than 10,000 sick; they could obtain no news from Spain, and had no more provisions left than would serve the troops during their retreat to the frontiers.

In the beginning of March Massena moved his sick and baggage by degrees to the rear, and after demonstrations in various directions the divisions of his army filed off in the direction of Pombal. Santarem was evacuated in the night of the 5th of March, and next morning it was entered by the English. Massena however had gained two days' march, and his army was not overtaken by the English till the 10th, when it was concentrated on a table-land before Pombal, presenting a front of resistance. There was some skirmishing with the light division, whilst Wellington brought up his other divisions, but the French having gained time for their baggage to file off, retreated on the 11th through the town. A detachment which Ney had left in the castle of Pombal was driven away with some loss by the English, and in the night Massena continued his retreat. On the 12th the English advance found Ney with the French rear-guard posted on a high table-land in front of the village of Redinha, when another skirmishing took place. As the French seemed disposed to stand their ground, and made a show of considerable force, Lord Wellington formed his army in line and moved on to the attack, when, after a general discharge from the French battalions, which hid them in smoke, the French were again in full retreat through the village, and joined that evening the main body at Condeixa, where one road leads to Coimbra and another ascends the valley of the Mondego. Massena's intention was to seize Coimbra and, if possible, Oporto, and there to wait for reinforcements from Spain, and he had sent a division under Montbrun to secure the bridge of Coimbra. Wellington had foreseen his intention, and had ordered Wilson and Trant with the Portuguese militia to look to the security of the important town of Oporto, and to abandon the line of the Mondego, which was fordable in many places, and retire across the Douro, removing all the boats. Coimbra was thus necessarily left to a surprise by the French retreating army. But it luckily happened that Trant lingered behind at Coimbra with a small force, and, having destroyed one arch of the bridge, and placed guards at the fords, he determined to defend the town, thinking that, if he could parry a sudden assault, Massena could not stay long on the left bank of the Mondego with the allied army at his heels. On the 11th of March Montbrun appeared at the suburb of Santa Clara, and on the 12th made an attempt to force the bridge, but his men were repulsed by grape-shot. Montbrun fancied that Trant had been reinforced with some English regiments by sea, and having made his report, Massena relinquished the idea of crossing the Mondego, and determined to retreat by Ponte de Murcella and the left bank of the Mondego. Thus Coimbra was saved from the impending visitation.

Massena resumed his retreat on the 13th of March in rather a hurried manner, being on the point of having his left turned by Picton's division, which had marched by a path over the mountains of Anciāo. Ney, in command of the rear-guard, set fire to the town of Condeixa, in order to stop the British artillery, but the light division pursued the retreating enemy, and penetrated between their columns, until night stopped any further pursuit. By the aid of darkness the French got together again, and on the morning of the 14th, when the fog which enveloped the mountains began to clear off, Ney was seen posted on a hill near Casal Nova. The light division attacked him; and Picton's and Cole's divisions appearing on his left, he renewed his retreat with admirable precision from ridge to ridge, covering his rear with guns and light troops, until he gained the strong defile of Miranda de Corvo, where the main body of the French was already posted. Massena, fearing that Cole's and Nightingale's divisions, which were advancing by the road of Espinhal, might gain his rear, set fire to the town of Miranda in the night, and passed the river Ceira, an affluent of the Mondego, destroying a great quantity of his baggage and ammunition, and leaving Ney to cover the passage of the river, without however risking an action. Ney remained on the left bank, and took up a position near the village of Fons de Arronce. The Allies coming up about four o'clock in the afternoon of the 15th, Wellington commenced an attack on Ney's troops, in which the French lost 500 men, one-half of whom were drowned in endeavouring to pass the swollen river in their rear. Night put an end to the fight, but not to the confusion; for as the French baggage and other incumbrances were pressing along the bridge, panic spread among their troops, who, in the midst of the disorder, darkness, and rain, fired upon one another. In the night Ney blew up part of the bridge, and moved on his corps, keeping a rear-guard on the right bank the whole of the 16th. The Allies halted on the left bank that day, partly because the river was not fordable, and partly because they were in want of provisions, especially the Portuguese troops, for the Portuguese Regency, in spite of the urgent representations of Wellington and Beresford, had neglected to collect the means of carrying provisions along with the army. Nothing could be got from the country, which had been twice ravaged. Some of the Portuguese brigades were actually starving; many men fell off and died, and to save the rest the British supplies were shared with them. The British commissary-general's means were thus overlaid, and the whole army suffered in consequence. (Dispatches to Charles Stuart, dated Louzão, March 16, and Pombeiro, March 18, and another to the Earl of Liverpool of March 16.) On the 17th the British army crossed the Ceira over a trestle bridge, the French having withdrawn in the night.

Massena had taken up a strong position on the river Alva, another affluent of the Mondego, which was swollen by the rains, and had destroyed the bridge of Murcella, apparently intending to remain there some days. He had also sent out detachments to scour the neighbouring country for provisions. But Wellington marched three divisions by the mountains of Quiteria to Arganil, on the Upper Alva, which movement obliged the French marshal to abandon the Lower Alva, and continue his retreat by Moita, towards Celorico. The English army crossed the Alva near Pombeira, and collected at Moita on the 19th. Here again Massena destroyed much of his baggage and ammunition, for want of cattle to drag it, and also forsook the foraging parties that he had sent out, which were intercepted and taken by the English, to the number of about 800 men. The main body of the allied army halted at Moita for several days, in order to give time for the provisions to come up which had been sent round by sea from Lisbon to the Mondego. The light division and cavalry however continued to follow the French, who reached Celorico and Guarda on the 21st, and remained there for several days, and re-opened their communications with Almeida and the Spanish frontier. The retreat of the French, properly speaking, may be considered as having terminated here—a fortnight's retreat "in which the French commander displayed infinite ability, but withal a harsh and ruthless spirit. I pass over the destruction of Redinha, Condeixa, Miranda de Corvo, and many villages on the route; the burning of those towns covered the retrograde movements of the army, and something must be attributed to the disorder which usually attends a forced retreat; but the town of Leiria and the convent of Alcobaça were given to the flames by express orders from the French head-quarters; and although the laws of war, rigorously interpreted, anthorise such examples when the inhabitants take arms, it can only be justly done for the purpose of overawing the people, and not from a spirit of vengeance when abandoning the country. But every horror that could make war hideous attended this dreadful march. Distress, conflagration, death in all modes! from wounds, from fatigue, from water, from the flames, from starvation! On every side unlimited violence, unlimited vengeance! I myself saw a peasant hounding on his dog to devour the dead and dying; and the spirit of cruelty, once unchained, smote even the brute creation. On the 15th the French general, to diminish the encumbrances of his march, ordered a number of beasts of burden to be destroyed. The inhuman fellow charged with the execution ham-stringed 500 asses, and left them to starve, and thus they were found by the British army on that day. The mute but deep expression of pain and grief visible in these poor creatures' looks wonderfully roused the fury of our soldiers, and so little weight has reason with the multitude when opposed by a momentary sensation, that no quarter would have been given to any prisoner at that moment. Excess of feeling would have led to direct cruelty. This shows how dangerous it is in war to listen to the passions at all, since the most praiseworthy could be thus perverted by an accidental combination of circumstances." (Napier, 'Peninsular War,' vol. iii., pp. 471, 472). Lord Wellington, habitually sober in the expression of his sentiments, assumes even a more decided and indignant tone on the same occasion. In his official dispatch to Lord Liverpool, dated March 14, after detailing the movements of the French to that day, he thus continues:—"I am sorry to be obliged to add to this account that their conduct throughout this retreat has been marked by a barbarity seldom equalled, and never surpassed. Even in the towns of Torres Novas, Thomar, and Pernes, in which the head-quarters of some of the corps had been for four months, and in which the inhabitants had been invited, by promises of good treatment, to remain, they were plundered, and many of their houses destroyed, on the night the enemy withdrew from their position, and they have since burnt every town and village through which they have passed. The convent of Alcobaça (a splendid structure) was burnt by orders from the French head-quarters. The bishop's palace and the whole town of Leiria, in which General Drouet had had his head-quarters, shared the same fate; and there is not an inhabitant of the country, of any class or description, who has had any dealing or communication with the French army, who has not had reason to repent of it, and to complain of them. This is the mode in which the promises have been performed and the assurances have been fulfilled which were held out in the proclamation of the French commander-in-chief, in which he told the inhabitants of Portugal that he was not come to make war upon them, but, with a powerful army of 110,000 men, to drive the English into the sea." ('Dispatches,' vol. vii., p. 358).

On the 25th of March the French abandoned Celorico, but retained the position of Guarda. On the 29th however Lord Wellington moved his columns up the steep hill of Guarda, when the French retreated to the Coa, without firing a shot—the rear-guard in excellent order. On the 2nd of April the British army came up with them, and found them posted on the right bank of the Coa. On the 3rd the light division passed the Coa on the left of the French, and drove in their light infantry; but the main body of the French advanced, and a rain-storm coming on at the moment, the men of the light division could not see that they were pushing too far. When the weather cleared up, the French, seeing that only a small force had crossed the river, attacked it in columns with cavalry. Three times the 43rd and 52nd regiments were driven back towards the river, and three times they rallied and beat back the enemy. At last, Picton's division having crossed the Coa, and the 5th division also making its appearance by the bridge of Sabugal, the whole French army retired upon Alfayates, having sustained considerable loss in men and also in baggage. This was called the combat of Sabugal, in which the light division lost about 200 men. On the 4th the French were about Aldea da Ponte and Aldea Velha, on the extreme frontier of Portugal, and on the 6th they crossed the Agueda into Spain. Thus terminated the third and last French invasion of Portugal. They left a garrison in Almeida, which was blockaded by the English. "The enemy's loss in this expedition to Portugal is immense—I should think not less than 45,000 men, including the sick and wounded; and I think that, including the 9th corps, they may have now 40,000 men on this frontier." (Dispatches to Lord Liverpool, April 9, 1811). A great part of the loss of the French, in killed, was from the hands of the Portuguese peasantry, who revenged themselves for the injuries which had been inflicted on their countrymen during the six or seven months that the French had remained in Portugal, by killing every straggler whom they could lay their hands upon before the British columns came up. Dismal scenes of suffering and death presented themselves along the whole line of that disastrous retreat—bodies of dead soldiers, generally naked, carts broken down on the road, carcases of horses and mules. Some of the poor creatures seemed to have crawled or been dragged out of the road to die behind the oose stone walls with which the fields are enclosed ; and, on ooking over the stone walls into the fields, they were seen ying in clusters of three or four or more, in all sorts of posiions. Portuguese villagers, men and women, were occaionally seen insulting and kicking the bodies of dead Frenchmen on the road, when they were properly reproved nd driven away by a British non-commissioned officer. It was chiefly in the mountain valleys of the Serra de Estrella hat the work of destruction had been carried on by the French during the winter of 1810-11. The marauding paries went searching for provisions in those sequestered valleys, nd when they fell upon a hamlet or farm-house they showed no mercy to the inmates. Sometimes in the mountains they pounced upon several families huddled together in a cave, with a provision of Indian corn or pulse to last them for he winter. The males were soon despatched—the females pared for a time, but not in mercy. It happened however t times that these marauding parties were small, and they were overpowered by the peasantry, who gave no quarter.

The orders given by the Regency of Portugal, at Lord Wellington's request, for the people of Beira and Estremadura to withdraw from the open country upon the advance f the enemy, had caused a vast influx of population within he lines during the winter. These people were assisted partly by their own countrymen, and partly by a gift of 00,000*l.* voted by the British Parliament, and by subscripions raised in England. After the retreat of Massena they eturned to their homes, when the poorer class received urther assistance during the remainder of that year and the ollowing winter.

Lord Wellington having placed his army in cantonments etween the Coa and the Agueda, and made arrangements for he blockade of Almeida, set out for the south to see the tate of affairs on the Guadiana. Marshal Beresford commanded the allied troops in Alemtejo, in the absence of General Hill, who had gone home on leave. The Spanish General Mendizabal, having been utterly defeated by the French in the preceding February, Soult had invested the ortress of Badajoz, the governor of which, General Menacho, was unfortunately killed by a cannon shot. The command f the garrison devolved upon General Imar, who, on the 0th of March, only one day after the breaching battery had pened, and the breach was far from practicable, surrendered he place, although he knew by a telegraphic dispatch that a arge British and Portuguese force was advancing to his relief, s Massena being then in full retreat, Lord Wellington had ent troops to reinforce Beresford and to save Badajoz. In he mean time General Graham, with the British garrison of Cadiz, defeated the French under Victor in the battle of Barrosa, but not being supported by the Spanish troops, he was obliged to return to Cadiz.

Marshal Soult having obtained Badajoz, repaired to Seville ; and Mortier, who succeeded him in command in Estremadura, laid siege to Campo Mayor, a weak place within the frontiers of Portugal, with a garrison of only a few undred men ; but the commander, a Portuguese officer of ngineers, defended himself bravely until a regular breach was made, when, being summoned, he asked of Mortier our-and-twenty hours more to wait for succour. Mortier ranted the honourable demand of the brave veteran, and t the expiration of the time agreed upon the place was urrendered.

Marshal Beresford, having been reinforced from the north by Lord Wellington, was advancing at the head of 22,000 men ; and at his appearance, on the 25th of March, the French, hastily evacuating Campo Mayor, withdrew to Badajoz after a sharp skirmish with the British cavalry. Beresford had orders from Wellington to invest Badajoz before the enemy could provision and repair their conquest. Crossing the Guadiana, he advanced into Spanish Estremadura, Mortier having retired before him, and Beresford placed his army in cantonments about Zafra and Merida to over the siege of Badajoz. He began by besieging and aking Olivença ; and shortly afterwards, April 20, Lord Wellington arrived from the north, reconnoitred Badajoz, and rdered immediate operations against the place. The unxpected surrender of Badajoz had been a severe blow, and e considered its recapture essential to his future operations, or he had formed the plan of advancing into the heart of Spain, and obliging the French to evacuate Andalucia. Dispatch to Lord Liverpool, vii., p. 523.) But the possession f Badajoz not only protected the French positions in Andalucia and Estremadura, but gave them the key of the southern provinces of Portugal. While making the preparatory arrangements for the siege, Lord Wellington was recalled to the north by Massena's movements. On the 28th of April the British commander was back again, with his head-quarters at Villa Fermosa, near the Coa.

Massena, having recruited his army at Salamanca to a certain extent, was anxious to throw provisions into Almeida. He had repeatedly applied for reinforcements, and, above all, provisions, in the most urgent manner to his brother marshal, Bessières, duke of Istria, who held, by Napoleon's orders, a separate command in the north. Bessières however seems to have paid no great attention to these applications, for we find Massena writing to him from Ciudad Rodrigo on the 29th of April, when he was actually on his march to relieve Almeida, in the following terms :—"My dear Marshal, your letters are to me inconceivable. In that of the 20th you tell me that you can give me no assistance. In that of the 22nd you tell me that, on the 25th or 26th, you will join me wherever I may be, and that the head of your column will be at Salamanca on the 26th. By your letter which I receive now, you tell me that your cavalry and your artillery were, on the 27th, still one day's march from Salamanca ; and you conclude that my movement must be by this time at an end, and you say that you regret not having been able to cooperate in it. . . . . I beg of you again to send without delay biscuit, flour, and corn, to Ciudad Rodrigo, for the place has not fifteen days' provisions." (Napier, 'Peninsular War,' vol. iii. App. pp. 620-22.)

On the 2nd of May, Massena, having been joined at last by some cavalry, moved from Ciudad Rodrigo, and crossed the Agueda, with 40,000 infantry, 5000 horse, and about thirty pieces of artillery, for the purpose of relieving Almeida. He expected every day to be superseded in his command, and he wished to make a last effort for the sake of his own military character. Lord Wellington could muster no more than 32,000 men, of which force only 1200 were cavalry. He however determined to fight rather than give up the blockade of Almeida. He drew back his army half way between the Agueda and the Coa, and placed it in an extended line on a table-land between the two parallel rivers Turones and Das Casas, which are affluents of the Agueda ; his left on Fort Conception, covering the blockade of Almeida ; the centre opposite the village of Almeida ; and the right at Fuentes de Oñoro, extending towards Nava d'Aver, on the road to Sabugal : the whole distance being nearly seven miles. He had the Coa in his rear, with the bridge of Castello Bom in case of a retreat. The front of the British position was protected by the river Das Casas, flowing through a deep ravine, in which lay the village of Fuentes de Oñoro ; but to the right of this village the table-land turned back towards the Turones, leaving a plain between it and the hill of Nava d'Aver. The French advanced in three columns, one of which took post on a ridge which overhangs the village of Fuentes de Oñoro, and nearly parallel to that occupied by the Allies. They then attacked the village, which was stoutly defended by the British. The French at one time took possession of part of it, but were charged and driven away by a fresh brigade of British infantry. Night put an end to the fight. The Allies lost about 250 men, and the French somewhat more. The next day, Massena, who had been joined by Bessières with a body of the Imperial Guards, reconnoitered the position of the Allies ; and on the 5th of May he made a grand attack with the greater part of his force on the British right, which he expected to turn by the plain which extends between the hill of Fuentes de Oñoro and that of Nava d'Aver, and between Poço Velho on the river Das Casas to the Turones, which last stream flowed in the rear of the British position. Had they passed the Turones, the French would have spread into the open country about Frenada, and cut off the English from the Coa. The French, crossing the Das Casas at Poço Velho, attacked the Spanish party of Julian Sanchez, and drove him from Nava d'Aver ; they then charged the 7th and light divisions, which formed the British right. The light division immediately formed into squares ; but the numerous French cavalry fell upon the 7th division before it could effect a like formation. The troops however stood firm ; and although some were cut down, the enemy was checked by the steady fire of the Chasseurs Britanniques, a foreign regiment in the British service, and of the other regiments of the 7th division. Lord Wellington however, considering his position too far extended to the right, gave up Nava d'Aver and his communication with Sabugal, and ordered the 7th and light divisions to retire across the plain, and the 1st and 3rd divisions to wheel back and take up a new alignement on a steep ridge which runs from the Das Casas and Turones, nearly at right angles with the original position. The village of Fuentes de Oñoro thus became the left of the new position, and the right was at Frenada, beyond the Turones, and between that and the Coa. This movement was well executed, though under very critical circumstances, for the British squares had to cross a vast plain, exposed to the charge of a numerous French cavalry supported by artillery, the British cavalry being too weak to give much protection. The non-combatants, who had gathered behind the British line, were hurrying away, driven by the French horsemen across the plain. Colonel Napier says that "in all this war there was not a more dangerous hour for England. The whole of the vast plain, as far as the Turones, was covered with a confused multitude, amidst which the squares appeared but as specks; for there was a great concourse, composed of commissariat followers of the camp, servants, baggage, led horses, and peasants attracted by curiosity, and finally the broken picquets and parties coming out of the woods. The 7th division was separated from the army by the Turones; 5000 French cavalry, with fifteen pieces of artillery, were close at hand impatient to charge; the infantry of the 8th corps was in order of battle behind the horsemen; the wood was filled with the skirmishers of the 6th corps; and if the latter body, pivoting upon Fuentes, had issued forth, while Drouet's divisions fell on that village, while the 8th corps attacked the light division, and while the whole of the cavalry made a general charge, the loose multitude encumbering the plain would have been driven violently in upon the 1st division, in such a manner as to have intercepted the latter's fire, and broken their ranks. No such effort however was made; Montbrun's cavalry merely hovered about Craufurd's squares, the plain was soon cleared, the cavalry took post behind the centre, and the light division formed a reserve to the right of the 1st division, sending the riflemen among the rocks to connect it with the 7th division, which had arrived at Frenada, and was there joined by Julian Sanchez. At the sight of this new front, so deeply lined with troops, the French stopped short, and commenced a heavy cannonade, which did great execution, from the closeness of the allied masses; but twelve British guns replied with vigour, and the violence of the enemy's fire abated: their cavalry then drew out of range, and a body of French infantry attempting to glide down the ravine of the Turones, was repulsed by the riflemen and light companies of the Guards. But all this time a fierce battle was going on at Fuentes de Oñoro. Massena had directed Drouet to carry this village at the very moment when Montbrun's cavalry should turn the right wing. It was, however, two hours later ere the attack commenced. The three British regiments (24th, 71st, and 79th) made a desperate resistance; but overmatched in number, and little accustomed to the desultory fighting of light troops, they were pierced and divided: two companies of the 79th were taken, Colonel Cameron was mortally wounded, and the lower part of the town was carried: the upper part however was stiffly held, and the rolling of the musketry was incessant. Had the attack been made earlier, and the whole of Drouet's division thrown boldly into the fight, while the 6th corps, moving through the wood, closely turned the village, the passage must have been forced, and the left of the new position outflanked; but now Lord Wellington having all his reserves in hand, detached considerable masses to the support of the regiments in Fuentes. The French continued also to reinforce their troops, until the whole of the 6th corps and a part of Drouet's division were engaged, when several turns of fortune occurred. At one time the fighting was on the banks of the stream, and amongst the lower houses; at another upon the lower heights and round the chapel, and some of the enemy's skirmishers even penetrated completely through towards the main position: but the village was never entirely abandoned by its defenders; and in a charge of the 71st, 79th, and 88th regiments, led by Colonel M'Kinnon, against a heavy mass which had gained the chapel eminence, a great number of French fell. In this manner the fight lasted until evening, when the lower part of the town was abandoned by both parties—the British maintaining the chapel and crags, and the French retiring a cannon-shot from the stream. ('History of the Peninsular War,' iii. 514-16.)

The total loss of the British was 235 killed, 1234 wounded and 317 missing or taken prisoners. The loss of the French was certainly greater, judging from the number of dead bodies found in the village. No fighting of any consequence occurred on the left of the British position, where the fifth and sixth divisions were posted to protect the blockade of Almeida, the second corps of the French merely waiting the issue of the battle at Fuentes de Oñoro, and watching for an opportunity of throwing provisions into Almeida, which however did not occur. The battle of Fuentes de Oñoro was of importance, being a regular pitched battle fought by the British in a position of no particular strength, and indeed very weak in one point, under great disadvantage of numbers, and especially of cavalry. The great majority of the troops engaged were British, for the Portuguese were mostly with Marshal Beresford in the south. There were only four British divisions and one Portuguese brigade and about 1000 cavalry engaged against three French corps of infantry and 5000 cavalry. Massena fought the battle for the purpose of relieving Almeida, but he failed, and Almeida a few days afterwards was evacuated by the French garrison in the night. With this battle Massena closed his long and active career. He withdrew his army beyond the Agueda, and soon afterwards Marshal Marmont, duke of Ragusa, arrived at Salamanca to supersede him. The order of Napoleon by which Massena was directed to give up the command to Marmont was not conceived in very gracious terms. He was allowed to take with him to France his son and one of his aides-de-camp only. Marmont was told to take the reins of command with a firm hand. (Napier, 'Peninsular War,' vol. iii., Appendix vii., p. 622.)

Whilst these things were happening in the north, Marshal Beresford had invested Badajoz, when Soult marched from Seville to relieve that place. On the 13th of May, Beresford raised the siege, removed his artillery, platforms, and stores, and prepared to meet Soult in position on the ridge of Albuera with above 7000 British infantry, several Portuguese brigades, and Blake's Spanish corps, in all about 30,000 infantry and about 2000 cavalry, but hardly one-half of this force could be depended upon in the field. He had with him thirty-eight pieces of artillery. On the evening of the 15th Soult came up with about 19,000 chosen infantry, about 4000 cavalry, and fifty guns. He immediately reconnoitred Beresford's position, and determined upon an attack on the right flank of the Allies, which was their weak point, though Beresford had directed his chief attention to the centre, where he had placed his British troops. It was on the French part the same game as at the battles of Talavera and Fuentes; but Wellington was not there, nor were British troops at hand all along the line; and when Beresford, perceiving his mistake, ordered Blake to change his front so as to face the French marching upon his right, Blake refused, saying that the real attack was against the centre by the bridge of Albuera. There was indeed an attack by the French in that quarter, but it was only intended to mask and support the grand attack on the right of the Allies. It was only when the French actually appeared on the table-land on the right, commanding and enfilading the whole position of the Allies, that Blake consented, with much slowness, to change his front. In the mean time the French columns were already in possession of the table-land; their guns opened, and their cavalry outflanking the front, put the Spaniards in disorder, and they gave way. The brigades of the second division, British, were ordered to advance to the right; the first, or Colborne's brigade, while in the act of deploying, was attacked in flank and rear, and nearly destroyed by the French and Polish cavalry: the next, Houghton's brigade, reached the summit, and maintained a desperate struggle. But the men fell fast, ammunition failed, and Beresford began to think of a retreat, which would have been ruinous, when, at the suggestion of Colonel Hardinge, General Cole, with the 4th division, was ordered to march up the hill. It consisted of only two brigades, one Portuguese and the English Fusileer brigade (7th and 23rd regiments), commanded by Sir William Myers. This last brigade restored the fight and saved the army. General Cole directed the Portuguese brigade under General Harvey to move round the hill on the right, whilst Abercrombie's brigade, the last remaining one of the second division, moved up the hill on the left; Cole himself led the brave fusileers up the fatal hill, which was crowned by the French masses and artillery. Six British guns were already in the enemy's possession, the whole French reserve was coming forward to reinforce their front column, and what remained of Houghton's brigade could no longer maintain its position. The ground was heaped with dead bodies, and the Polish lancers were riding furiously about the captured artillery on the upper part of the hill. General Cole at the head of the fusileers, flanked by a battalion of the Lusitanian Legion under Colonel Hawkshawe, dispersed the lancers, recovered the captured guns, and appeared on the right of Houghton's brigade exactly as Abercrombie's issued out on the left. We must now once more borrow Sir William Napier's eloquent pen :—"Such a gallant line, issuing from the midst of the smoke, and rapidly separating itself from the confused and broken multitude, startled the enemy's heavy masses, which were increasing and pressing onwards as to an assured victory: they wavered, hesitated, and then, vomiting forth a storm of fire, hastily endeavoured to enlarge their front, while a fearful discharge of grape from all their artillery whistled through the British ranks. Sir William Myers was killed, Cole, and the three colonels, Ellis, Blakeney, and Hawkshawe, fell wounded, and the fusileer battalions, struck by the iron tempest, reeled and staggered like sinking ships. Suddenly and sternly recovering, they closed on their terrible enemies, and then was seen with what a strength and majesty the British soldier fights. In vain did Soult, by voice and gesture, animate his Frenchmen; in vain did the hardiest veterans, extricating themselves from the crowded columns, sacrifice their lives to gain time for the mass to open out on such a fair field; in vain did the mass itself bear up, and, fiercely arising, fire indiscriminately upon friends and foes, while the horsemen, hovering on the flank, threatened to charge the advancing line. Nothing could stop that astonishing infantry. No sudden burst of undisciplined valour, no nervous enthusiasm, weakened the stability of their order; their flashing eyes were bent on the dark columns in their front; their measured tread shook the ground; their dreadful volleys swept away the head of every formation; their deafening shouts overpowered the dissonant cries that broke from all parts of the tumultuous crowd, as foot by foot, and with a horrid carnage, it was driven by the incessant vigour of the attack to the farthest edge of the hill. In vain did the French reserves, joining with the struggling multitudes, endeavour to sustain the fight; their efforts only increased the irremediable confusion, and the mighty mass, giving way like a loosened cliff, went headlong down the ascent. The rain flowed after in streams discoloured with blood, and 1500 unwounded men, the remnant of 6000 unconquerable British soldiers, stood triumphant on the fatal hill." (Napier, 'Peninsular War,' iii., 540-1.)

The day was now won, and Beresford ordering the Portuguese and Spaniards to advance, the French retreated in confusion across the small river on which stands the village of Albuera. About three o'clock the fire had ceased. The allied army had lost in killed and wounded about 7000 men, of whom two-thirds were British. The French lost about 8000 men, including two generals killed and three wounded. On the 16th of May the two armies remained in their respective positions, and Beresford waited in anxiety for another attack, when he had hardly British soldiers enough for his picquets and to take care of the crowd of wounded. On the 17th however he was reinforced by an English brigade, and the following day Soult retired towards Seville, leaving 800 soldiers severely wounded to the generosity of the English. On the 19th Lord Wellington arrived from the north, followed by two fresh divisions, and gave directions to resume the siege of Badajoz. The trenches were opened, and on the 5th of June, a breach being made in Fort St. Christoval, the assault was given, but failed. On the 9th another attempt at storming was made, which proved equally fruitless. On the 10th Lord Wellington received intelligence that Marmont was marching to the south to join Soult. He then took up a position near Campo Mayor, along the frontiers of Portugal. The enemy did not choose to attack him, and about the middle of July, Marmont, again separating himself from Soult, recrossed the Tagus by Almaraz, and marched on Salamanca. Lord Wellington likewise, leaving General Hill with one British division and the Portuguese in Alemtejo, and giving up the siege of Badajoz for the present, crossed the Tagus with the remainder of his army, and fixed his head-quarters at Fuente Guinaldo, on the line of the Agueda. He was looking towards recovering possession of the important fortress of Ciudad Rodrigo, which his advanced parties surrounded and kept in a state of blockade. Towards the end of September, Marmont, having received large reinforcements from France, moved upon the Agueda, and by his superiority of numbers and especially of cavalry, obliged Lord Wellington, after a partial engagement at El Bodon, to withdraw his army, which he did in excellent order to his old position on the Coa, where Marmont did not choose to follow him. Nothing more happened after this on that side for the remainder of the year 1811.

In the south, General Hill effected a gallant achievement by surprising the French General Girard, with 4000 foot and 1000 horse, at Arroyos de Molinos, in the neighbourhood of Caceres, in Spanish Estremadura, on the 28th of October. Hill completely routed Girard, took 1500 prisoners, with several officers of rank, and the whole of the enemy's artillery, ammunition, stores, and baggage, with only a trifling loss on the part of the Allies. Hill then advanced to Merida, where he placed his troops in cantonments, that part of Estremadura being thus delivered from the enemy.

Lord Wellington, in the second part of 1811, besides having firmly established his complete possession of Portugal, had by his operations within the Spanish frontiers, both north and south of the Tagus, given full employment to two French armies, each commanded by a French marshal of high reputation, and prevented them from acting with vigour either against Galicia in the north or against Cadiz in the south. He had thus fulfilled the promise which he had made the year before of being able to retain possession of Portugal, and to make it a position of support for future operations against the French in Spain, and he continued to hold the same language to ministers at home. ('Dispatches,' March 23, 1811, vii., p. 392.)

In eastern Spain unfortunately the French had obtained in 1811 great successes against the unassisted Spaniards. They took Tarragona by storm in June, when a horrid butchery of the unarmed population took place, without regard to age or sex, to the number, it was stated, of 6000. Still the brave Catalonians, undismayed, continued to carry on the war with unabated zeal. The Spanish General Blake, after being defeated by Suchet near Valencia, shut himself up in that city with his whole army, the last Spanish army which had remained in the field; and in the beginning of January 1812, he capitulated with 18,000 soldiers, 23 general officers, and between 300 and 400 guns. "I believe," observed Lord Wellington, at the time, "there is no man who knows the state of affairs in that province, and has read Suchet's account of his action with Blake on the 25th of October, who does not believe that, if Blake had not fought that action, Valencia would have been safe. Are the English ministers and generals responsible for the blunders of Blake?" ('Dispatches,' viii., p. 520.)

Campaign of 1812.—Lord Wellington from his head-quarters at Frenada, near the Coa, where he had been apparently quiet during the latter months of 1811, had been preparing in secrecy the means of recapturing the important fortress of Ciudad Rodrigo. Under the appearance of repairing and fortifying Almeida he had collected there a battering train and abundant stores. A portable bridge on trestles was also constructed in the same place. He also effected the formation of a commissariat waggon-train, with several hundred waggons constructed for that purpose, in order to supersede the rude carts of Portuguese construction which had been hitherto used as a means of transport for the army, but which would have often proved quite ineffectual without the assistance of a large body of Spanish mules and muleteers, which followed all the movements of the divisions of the British army. By the exertions of the engineer officers the river Douro had been rendered navigable as far as the confluence of the Agueda, that is to say, forty miles higher than boats had ever before ascended it. All this was done with so little outward bustle and show that Marmont does not seem to have anticipated any attack upon Ciudad Rodrigo, at least for the remainder of the winter. The French marshal had placed his army, the 'Army of Portugal,' in extensive cantonments about Plasencia and Talavera, towards the Tagus, and had detached part of it to the eastward towards La Mancha, and two divisions to the north, to occupy Asturias. Suddenly, Lord Wellington, on the 6th of January, 1812, moved his head-quarters forward to Gallegos, and on the 8th part of the army crossed the Agueda, and immediately invested Ciudad Rodrigo. An external redoubt, on a hill called the Great Teson, was stormed by a party of the light division that very evening, and the first parallel was soon afterwards established. On the night of the 13th the fortified convent of Santa Cruz, situated outside of the walls, was surprised and carried; and on the 14th the convent of San Francisco, likewise situated outside the walls, was carried by assault. The second parallel was then completed, and fresh batteries being established, two practicable breaches were made on the 19th, and that very evening orders were given to storm the place. No time was to be lost, as Marmont was known to be advancing to relieve the garrison. A part of the light division under General Craufurd, on one side, and General Mackinnon's brigade, supported by the 94th and 5th regiments, on the other, advanced to the breaches, whilst Colonel Pack's brigade attacked the gate of St. Jago, and in less than half an hour from the time the attack commenced the Allies were in possession of the ramparts, and the garrison then surrendered. ('Dispatches to Lord Liverpool,' vol. viii., p. 549, &c.) The loss of the British was severe. General Mackinnon and many of his men were blown up by the explosion of a magazine on the rampart, which took fire accidentally. General Craufurd, the gallant commander of the light division, was mortally wounded, and died shortly afterwards. General Vandeleur and Colonel Colborne were also wounded, as well as Major George Napier, who led the storming party on the left. The total loss of the British and Portuguese amounted to about 1000 killed and wounded. The loss of the garrison was estimated at about the same, besides 1700 prisoners. A large battering-train and a vast quantity of ammunition and stores were found in the place.

Marshal Marmont heard at Valladolid, on the 15th of January, of Lord Wellington's operations against Ciudad Rodrigo. He quickly recalled Bonet's division from Asturias, collected his other divisions, and marched, as he thought, to relieve the place; but on arriving at Salamanca he heard of its fall. His astonishment was thus expressed in a letter to Berthier:—"On the 16th the English batteries opened their fire at a great distance: on the 19th the place was stormed, and fell into the power of the enemy. There is something so incomprehensible in this that I allow myself no remarks, as I am not yet furnished with the necessary information."

The Spanish Cortes assembled at Cadiz passed unanimously a vote of thanks to Lord Wellington, and conferred on him the title of Duke of Ciudad Rodrigo. In England he was raised to the dignity of Earl of Wellington of the United Kingdom, and parliament, besides a vote of thanks to him and his brave army, annexed to the title an annuity of 2000*l*.

Having repaired in some degree the works of Ciudad Rodrigo, Lord Wellington placed it under the command of a Spanish governor, and prepared to move to the south, for he had made up his mind to take Badajoz, if possible, before Marmont and Soult could unite for its defence. The artillery for the siege was embarked at Lisbon for a fictitious destination, then transhipped at sea into small craft, in which it was conveyed up the Setubal river to Alcacer do Sul, and thence by land across Alemtejo to the banks of the Guadiana. On the 6th of March, leaving one division on the Agueda, Lord Wellington marched the remainder of his army to the south. On the 16th the army crossed the Guadiana, and Badajoz was immediately invested, while several divisions advanced to Llerena and Merida to cover the siege. On the 25th, the Picurina, an advanced post, separated from the body of the place by the small river Rivillas, was taken by storm, and on the 26th two breaching batteries opened their fire on the town. In the meantime Soult was collecting his disposable force at Seville for the relief of the place, and Marmont, in order to effect a diversion, entered Portugal by Sabugal and Penamacor, and ravaged the country east of the Serra de Estrella. Lord Wellington accelerated the operations of the siege. On the 6th of April, three breaches having become practicable, orders were given for the assault in the evening. The various divisions passed the glacis under a tremendous fire from the garrison, which greatly thinned their ranks; and they descended into the ditch, and ascended the breaches, but here they found obstacles which appeared insuperable. Planks studded with iron spikes, like harrows, and chevaux-de-frise formed of sword-blades, effectually stopped the way, and the ramparts and neighbouring buildings were occupied by light infantry, who showered their volleys upon the assailants. Shells, hand-grenades, every kind of burning composition, and missiles of every sort, were hurled at them. At last Lord Wellington ordered them to withdraw just as a report came that General Picton's division had taken the castle by escalade, and soon afterwards General Walker's brigade also entered the town by escalade on the side of the Olivença Gate. The othe divisions then formed again for the attack of the breaches when all resistance ceased. The French governor, General Philippon, with a few hundred men, escaped across the Guadiana to Fort San Christoval, where he surrendered the following morning. Great excesses and outrages were committed by the soldiers during the remainder of the night, until severe measures on the part of Lord Wellington restored order. The loss of the Allies was much more severe than at Ciudad Rodrigo, amounting to 72 officers and 963 men killed; and 306 officers and 3480 men wounded. "When the extent of the night's havoc," says Napier, "was made known to Lord Wellington, the firmness of his nature gave way for a moment, and the pride of conquest yielded to a passionate burst of grief for the loss of his gallant soldiers."

Soult collected his army at Villafranca, between Llerena and Merida, on the 8th, when, hearing of the fall of Badajoz, he retired before daylight next day towards Seville, pursued by the British cavalry, which made a successful attack on his rear-guard at Villa Garcia.

On the 13th of April Lord Wellington moved the main body of his army back to the north, leaving General Hill south of the Tagus. Marmont, on hearing of this, gave up the blockade of Almeida and Ciudad Rodrigo, and withdrew to Salamanca. Lord Wellington's head-quarters were again at Guinaldo, between the Coa and the Agueda, where they remained till the middle of June, nothing of importance occurring in that quarter during the interval. In the south however General Hill took and destroyed, in the month of May, the forts which the French had constructed at Almaraz on the Tagus, where they had a bridge of boats to secure the communication between the Armies of the North and South.

On the 13th of June Lord Wellington, having completed his preparations for an advance into Spain, broke up from his cantonments with about 40,000 men, leaving General Hill on the Tagus, near Almaraz, with about 12,000 more. On the 17th he appeared before Salamanca. Marmont retired on his approach, and left about 800 men in some forts constructed on the ruins of convents, which commanded the bridge across the river Tormes. The allied army forded the river and entered the town, to the great joy of the inhabitants. "They have now been suffering for more than three years, during which time the French, among other acts of violence and oppression, have destroyed 13 out of 25 convents, and 22 of 25 colleges, which existed in this celebrated seat of learning." ('Dispatches,' ix. p. 239.) The forts were immediately invested, while Marmont's army retired to Toro on the Douro, and the British advance took up a position at San Cristoval, a few miles in front of Salamanca. An attempt was made to carry the forts by escalade, which failed, and Major-General Bowes and 120 men fell in the attack. On the 20th Marmont moved forward again, and, arriving in front of the position of San Cristoval, made a demonstration with his cavalry in the plain, but it ended merely in a skirmish. He made other demonstrations and movements in the following days for the purpose of relieving the forts, but was baffled by the watchfulness of the British general, until on the 27th the forts within Salamanca were taken or surrendered.

Marmont again retired to the Douro in the beginning of July, and took up a strong position on high ground along the northern bank of the Douro, his centre being at Tordesillas. The British and Portuguese allied army took up a line on the left or southern bank of the river, facing the enemy. A great deal of manœuvring, marching, and counter-marching, and changing of front, followed on the part of Marmont, during which the French marshal was reinforced by Bonet's division from Asturias, which had effected a difficult march over the mountains, having been harassed and pressed by the Spaniards from Galicia under Mahy and Porlier. On the 16th of July Marmont threw two of his divisions across the Douro at Toro, when Lord Wellington moved his army to the left, to concentrate it on the Guareña, an affluent of the Douro from the south. On the night of the 16th the French, recrossing the Douro at Toro, ascended the northern bank of the river with their whole army to Tordesillas, when they again crossed over to the southern bank, and by a forced march assembled at Nava del Rey on the 17th. On the 18th they attempted to cut off the right of the British army, consisting of the 4th and light divisions, but were repulsed by several charges of the British and Hanoverian cavalry, as well as of the British and Portuguese infantry. By his manœuvres however Marmont succeeded in establishing his communication with King Joseph and the army of the centre, which was advancing from Madrid to join him. In the mean time the two armies of Marmont and Wellington were in line on the opposite banks of the Guareña. More manœuvring took place on the part of Marmont, who, on the 20th, crossed the Guareña on the right of the Allies, and advanced towards the Tormes by Babilafuente and Villamosa. Lord Wellington followed closely the enemy's movements during part of that day's march, and the two hostile armies moved in parallel lines within half cannon-shot of each other in the finest order; and as the nature of the ground gave either party a temporary advantage the artillery opened fire, but no actual collision took place, though both armies were ready to form in line of battle. Lord Wellington, in his dispatch to Earl Bathurst dated the following day, July 21, observes as follows—"The enemy's object hitherto has been to cut off my communication with Salamanca and Ciudad Rodrigo, the want of which he knows would distress us very materially. The wheat-harvest has not yet been reaped in Castile, and even if we had money we could not now procure anything from the country, unless we should follow the example of the French, and lay waste whole districts in order to procure a scanty subsistence of unripe wheat for the troops. It would answer no purpose to attempt to retaliate upon the enemy, even if it were practicable. The French armies in Spain have never had any secure communication beyond the ground which they occupy; and, provided the enemy opposed to them is not too strong for them, they are indifferent in respect to the quarter from which their operations are directed, or on which side they carry them on. The army of Portugal has been surrounded for the last six weeks, and scarcely even a letter reaches its commander; but the system of organised rapine and plunder, and the extraordinary discipline so long established in the French armies, enable it to subsist at the expense of the total ruin of the country in which it has been placed, and I am not certain that Marshal Marmont has not now at his command a greater quantity of provisions and supplies of every description than we have. . . . . . . I have invariably been of opinion that, unless forced to fight a battle, it is better that one should not be fought by the allied army unless under such favourable circumstances as that there would be reason to hope that the allied army would be able to maintain the field, while that of the enemy should not. Your lordship will have seen by the returns of the two armies that we have no superiority of numbers even over that single army immediately opposed to us; indeed I believe that the French army is of the two the strongest, and it is certainly equipped with a profusion of artillery double ours in number, and of larger calibres. It cannot therefore be attacked in a chosen position without considerable loss on our side. To this circumstance add, that I am quite certain that Marmont's army is to be joined by the King's, which will be 10,000 or 12,000 men, with a large proportion of cavalry, and that troops are still expected from the army of the north, and some are ordered from that of the south; and it will be seen that I ought to consider it almost impossible to remain in Castile after an action, the circumstances of which should not have been so advantageous as to have left the allied army in a situation of comparative strength while that of the enemy should have been much weakened. I have therefore determined to cross the Tormes if the enemy should; to cover Salamanca as long as I can, and above all not to give up our communication with Ciudad Rodrigo; and not to fight an action unless under very advantageous circumstances, or it should become absolutely necessary." ('Dispatches,' ix. pp. 296-98.)

On the 21st both hostile armies crossed the Tormes—the Allies by the bridge of Salamanca, and Marmont's higher up the river by the fords between Huerta and Alba de Tormes. Lord Wellington placed his troops in a position, the left of which rested on the left or southern bank of the river, and the right on one of two steep hills which from their similarity and contiguity are called the Dos Arapiles. On the morning of the 22nd some sharp skirmishing took place, and the French succeeded in gaining possession of the more distant Arapiles, by which they had it in their power to annoy and perhaps turn the right of the British, Marmont's plan being evidently to cut them off from Ciudad Rodrigo. This obliged Lord Wellington to extend his right to a height behind the village of Arapiles, occupying the village itself with the light infantry. After a variety of evolutions and movements on the part of Marmont, which lasted till two o'clock in the afternoon, the French commander, under cover of a very heavy cannonade, "extended his left, and moved forward his troops apparently with an intention to embrace, by the position of his troops and by his fire, our post on that of the Two Arapiles which we possessed, and from thence to attack and break our line, or at all events to render difficult any movement of ours to our right. The extension of his line to his left however, and its advance upon our right, notwithstanding that his troops still occupied very strong ground, and his position was well defended by cannon, gave me an opportunity of attacking him, for which I had long been anxious." (Dispatch to Earl Bathurst, July 24.) Lord Wellington's anxiety is explained by the intelligence which he had received that General Clausel had arrived at Pollos, on the Douro, on the 20th, with the cavalry and horse-artillery of the army of the north, to join Marmont, which he was expected to do on the 22nd or 23rd at the latest. This junction would give Marmont such a superiority in cavalry as greatly to embarrass and endanger the movements of the British.

Lord Wellington, suddenly seizing the opportunity for which he had been waiting, disposed his divisions so as to turn the enemy's left and at the same time attack him in front. General Pakenham, at the head of the third division, steadily ascended the ridge occupied by the extreme left of the French, formed line across their flank, and, being supported by some cavalry, he moved on towards the centre of the enemy, driving everything before him. Wherever the French attempted to make a stand they were charged with the bayonet; the cavalry at the same time charged the enemy in front, and the whole left wing of the French made a disorderly retreat towards their right, leaving many killed and wounded behind, and about 3000 prisoners. Meantime the 4th and 5th divisions, after a very severe struggle, succeeded in driving in the centre of the enemy, whose right however remained unbroken, when General Clausel, who having joined the French army that day, succeeded to the command in consequence of Marshal Marmont being wounded, withdrew his troops with great skill, and formed them in a new position nearly at right angles with the original one. His cavalry was numerous, and his artillery formidable. Lord Wellington directed a fresh attack, and the 6th division, ascending to the enemy's position under a sweeping fire of artillery and musketry, gained the level ground, when they charged with the bayonet, and the 4th division coming up at the same time the French abandoned the ground in great confusion, retreating towards Alba de Tormes, followed closely by the British till night stopped the pursuit, which was renewed by the cavalry on the morning of the 23rd. The cavalry came up with the French rear near La Serna, when three French battalions surrendered, being forsaken by their own cavalry. Clausel retired by Peñaranda to Arevalo, whence he took the direction of Valladolid. The loss of the French was very severe; three generals killed, four wounded; one general, six field-officers, 130 officers of inferior rank, and between 6000 and 7000 men taken prisoners, besides two eagles. Their total loss in killed and wounded could not be ascertained. The Allies had 694 killed and 4270 wounded, but the proportion of officers was very great. General Le Marchant was killed and Generals Beresford, Leith, Cole, Cotton, and Spry, were wounded.

The ultimate though not immediate results of the victory of Salamanca were great, and a French historian, generally very warm in the cause of Napoleon, does not hesitate to attribute to the military and political consequences of that battle the ultimate loss of Spain by the French. (Thibaudeau, 'Histoire de l'Empire,' ch. 83.) Among the political consequences must be reckoned the obliteration of any tendency that there might have been in the minds of some of the influential men in Spain, and even in the Cortes, to give up the English alliance, and make their peace with King Joseph, on condition of his acknowledging the constitution proclaimed by the Cortes assembled at Cadiz in March of that year. The author just quoted says, "We are assured that a negociation to that effect had been entered into, which the battle of Salamanca broke off for ever."

Lord Wellington, having crossed the Douro, reached Valladolid on the 30th of July, Clausel continuing his retreat towards Burgos. King Joseph, with all the troops he could muster at Madrid, about 20,000, had marched by the Escurial on the 21st of July to join Marmont. On arriving at Arevalo he heard of Marmont's defeat, upon which he marched by his right to Segovia to effect a diversion in favour of Clausel's retreating army. Lord Wellington, recrossing the Douro, marched against him on the 7th of August, leaving a force on the Douro to watch Clausel. King Joseph retreated to Madrid, and the Allies having passed the Guadarama, he abandoned the capital and withdrew to the left bank of the Tagus, between Aranjuez and Toledo. Lord Wellington entered Madrid on the 12th, and was received with great acclamations. In consequence of this movement Soult raised the blockade of Cadiz, destroying the works which the French had constructed with so much labour and expense, and, abandoning western Andalucia, concentrated his forces in Granada. His rear-guard was attacked by an allied Spanish and English force from Cadiz, which drove it from San Lucar, and took Seville by assault. General Hill at the same time advanced from the banks of the Guadiana to the Tagus, connecting his operations with those of the main body of Lord Wellington's army. On his approach King Joseph abandoned Toledo and fell back to Almanza, in Murcia, to keep himself in communication with Soult and Suchet. A great part of southern and central Spain was thus freed from the French, who never retook Seville; and this was another result of the battle of Salamanca.

The situation of Lord Wellington at Madrid was however critical. Clausel's army in the north had been largely reinforced, and Soult, and Suchet, and King Joseph, by forming a junction, might advance from the south, and thus the Allies would be attacked by a combined force nearly treble in number to their own. The Anglo-Sicilian expedition of not more than 6000 men, part of whom were foreign auxiliaries, was cooped up in Alicante, and could not effect any powerful diversion. There was no Spanish force of any magnitude upon which Lord Wellington could depend for field operations. The Galician army under Santocildes, which was the most effective Spanish corps, after taking Astorga, had advanced towards Zamora, but was driven back by Clausel. Ballasteros, who commanded a Spanish force in Andalucia, refused to be directed by Lord Wellington, and O'Donnell had been defeated in Valencia by Suchet, and driven into Murcia. At Madrid Lord Wellington was treated with enthusiastic admiration, but no active exertions were made in the common cause. The country was exhausted, the people appeared disheartened, and the British commander-in-chief could not realise at Madrid, upon drafts on the British treasury, a sum of money adequate to his most pressing wants. To remain at Madrid was therefore impracticable; he must either advance to the north against Clausel, or to the south against Soult, and he determined on the first of these movements, for the purpose of striking a blow at Clausel before the French in the south and east could advance to his support. Leaving two divisions at Madrid, he marched with the remainder on the 1st of September for Valladolid, which he entered on the 7th, and, continuing his march towards Burgos, was joined at Palencia by the Spanish army of Galicia, which scarcely mustered 10,000 men, undisciplined and deficient in equipment. On the 19th the allied army entered Burgos, and the French, under General Souham, who had assumed the command in the north, fell back to Briviesca, leaving 2000 men, under General Dubreton, in the Castle of Burgos, strong by its position, which had been fortified with care. The possession of that fort was necessary for the security of the allied army in its present advanced and insecure position, and Lord Wellington directed it to be invested forthwith, though he was ill furnished with siege artillery. A horn-work on a hill, which commanded several of the works of the castle, was carried by assault. The fort itself was battered, but with little effect, and sapping was then resorted to. On the 29th, a breach being effected in the outer wall by the explosion of a mine, an attempt was made to storm it, but failed. Another breach was effected in like manner on the evening of the 4th of October, and, being stormed with success, the besiegers were established within the exterior line of the works of the castle. The garrison made two sorties, by which they materially injured the works of the Allies, and occasioned them great loss. Want of ammunition greatly retarded the operations of the siege. A breach at last being effected, by mining, in the second line on the 18th, orders were given to storm it. A detachment of the King's German Legion carried the breach, and a detachment of the Guards succeeded in escalading the line; but the enemy brought such a fire upon them from the third line and from the body of the castle, and attacked them with numbers so superior before they could be supported, that they were obliged to retire with considerable loss. But now the French army of the north advanced with evident intention to raise the siege; and at the same time Lord Wellington learnt from General Hill that the armies of the south and centre, which, being united, mustered 70,000 strong, were advancing from Valencia towards the Tagus, and that the Spanish General Ballasteros had not assumed a position in La Mancha, which the Spanish Government, at Lord Wellington's suggestion, had directed him to take in order to intercept the enemy's movements. The British commander was therefore under the necessity of abandoning the siege of Burgos, and of effecting a retrograde movement in order to draw near to General Hill, who at the approach of Soult abandoned Madrid and retired slowly towards Salamanca.

On the 21st of October the siege of Burgos was raised, and Lord Wellington retired in good order to Palencia, and was joined by a brigade from England under Lord Dalhousie, which had landed at Coruña. The French, under Souham, repeatedly attacked the rear-guard of the Allies until they reached the Douro at Tudela, when Souham halted, waiting to be joined by Soult from the south. Lord Wellington continued his retreat to the Tormes, being joined on the 3rd of November by General Hill. On the 8th of November the Allies took up their old position on the heights of San Cristoval, in front of Salamanca. On the 10th, Souham and Soult joined their forces, which amounted to 75,000 infantry and 12,000 cavalry, while Lord Wellington's army did not exceed 48,000 infantry and 5000 cavalry. On the 14th the French crossed the Tormes in force near Lucinas. Lord Wellington took position at the Arapiles, being the ground of his former victory; but as the enemy, through his superiority of numbers, and especially of cavalry, was in motion to intercept his communications with Ciudad Rodrigo, he withdrew to the Agueda, and on the 18th his head-quarters were at Ciudad Rodrigo. Soult did not follow him close: in fact, the French made no serious movement beyond the Tormes, and soon afterwards they even withdrew a great part of their army from the banks of that river, to place them in better cantonments in Castile. The main army of the British and Portuguese were distributed in their old quarters within the frontiers of Portugal, their left resting at Lamego on the Douro, whilst General Hill's corps moved into Spanish Estremadura, into cantonments, near Coria, and towards the Tagus, placing strong posts at the passes of Baños and Bejar. The campaign of 1812 was now terminated.

During the retreat from Burgos the allied troops suffered much fatigue and privation; the weather was very inclement, the roads were deep and miry, and the rivers were greatly swelled, and some of them were breast-high at the fords. Owing to the irremediable difficulty of obtaining provisions in Spain, a great part of the army had neither bread nor biscuit, and the men had only a ration of lean tough beef, which they could not cook, but heated upon such smoky fires as they could make, and so ate it half raw. Many irregularities were committed by the soldiers, which Lord Wellington severely reprobated in a circular letter which he addressed to all commanding officers of divisions and brigades, dated Frenada, 28th of November 1812. ('Dispatches,' ix., p. 582.)

When the news reached England of the victory of Salamanca, Lord Wellington was advanced in the peerage by the title of Marquis of Wellington, Aug. 18, 1812. On the 3rd of December he received the thanks of Parliament, and on the 7th of the same month the sum of 100,000*l.* was voted to him as a reward for his services, and to enable him to support with dignity the rank to which he had been elevated.

Campaign of 1813.—Napoleon, having lost the best part of his army in his Russian expedition of 1812, not only could not reinforce his marshals in Spain, but thought it advisable to recall Marshal Soult, at the beginning of 1813, in order to intrust him with a command in the approaching campaign against the Russians and Prussians in Germany. Soult however only took about 20,000 men with him from the Peninsula. The French had still about 70,000 to oppose to Lord Wellington, independent of the force under Suchet in eastern Spain. The army still called the 'Army of Portugal,' under General Reille, had its head-quarters at Valladolid; that of the centre, under Drouet, was distributed round Madrid; and the head-quarters of the army of the south, formerly Soult's, were at Toledo. All these forces were under King Joseph, who was assisted by Marshal Jourdan. Clausel and Foy commanded separate divisions in Aragon and Biscay. Andalucia and Estremadura were free from the French, as well as Galicia and Asturias in the north.

Lord Wellington had been at last appointed by the regency of Spain, with the approbation of the Cortes, to the rank of commander-in-chief of the Spanish armies, and measures were taken to render the Spanish troops more effective than they had hitherto been. But the army upon which he could immediately rely for field operations consisted of about 65,000 infantry, British and Portuguese, and about 6000 cavalry. With this force he opened the campaign of 1813.

About the middle of May, Lord Wellington broke up from his Portuguese cantonments, and put his army in motion for Spain in three bodies, the left under Sir Thomas Graham, the right under General Hill, and the centre under his own immediate command. He directed General Graham to pass by Lamego to the north of the Douro, and march through Tras-os-Montes to Bragança and Zamora, and thence to Valladolid, thus securing the position which the French had taken and had been at great pains to strengthen, along the northern bank of the Douro. The French were taken by surprise, not expecting this movement through Tras-os-Montes. Graham reached the Esla, an affluent of the Douro from the north, without meeting an enemy. On the 1st of June, having crossed the Esla, he encamped near Zamora, the French retreating before him, and, being joined by Lord Wellington from Salamanca, they moved on towards Valladolid. General Hill having crossed the Douro at Toro on the 3rd of June, joined the rest of the allied army, which was likewise joined by the Spanish army of Galicia, and afterwards by another Spanish corps from the south under O'Donnell. The French at Madrid and Toledo, disconcerted by this rapid march of the Allies, and fearing to be cut off from their countrymen in the north, hastily quitted the capital with King Joseph, his court, and retainers, and crossed the Douro at Puente, when the united French army retired to Burgos. On the 12th of June, the Allies continuing their advance, the French abandoned Burgos, destroying the defences of the castle, and retreated by Briviesca to the Ebro, which was the line they intended to defend. They threw a garrison into the fortress of Pancorvo in advance of the river. Lord Wellington, to avoid a useless sacrifice of men in forcing the passage of the Ebro in front of the enemy, moved his left by the road to Santander, through a rugged country, and directed it to pass the Ebro near its source by Rocamunde and San Martino, and then to follow the left or northern bank of the river towards Osma. The French position on the Ebro was thus turned, and the French fell back upon Vitoria after an engagement at Osma, in which they were defeated. The whole allied army, having passed the Ebro on the 15th of June, followed the enemy, and on the 20th was concentrated near Vitoria, where the French had taken a strong position in front of the town, covering the three roads from Madrid, Bilbao, and Logroño, which united at Vitoria.

The two hostile armies were nearly equal in number, amounting to from 70,000 to 75,000 men each. On the morning of the 21st Lord Wellington moved his army for the attack in three great divisions. The left, under General Graham, was directed by a circuitous movement to turn the enemy's right across the Bilbao road, and cut off his retreat to France by the Bayonne road; the right, under General Hill, was to commence the action by crossing the river Zadorra where the road from Madrid to Vitoria intersects the river, and to attack the enemy's left on the high ridge behind the village of Subijana de Alava; and the centre, consisting of the 3rd, 4th, 7th, and light divisions, in two columns, was to attack the French centre. General Hill succeeded, after a severe contest, in carrying the heights of Subijana de Alava, when King Joseph ordered his left to fall back for the defence of Vitoria. In the mean time General Cole, with the 4th and light divisions, crossed the Ebro by the bridges of Nanclaras and Tras Puentes, and soon afterwards the 3rd and 7th divisions crossed the river higher up, and marched against the centre of the French, who received the advancing columns with a destructive fire. General Picton's division, the 3rd, coming in contact with a strong body of the enemy, drove it back, and took its guns. The other divisions coming up, the French abandoned their position, and began their retreat in good order towards Vitoria. But while this was passing in front, General Graham, moving along the road from Bilbao, had attacked the French right, which was posted on the heights beyond the Zadorra, above the village of Abechuco, and had dislodged it from thence, and then, ascending the right bank of the Zadorra towards the road to Bayonne, he carried the village of Gamarra Mayor: at the same time the Spanish division of Longa carried the village of Gamarra Menor, which is on the right bank of the river opposite the road to Bayonne, which runs along the left bank, the heights of which were occupied by two divisions of French infantry in reserve. Towards the evening however the main body of the French army having been driven through the town of Vitoria, the divisions on their right withdrew hastily from their position; and then General Graham, crossing the Zadorra, took possession of the Bayonne road, by which the French were retreating, and this movement threw their army into irretrievable confusion. Their columns were obliged to alter their line of retreat, and take the road to Pamplona, abandoning all their baggage, artillery, ammunition, military chests, and the court equipage of King Joseph, and were followed after dark by the Allies. It was the most complete defeat that the French ever experienced in Spain. On this occasion the Spanish divisions under Generals Morillo and Longa, who were in the field with the British and Portuguese army, behaved remarkably well, and were honourably mentioned in Lord Wellington's dispatch after the battle. The total loss of the Allies was 740 killed and 4174 wounded. The loss of the French was stated by themselves at 6000. About 1000 prisoners fell into the hands of the Allies. But the French lost also 151 guns, 415 caissons, more than 100 waggons, an immense quantity of ammunition, and all the baggage of the army, and the baton of Marshal Jourdan. They carried away only one gun to Pamplona. King Joseph's carriage was seized, and he had hardly time to escape on horseback. Many carriages belonging to his court, with ladies, were also taken.

The French, leaving a strong garrison at Pamplona, continued their retreat to France. General Foy, who was not present at the battle, being near Bilbao, likewise fell back upon Bayonne, and was pursued by General Graham. A French garrison remained at San Sebastian. General Clausel, who was coming up from Logroño with about 15,000 men, hearing of the result of the battle, turned hastily back to Zaragoza, and thence by Jaca and the central Pyrenees, into France, having lost his artillery. Suchet alone remained with his army in Cataluña and Valencia, having his hands fully employed in that quarter.

Lord Wellington, having established the blockade of Pamplona, and directed General Graham to invest San Sebastian, advanced with the main body of his army to the Pyrenees, to occupy the passes from Roncesvalles to Irun, at the mouth of Bidasoa.

When the news of the battle of Vitoria reached England, there were great public rejoicings; and Lord Wellington was appointed a Field Marshal of England. "You have sent me," thus wrote to him the Prince Regent of England, "among the trophies of your unrivalled fame, the staff of a French Marshal, and I send you in return that of England." The Spanish Cortes, by a decree, created him Duke of Vitoria, and granted him in perpetuity the estate of Soto de Roma, in the kingdom of Granada.

When Napoleon, in his camp in Saxony, heard of the disaster of Vitoria, he was sorely vexed, and he immediately sent Marshal Soult to the Army of Spain, with the rank of 'Lieutenant of the Emperor.' Soult arrived on the Spanish frontier on the 13th of July, and set about restoring order and confidence in his army, which consisted of nine divisions of infantry (nearly 80,000 men), and three divisions of cavalry. He told them, in a proclamation dated July, that the disasters of the preceding campaign were owing to pusillanimous councils and unskilful dispositions of their late commanders. "Let us not, however," added he, "defraud the enemy of the praise which is due to him. The dispositions and arrangements of their general have been prompt, skilful, and consecutive, and the valour and steadiness of his troops have been praiseworthy." He concluded by saying that his instructions from the emperor were "to drive the enemy from those lofty heights which enable him proudly to survey our fertile valleys, and drive them across the Ebro. It is on the Spanish soil that your tents must next be pitched, and your resources drawn. . . . Let the account of our success be dated from Vitoria, and the birth of his Imperial Majesty be celebrated in that city."

Marshal Soult's first object was to relieve Pamplona. With this view he collected the main body of his army at St. Jean Pied de Port, and on the 25th of July attacked, with between 30,000 and 40,000 men, the British right at Roncesvalles. General Cole moved to the support of that post, but the French having turned the British position, General Cole considered it necessary to withdraw in the night, and march to Zubiri. In the meantime two French divisions attacked General Hill's position in the Puerto de Maya, at the head of the valley of Baztan. At first they gained ground, but were again driven back, when the retrograde movement of General Cole, on his right, induced General Hill to withdraw likewise to Irurita. Lord Wellington, who had his head-quarters at Lesaca, on the left of the army, heard of these movements late in the night, and concentrated his army to the right. On the 27th the French made a partial attack on the 4th division, near Sorauren, but were repulsed. On the 28th Soult directed a grand attack, first on the left, by the valley of the Lanz, and then on the centre of the British position. The 4th division (General Cole's) sustained nearly the whole brunt of the attack, and repulsed the enemy with the bayonet. In one instance the French succeeded in overpowering a Portuguese battalion on the right of General Ross's brigade, at the chapel of Sorauren, which obliged General Ross to withdraw, and the enemy established himself for a moment on the line of the Allies; but Lord Wellington directed the 27th and 48th regiments to charge, and the French were driven down the hill with great loss. On the 29th both armies remained inactive. Soult changed his plan, and on the 30th endeavoured to turn the British left by an attack on General Hill. He collected a large body on his right for this purpose, and by manœuvring on the left flank of Hill's corps, obliged him to withdraw from the height which he occupied behind Lizasso to another range about a mile in the rear, where, however, General Hill maintained himself against every effort that was made to dislodge him. At the same time Lord Wellington attacked the French corps in his front, in a strong position, between the valley of the Lanz and that of Arga, and obliged them to retire. On the morning of the 31st the French were in full retreat into France, by the various passes of the Pyrenees, followed by the Allies, who took many prisoners and much baggage. These various combats are designated by the name of the 'Battles of the Pyrenees.' On the 1st of August Lord Wellington took possession of the passes in the mountains.

During the month of August, General Graham was pressing the siege of San Sebastian. On the 31st of August the assault was made, and the town was carried, but with great loss, and after a most determined resistance. The French garrison retired to the castle. Many excesses were committed by the British and Portuguese soldiers after they had entered the town. Most of the houses were plundered, and it was not till the 2nd of September that order was restored by severe measures. The castle of San Sebastian capitulated after a few days. The siege and capture of the place cost the Allies nearly 4000 men, killed and wounded. Three British general officers were wounded, and Sir Richard Fletcher, the commanding officer of engineers, was killed.

In the month of October, Lord Wellington moved his left across the Bidasoa upon French ground, and took possession of the hills called La Rhune. The French made only a slight resistance, as Marshal Soult had already fixed upon the line of the river Nivelle in his rear for a position. On the 31st of October the French garrison of Pamplona, 4000 strong, having lost all hopes of relief, surrendered themselves prisoners of war. Early in November Lord Wellington made his preparations for marching his whole army into France, where they would find good cantonments for the winter. Before however taking this serious step he issued an order of the day to all his troops of the various nations that composed his army, in which he told "the officers and soldiers to remember that their nations were at war with France solely because the ruler of the French nation would not allow them to be at peace, and wanted to force them to submit to his yoke; and not to forget at the same time that the worst of the evils suffered by the enemy in his profligate invasion of Spain and Portugal had been occasioned by the irregularities of his soldiers and their cruelties towards the unfortunate and peaceful inhabitants of the country. To avenge this conduct on the peaceful inhabitants of France would be unmanly and unworthy of the allied nations." But Lord Wellington was not satisfied with mere proclamations and general orders; he enforced them strictly; and whenever he found any part of his troops attempting to plunder, he not only punished by military law those who were caught in the fact, but he placed the whole regiment or brigade under arms to prevent further offence. His greatest trouble was with the Spanish troops, who being badly supplied with provisions by their own government, and having the fresh recollection of the treatment which their countrymen in Spain had met with at the hands of the French, could only be restrained by the strongest measures from retaliating upon the French peasants. He was at last obliged to diminish his army by moving back most of the Spanish troops within the Spanish frontiers.

On the 10th of November the allied army left their cold and cheerless position in the high valleys of the Pyrenees, and descended into the plains on the French side. Soult had a strong position on the Nivelle from St. Jean de Luz to Ainhoe, about 12 miles in length. General Hill, with the British right, advanced from the valley of Baztan, and, attacking the French on the heights of Ainhoe, drove them towards Cambo on the Nive, while the centre of the Allies, consisting of English and Spanish troops under Marshal Beresford and General Alten, carried the works behind Sarre, and drove the French beyond the Nivelle, which the Allies crossed at St. Pè, in the rear of the enemy. Upon this the French hastily abandoned their ground and works on the left of the Nivelle, and in the night withdrew to their entrenched camp in front of Bayonne. Lord Wellington's head-quarters were established at St. Jean de Luz on the right bank of the Nivelle. The Allies went into cantonments between the sea and the river Nive, where their extreme right rested on Cambo. The enemy guarded the right bank of the Nive from Bayonne to St. Jean Pied de Port.

Lord Wellington, being straitened for room and supplies for his large army, determined to cross the Nive and occupy the country between that and the Adour. On the 9th of December General Hill forded the Nive above Cambo, while the 6th division crossed at Ustaritz, and the French were dislodged from their position at Ville Franque. In the night all their posts were withdrawn to Bayonne, and on the 10th the British right rested on the Adour. On that day Soult, resuming the offensive, issued out of Bayonne, and attacked the British left under Sir John Hope, which covered St. Jean de Luz, where the Allies had considerable depôts of stores. The French came on with great spirit, and twice succeeded in driving in the fifth division of the Allies, and twice were repulsed again, the first time by the 9th British and a Portuguese battalion, and the second time by the brigade of Guards. At last night put an end to the fight. Next morning, December 11, Soult, having withdrawn in the night most of his force from the position in front of the British left, prepared to attack the light division with overwhelming numbers. General Hope, suspecting this, had moved part of his troops to their right to support the light division. This occasioned another change in Soult's movements, who again directed several columns against the left at Barouilles. The troops were occupied in receiving their rations, and had barely time to run to their arms; but they withstood the attack, and at the close of the day both armies remained in their respective positions. Marshal Soult now giving up any further attempt on the left of the Allies, and imagining that his repeated attacks on that side must have induced Lord Wellington to weaken his right, changed his plan, and during the night of the 12th moved with his main force to his left to attack the British right. Lord Wellington however had foreseen this, and had given orders to the 4th and 6th divisions to support the right, and the third division was held in readiness for the same object. General Hill had under his immediate command above 13,000 men, and his position extended across from the Adour beyond Vieux Mouguerre to Ville Franque and the Nive. Soult directed from Bayonne on the 13th a force of 30,000 men against his position. His columns of the centre gained some ground, but were fiercely repulsed. An attack on Hill's right was likewise successful at first, but was ultimately defeated. Soult at last drew back his troops towards his entrenched camp near Bayonne. General Hill had withstood all the efforts of the enemy without having any occasion for the assistance of the divisions which Lord Wellington had moved towards him. Lord Wellington was well pleased, and said, "Hill, the day is all your own."

Nothing of importance occurred during the few remaining days of the year 1813. Both armies remained in winter-quarters. On the 1st of January in this year (1813) Lord

Wellington had been gazetted as Colonel of the Royal Regiment of Horse Guards, in place of the Duke of Northumberland, who had resigned; and on the 4th of March he had been elected a Knight of the Garter.

Campaign of 1814.—The mighty contest which had been carried on for ten years between France and the rest of Europe was drawing fast to a close. The battle of Leipzig (October 1813) had given the death-blow to the ambition of Napoleon. He had lost another fine army which he had got together with great pains after the disasters of the Russian campaign of the previous year. The scanty remains of his host were driven out of Germany across the Rhine; that river which, according to his early declarations, constituted the natural frontier of France, but which he had not had self-command enough to respect. He was now reduced to the necessity of depending upon the resources of France alone. Lord Wellington had long foretold that, when that should come to be the case, the feelings of the French population would turn against him. Napoleon had hitherto supported his enormous armies chiefly at the expense of foreign states.

On his return to Paris, in November, 1813, Napoleon decreed by a senatus consultum a new levy of 300,000 conscripts. In December he ordered the assembling of 180,000 national guards to garrison the towns and fortresses. He talked however of peace, but he hesitated, and lost time in agreeing to the preliminary basis of a treaty such as was offered to him by the Allied Powers at Châtillon. He left his own envoy there without instructions or powers. He wished in short to try once more the chances of war. On the 25th of January 1814 he left Paris for Châlons to attack the Prussians and Russians.

Lord Wellington now made his preparations to drive the army of Soult from the country on the left of the Adour. About the middle of February, by a succession of movements and partial engagements, he drove the French first across the Bidasoa, and afterwards across the Gave d'Oléron, an affluent of the Adour. On the 27th of February he met Soult's army concentrated at Orthez on the Gave de Pau, attacked and beat it, and pursued it to the Adour, the French retiring eastward towards Auch. On the 1st of March Lord Wellington's head-quarters were at St. Sever, north of the Adour. The loss of the Allies at the battle of Orthez was 277 killed, and about 2000 wounded or missing. The loss of the French army was considerable during the battle, and still more during the retreat, owing to desertion having spread to a great extent, especially among the conscripts, who threw away their arms in vast numbers.

The battle of Orthez had important results. The garrison of Bayonne was now left to its fate, and the road to Bordeaux lay open to the Allies. Lord Wellington gave orders to General Hope for the siege of Bayonne, and detached Marshal Beresford with two divisions to occupy Bordeaux. On the arrival of the Allies at the latter city, the mayor and most of the inhabitants, of their own accord, proclaimed Louis XVIII.

Lord Wellington's business was purely military. In the Spanish peninsula it was to drive the invader out of the country, and leave the people to settle their own affairs. In France, from a similar principle, he was extremely anxious not to countenance a civil war. The Duke of Angoulême having landed in the south of France to excite a movement in favour of the Bourbons, Lord Wellington advised him politely to keep incognito, and to wait for some more imporant demonstration in his favour. When Beresford marched upon Bordeaux he directed him most particularly not to originate or encourage any rising of the Bourbon party. "If they should ask you for your consent to proclaim Louis XVIII., to hoist the white standard, &c., you will state that the British nation and their Allies wish well to Louis XVIII.; and as long as the public peace is preserved where our troops are stationed, we shall not interfere to prevent that party from doing what may be deemed most for its interest: nay, further, that I am prepared to assist any party that may show itself inclined to aid us in getting the better of Bonaparte. That the object of the Allies, however, in the war, and above all in entering France, is, as is stated in my proclamation, Peace: and that it is well known that the Allies are now engaged in negotiating a treaty of peace with Bonaparte: that, however I might be inclined to aid and support any set of people against Bonaparte while at war, I could give them no further aid when peace should be concluded; and I beg the inhabitants will weigh this matter well before they raise a standard against the government of Bonaparte, and involve themselves in hostilities. If however, notwithstanding this warning, the town should think proper to hoist the white standard, and should proclaim Louis XVIII., or adopt any other measure of that description, you will not oppose them; and you will arrange with the authorities the means of drawing, without loss of time, for all the arms, ammunition, &c., which are at Dax, which you will deliver to them. If the municipality should state that they will not proclaim Louis XVIII. without your orders, you will decline to give such orders, for the reasons above stated." ('Dispatches,' xi. p. 558 and 594.)

On the 18th of March Lord Wellington moved his army to Vic Bigorre, and Soult retired to Tarbes, which he abandoned on the 20th, and continued his retreat to Toulouse, where he arrived on the 24th. On the 27th the Allies arrived on the left of the Garonne, in front of Toulouse. The object of Soult was to facilitate a junction with Suchet, who was withdrawing his troops from Cataluña, in consequence of Ferdinand having been sent back to Spain, and acknowledged as King of Spain by Napoloon, who had resorted to this new political stratagem in order to create discord among the Allies. Knowing the character of Ferdinand, he had written to him on the 12th of November 1813, saying, "That the circumstances of the times made him wish to conclude at once the affairs of Spain, where England was fomenting anarchy and Jacobinism, and was depressing the nobility, in order to establish a republic. He (Napoleon) was much grieved to see the destruction of a nation bordering upon his empire, and whose maritime interests were closely connected with his own. He wished therefore to remove all pretence for the influence of England to interfere in the affairs of Spain, and to re-establish the relations of friendship and good neighbourhood between the two nations." (Thibaudeau, 'Histoire de l'Empire,' ch. 94.) A treaty was concluded at Valençay, where Ferdinand had been detained a prisoner for five years, in which Napoleon acknowledged him as King of Spain and of the Indies, and promised to withdraw the French troops from Spain, whilst Ferdinand engaged to cause the English to evacuate the Peninsula.

At last, in the month of March, Napoleon, being hard pressed for troops for the defence of France, and wishing to avail himself of the army of Suchet, which was uselessly cooped up in Cataluña, allowed Ferdinand to return to Spain. Meantime Suchet, who had already detached, early in March, 10,000 men to join Soult, made an offer to the Spanish Regency to withdraw all his garrisons from Cataluña, which were blockaded by Spanish troops, on condition of their being allowed to return to France with their arms. The Regency referred the proposal to Lord Wellington for his opinion, and he recommended them not to allow any capitulation with any French troops, except on the condition of their being prisoners of war. Suchet's garrisons amounted to about 18,000 men, mostly veteran soldiers, who, if they had been able to join Soult on the Garonne, would have made him too strong for Wellington, a part of whose army was stationed before Bayonne and another part at Bordeaux. Suchet, with his disposable force of about 14,000 men, evacuated Cataluña, and re-entered France. In the beginning of April he placed his head-quarters at Narbonne, but did not join Soult.

On the 10th of April Lord Wellington, having crossed the Garonne the day before, attacked Marshal Soult in his entrenched camp on a range of heights between the river Ers and the canal of Languedoc, on the eastern side of the city of Toulouse. Marshal Beresford, with the 4th and 6th divisions, attacked and carried the heights on the French right, and the redoubt which covered and protected that flank; the French however were still in possession of four redoubts and of the entrenchments and fortified houses, from which they could not be dislodged without artillery. At the same time the Spanish division of General Freyre had attacked the French left with great spirit, but were at first repulsed; one regiment, however, the Tiradores de Cantabria, maintained its position under the enemy's entrenchments. The British light division moving up, the whole rallied, and again advanced to the attack. Marshal Beresford, having brought up his artillery, which had been detained by the badness of the roads, continued his movement along the ridge on the right of the French, and General Pack's brigade of the 6th division carried the two principal redoubts and fortified houses in the centre of the French position.

Soult made a powerful attack on the 6th division, which received it with the bayonet, when the French general Taupin was killed. At last the French were driven entirely from the heights, and withdrew across the canal of Languedoc into the town of Toulouse, which Soult prepared to defend. The loss of the Allies at the battle of Toulouse was about 600 killed and 4000 wounded. The French acknowledged the loss of 3200 men.

On the night of the 11th Marshal Soult evacuated Toulouse by the only road which was still open to him, and retired by Castelnaudary to Carcassone. On the 12th Lord Wellington entered Toulouse, to the great joy of the inhabitants, who were relieved from the fearful apprehensions of a siege. The white flag was flying, everybody had put on white cockades, and the people had pulled down Napoleon's statue and the eagles and other emblems of the imperial government. The municipality of Toulouse presented an address to Lord Wellington, requesting him to receive the keys of their city, in the name of Louis XVIII. Lord Wellington told them what he had told the people of Bourdeaux, that he believed that negotiations for a peace were still being carried on with the existing government of France, and that they must judge for themselves whether they meant to declare in favour of the Bourbons, in which case it would be his duty to treat them as allies as long as the war lasted; but if peace should be made with Napoleon, he could not give them any assistance or protection afterwards. ('Dispatches,' xi., p. 630). In the afternoon however of the same day the English Colonel Cooke and the French Colonel St. Simon arrived from Paris, with news of Napoleon's first abdication, and of the establishment of a provisional government in the name of Louis XVIII. From Lord Wellington's head-quarters the two officers proceeded to those of Marshal Soult, who did not think himself justified in submitting to the provisional government, having received no information from Napoleon concerning what had happened, but he proposed an armistice to Lord Wellington. The British commander wrote to him a very polite letter, excusing himself from accepting the armistice, unless the marshal acknowledged the Provisional Government of France. The object of Lord Wellington was to prevent Marshals Soult and Suchet's armies becoming the nucleus of a civil war in France in favour of Napoleon's pretensions for his son. At the same time he made preparations to pursue Soult, if required. At last, on the 18th of April, Soult, having received from Berthier an order to stop all hostilities, concluded a convention with Lord Wellington for the purpose. A line of demarcation was drawn between the two armies. The head-quarters of Lord Wellington remained at Toulouse. Marshal Suchet concluded a like convention with Lord Wellington on the 19th, by which the final evacuation of Cataluña by the French garrisons was provided for.

Before the news of the events of Paris reached Bayonne, the French made a sortie out of the entrenched camp in front of it, on the 14th of April, and attacked the lines of the Allies, who lost about 800 men in this affair, including General Hay, who was killed, and the general in command, Sir John Hope, who was wounded and taken prisoner. General Stopford, of the Guards, was also wounded.

On the 30th of April Lord Wellington set off for Paris, whither he was sent for by Lord Castlereagh. He left General Hill in charge of the army. On the 13th of May he returned to Toulouse, and soon afterwards set off for Madrid, where the army had already taken different sides; O'Donnell and Elio for the king, and Freyre and the Prince of Anglona for the constitution. Having in some degree quieted the contending parties, and got the affairs of the kingdom into a condition for being amicably settled, Lord Wellington returned to France, and on the 11th of June was again with his army at Bordeaux, giving orders for the evacuation of France by the allied troops. On the 14th of June he issued his farewell general orders to the army. ('Dispatches,' xii., p. 62.)

In May 1814 he had been created Marquis of Douro and Duke of Wellington, and the Prince Regent had sent to the House of Commons a message recommending them to grant the Duke such an annuity as would support the high dignity of the title which had been conferred upon him. On the 12th of May an annuity of 10,000*l.* was granted to him, to be at any time commuted for the sum of 300,000*l.*, which was ultimately increased to 400,000*l.* On the 23rd of June the Duke of Wellington arrived in London, and on the 28th received in his place in the House of Peers the thanks of that House, and on the 1st of July he received likewise the thanks of the House of Commons, through the Speaker.

Peace of 1814.—After the establishment of peace by the treaty of Paris, May 30, 1814, the Duke of Wellington was sent in July as ambassador to the court of France. The Congress of Vienna assembled Nov. 1, 1814, and Lord Castlereagh having returned to England at the beginning of 1815, in order to resume his place in parliament, the Duke of Wellington was appointed to succeed him as the representative of Great Britain. In the month of January 1815 the Duke of Wellington repaired to Vienna to attend the general Congress of the European Powers. In the beginning of March, Napoleon, having escaped from Elba, landed at Cannes, on the French coast, and thence marched to Paris, without meeting any obstacle, Louis XVIII. having withdrawn to Ghent. On the 13th of March the ministers of the eight Powers assembled at Vienna, including the ministers of the King of France, signed a paper, by which they declared Bonaparte an outlaw, a violator of treaties, and a disturber of the peace of the world, and delivering him over to public justice. ('Dispatches,' xii., 269, 352.) At the same time they declared that they would maintain inviolate the treaty of Paris. On the 11th of April the Duke of Wellington was appointed to the command of the army to be assembled in the Netherlands.

Campaign of Waterloo, 1815.—In the middle of April the Duke of Wellington repaired to Brussels to prepare for the impending military contest. An English army was assembled in Flanders, including the Hanoverian Legion, and was joined by the troops of the King of the Netherlands, of the Duke of Brunswick, and of the Prince of Nassau. In all he had about 76,000 men under him, of whom 43,000 were British, or Hanoverians in British pay. Of these, deducting sick, detached, &c., there remained present in the field about 37,000 British and Hanoverians. The head-quarters were fixed at Brussels. Marshal Blücher, with the Prussian army, estimated at about 80,000 men, was on the left of the British; his head-quarters were at Namur.

During the month of May, Napoleon by great exertions collected an army of about 120,000 men, chiefly composed of veterans, on the frontiers of Flanders; and on the 11th of June he left Paris to take the command. On the 15th the French crossed the Sambre, and marched to Charleroi, the Prussian corps of General Ziethen retiring to Fleurus. Marshal Blücher concentrated his army upon Sombref, holding the villages of St. Amand and Ligny in front of his position. The Duke of Wellington marched his army upon Quatre Bras, on the road from Charleroi to Brussels. Napoleon attacked Blücher on the 16th, with superior numbers, carried the village of Ligny, and penetrated to the centre of the Prussian position; but the Prussians fought with great gallantry until night, when Blücher withdrew his army in good order to Wavre. In the mean time the Duke of Wellington, with part of his army, was attacked at Quatre Bras by the 1st and 2nd corps of the French army, commanded by Ney, and a corps of cavalry under Kellermann, which however made no impression upon the British position.

On the 17th the Duke of Wellington made a retrograde movement upon Waterloo, corresponding to that of Marshal Blücher. He took up a position in front of the village of Waterloo, across the high roads from Charleroi and Nivelles—his right thrown back to a ravine near Merke Braine, and his left extended to a height above the hamlet of Ter la Haye; and he occupied the house and gardens of Hougoumont, near the Nivelles road, in front of his right centre, and the farm of La Haye Sainte in front of his left centre. The French collected their army, with the exception of the 3rd corps, which had been sent to observe the Prussians, on a range of heights in front of the British position.

About ten o'clock on the morning of the 18th of June the French began a furious attack on the post of Hougoumont, which was occupied by a detachment of the Guards, who maintained their ground against all the efforts of the enemy throughout the day. There was no manœuvring on the part of Napoleon on that day. He made repeated attacks on the British position with heavy columns of infantry, supported by a numerous cavalry, and by a deadly fire from his numerous artillery. His attacks were repulsed with great loss on both sides. In one of these attacks the French carried the post of La Haye Sainte, which was occupied by a detachment of Hanoverians, who, having expended all their ammunition, were cut to pieces. Napoleon then ordered his cavalry to attack the British infantry, which formed in squares to receive them, but all the efforts of the French cavalry could make no impression on the British infantry. by whose steady fire they were brought down in great numbers. The French cavalry was nearly destroyed in these attacks, as well as by a charge from Lord E. Somerset's brigade of heavy cavalry, consisting of the Life Guards, the Royal Horse Guards, and the 1st Dragoon Guards, in which the French cuirassiers were completely cut up. At last, about 7 o'clock in the evening, when General Bulow's Prussian corps began to be engaged upon the French right, Napoleon moved forwards his guard, which he had kept in reserve, to make a last desperate effort on the British left centre near La Haye Sainte, of which the French had already possession. The French guard marched resolutely on in column, with supported arms, under a destructive fire from the British position. They halted at the distance of about fifty yards from the British line, and attempted to deploy, but they became mixed together, whilst uninterrupted discharges of musketry from the British infantry made fearful havoc in their dense mass. They were broken, and gave way down the slope of the hill in irretrievable confusion. On this the Duke of Wellington moved forward his whole line, which he led in person, sweeping away all before him. The French were forced from their position on the heights, and fled in confused masses, leaving all their artillery and baggage on the field of battle. Marshal Blücher now came up with two Prussian corps, and took charge of the pursuit, whilst the British troops rested on the field which they had won at such a fearful cost. The British and German Legion had on that day 2432 killed, 9528 wounded, and 1875 missing; many of the last however joined afterwards. In the preceding battle of Quatre Bras, on the 16th, they had 350 killed, and 2380 wounded, making altogether nearly 15,000 killed and wounded, in an army of about 37,000 British and Hanoverians, of whom however about 5000 were not present on the field of Waterloo, being posted near Braine le Comte, or stationed at Brussels, Antwerp, Ostend, and other places. (Official Returns, 'Dispatches,' xii., 485-87.) More than 600 officers were either killed or wounded at the battle of Waterloo. The gallant General Picton was killed while leading his division to a charge with bayonets. General Sir William Ponsonby, who commanded a brigade of heavy cavalry, was killed by a party of Polish lancers. Colonel de Lancey, quartermaster-general, was also killed. The Earl of Uxbridge, General Cooke, General Halkett, General Barnes, General Baron Alten, the Prince of Orange, and Lieutenant-Colonel Lord Fitzroy Somerset, were among the wounded. Lieutenant-Colonel the Hon. Sir Alexander Gordon died of his wounds soon after the battle. In the battle of Quatre Bras the Duke of Brunswick Oels was killed, fighting at the head of his corps. Such was the termination of the great continental war, which had lasted for twelve years from the rupture of the peace of Amiens in 1803.

After the last charge by his guard Napoleon rode off, in the dusk of the evening, from the field of Waterloo, and returned to Paris, which he was soon afterwards obliged to leave for Rochefort, being deserted by the nation at large. A provisional government was formed by the legislative chambers. The British and Prussian armies marched upon Paris, meeting with little or no resistance; and on the 3rd of July a convention was agreed upon between Marshal Davoust, who commanded the French army at Paris, on one side, and the Duke of Wellington and Marshal Blücher on the other, by which the French army withdrew from the capital, and retired beyond the Loire, and the allied armies occupied Paris. Soon afterwards Louis XVIII. was again restored to the throne of France, and peace was concluded between France and the Allied Powers.

After the return of the Duke of Wellington to England, the House of Commons voted a sum of 200,000*l.*, in addition to the sums previously granted to him; and with this sum the estate and mansion of Strathfieldsaye in Hampshire were purchased, to be held by the Duke of Wellington and his heirs on the condition of presenting a tri-coloured flag to the sovereign at Windsor Castle on the 18th of June every year. The King of the Netherlands conferred on him the title of Prince of Waterloo, and the King of France created him a Marshal of France and Duke of Brunoy.

Peace of 1815.—The battle of Waterloo was succeeded by a peace in Europe which has not since been materially interrupted, except by the short but terrible contest with Russia in 1854-55. To prevent any recurrence of those desolating wars which had just terminated, it was resolved by the Allied Powers that Napoleon should be detained in custody in the island of St. Helena, and that France should be controlled by an armed occupation. The Duke of Wellington was by unanimous choice appointed to the command in chief of the allied forces retained in France for this latter purpose; and it was chiefly owing to his mediation and influence with the allied sovereigns that no penalty of confiscation was enforced upon France, and that the armed occupation of the country was so soon terminated. In September 1818, the King of Prussia and the Emperors of Austria and Russia met at Aix-la-Chapelle, in order to hold a political conference, which was attended by the Duke of Wellington and Lord Castlereagh on the part of the British Crown. At this conference an agreement was concluded for the evacuation of France by the allied armies, and for the restoration of that kingdom to its independent dignity among the European governments. The allied armies began to evacuate France on the 1st of November 1818. A week previously the Emperors of Austria and Russia and the King of Prussia created the Duke of Wellington a Field-Marshal of their respective armies. He returned to England early in November.

When the allied armies were withdrawn from France the military life of the Duke of Wellington may be said to have terminated. He shortly afterwards commenced that life of political and administrative activity in which he attained an influence at home and a reputation abroad greater perhaps than that of any other public character of modern times. On the 1st of January, 1819, he was appointed to the office of Master-General of the Ordnance, and took his seat in the Cabinet as a member of the administration of Lord Liverpool. Though he did not at first take a prominent part in political affairs, he had to bear his share of the unpopularity which was the necessary result of the attempt of Lord Liverpool's government to put down disaffection. When Mr. Canning, on the death of Lord Londonderry in August 1822, succeeded to the office of Foreign Minister, he selected the Duke of Wellington to proceed to the Congress at Verona as the representative of Great Britain. On the 10th of March 1826, the Duke was appointed High Constable of the Tower of London, and in the same year was sent on a special mission to St. Petersburg, the object of which was to induce the Emperor Nicolas to join Great Britain and the other European Powers as mediators in the quarrel between Turkey and Greece. The mission was successful. On the death of the Duke of York, January 22, 1827, the Duke of Wellington succeeded to the office of Commander-in-Chief of the Forces. On the 17th of February following a stroke of apoplexy terminated the political life of the Earl of Liverpool, and early in April Mr. Canning succeeded him as First Lord of the Treasury. The Earl of Liverpool died on the 4th of December 1828.

On the accession of Mr. Canning to office as premier, April 10, 1827, the Duke of Wellington, who had no friendly feeling to him as a man, nor any liking for the popular principles of policy which he professed, sent in his resignation not only of his seat in the Cabinet, which was attached to his office of Master-General of the Ordnance, but also of his office of Commander-in-Chief of the Forces. The majority of the other members of the cabinet likewise resigned their offices. Mr. Canning died August 8, 1827, and was succeeded by Lord Goderich as premier. The Duke of Wellington then resumed his office of Commander-in-Chief of the Forces, but did not join the new ministry, which was of very short duration. Lord Goderich resigned, after holding the premiership till the end of the year.

On the 8th of January 1828, the king sent for the Duke of Wellington and offered him the premiership, which he accepted, though, only eight months previously, he had said in the House of Lords that he was "sensible of being unqualified for such a situation," and that he "should have been mad to think of it," words of which he was reminded at the time, as well as occasionally afterwards. He recalled Mr. Peel and Mr. Goulburn to the Cabinet, and retained five of those who had been favourable to the policy of Mr. Canning, namely Mr. Huskisson, Lord Dudley, Mr. Grant, Mr. Lamb, and Lord Palmerston. The Duke of Wellington now resigned the office of Commander-in-Chief of the Forces, and appointed Lord Hill as his successor. The parliamentary session of 1828 commenced January 29. On the 26th of February Lord John Russell brought forward in the Commons a motion for the repeal of the Test and Corporation Acts. The government opposed the measure, but the motion was carried in a full House of Commons by a majority of 44. Though the Duke did not approve of the policy of this measure, some of his colleagues did; and therefore to avoid a division in the cabinet and opposition to a declared resolution of the Commons, he yielded, took up the bill, and passed it through the House of Lords, in spite of the desperate resistance of Lord Eldon and the other Tories of his school. The Duke also gave his sanction to a corn-bill introduced by Mr. Huskisson. Later in the session however, when a motion was made to disfranchise the corrupt borough of East Retford, and invest Birmingham with the electoral rights which might thus be vacated, the government opposed the motion, but Mr. Huskisson voted for it. Mr. Huskisson was then Colonial Secretary, and feeling that he had placed himself in an awkward position, he wrote to the Duke to explain, and made some allusion as to his willingness to resign. The Duke, who had no liking for Mr. Huskisson's free-trade principles, immediately wrote to say that he had considered it his duty to lay the letter before the king, that is, to advise the king to accept the resignation. Mr. Huskisson, who had not intended to resign, wrote in explanation, but after several letters had passed between them, the Duke continued inflexible. It was related at the time, that when Lord Palmerston and Lord Dudley, as friends of Mr. Huskisson, waited on the Duke, and one of them observed that it was quite a mistake, the Duke replied emphatically, "It was no mistake, could be no mistake, and shall be no mistake." Mr. Huskisson therefore retired, and at the same time Lord Dudley, Lord Palmerston, and Mr. Grant, sent in their resignations, which were accepted. The Duke then called into office the Earl of Aberdeen, Sir Henry Hardinge, Sir George Murray, and Mr. Vesey Fitzgerald. Within a fortnight after the reconstruction of the cabinet, the question of Roman Catholic Emancipation was brought before both Houses. The motion for a committee to inquire into the claims of the Roman Catholics, which had been carried in the Commons, was lost in the Lords, but the Duke's speech on the question was decidedly conciliatory, though he opposed the motion. On the 20th of January, 1829, the king conferred on the Duke of Wellington the offices of Governor of Dover Castle and Lord Warden of the Cinque Ports, after which the Duke occasionally resided at Walmer Castle, the official residence of the Lord Warden, which is situated on the coast of Kent, near Dover.

Mr. O'Connell aided by the Catholic Association had produced, by the process of agitation, a degree of discontent in Ireland which threatened an insurrection of the most dangerous character. Under these circumstances, though the Duke of Wellington and Mr. Peel were both opposed to the granting of the claims of the Roman Catholics, they decided at once that it was better to renounce the principle of political and civil disabilities founded on differences of religious belief than to expose the country to the risk of a civil war in Ireland. There was a difficulty however with George IV. After repeated interviews and arguments he refused his sanction to the proposed measure, till the Duke and Mr. Peel tendered their resignations. He then yielded; and on the 5th of February 1829, when parliament assembled, the king's speech contained a recommendation to review the laws which impose civil disabilities on Roman Catholics, and to consider whether their removal could be effected without danger to the establishment in church and state. In the debates on the speech the Duke in the House of Lords and Mr. Peel in the House of Commons announced the forthcoming measure. On the 10th of March the Roman Catholic Relief Bill was read a first time in the House of Commons, and the division on the third reading, March 30, was, 320 for it, and 142 against it; in the House of Lords, the division on the third reading, April 10, was, 213 for it, and 104 against it. The Bill was then passed, and soon afterwards received the royal assent. The opposition of Lord Eldon, Lord Winchelsea, and other Tories, was violent; but the Duke had brought the whole power of government into action, and triumphantly carried the measure. Lord Winchelsea, writing to a gentleman connected with the new institution of King's College, among other observations on the Duke's motives, imputed to him an intention "to introduce Popery into every department of the state." The Duke demanded an apology for the expressions used, which not being given, a duel ensued between them on the 21st of March. Lord Winchelsea, after the Duke had fired and missed, discharged his pistol into the air, and then tendered the required apology, which settled the dispute.

The parliamentary session of 1830 commenced on the 4th of February. On the 23rd of February Lord John Russell moved for leave to bring in a bill to enable Manchester, Leeds, and Birmingham, to return members to parliament, which was negatived by 188 to 140. On the 28th of May a motion made by Mr. O'Connell for leave to bring in a bill for the radical reform of abuses in the state of the representation of the people in the House of Commons was negatived by 319 to 13; and a motion by Lord John Russell "that it is expedient to extend the basis of the representation of the people," was also negatived by 213 to 117. There was much distress throughout the country among the agricultural and manufacturing classes, and therefore much discontent; but the great body of the people, at that time, appeared to care little about the question of a reform of the House of Commons. A change, however, and that sudden and violent, was about to take place.

George IV. died on the 26th of June 1830, and was succeeded by William IV., whose political opinions were believed to be more liberal than those of the deceased king, and whose disposition was known to be more affable and conciliatory. The British parliament was dissolved by proclamation, July 24th, and a new one summoned. Almost immediately afterwards an important revolution took place at Paris; Charles X. was driven from his throne, and abdicated it; Louis-Philippe was chosen as his successor, with the title of King of the French. The excitement of that revolution extended over the British islands as well as over the continent of Europe. In Great Britain and Ireland the people, preparing for the election of new members of parliament, were everywhere seized with an ardent desire for more liberal institutions, and, as a preliminary step, for changes and reforms of the constituencies which elected the members of the House of Commons.

The new parliament assembled on the 26th of October 1830, and the king's speech was delivered by William IV. on the 2nd of November. During the debate which followed, Earl Grey, in the House of Lords, urged the necessity of an immediate reform of the House of Commons; and the Duke of Wellington, in reply, affirmed that "the country already possessed a legislature which answered all the good purposes of legislation, and that the system of representation possessed the full and entire confidence of the country," and declared that he was "not only not prepared to bring forward any measure of reform," but would "resist any such measure so long as he held any station in the government of the country." Public meetings were immediately called throughout the country, which were attended by vast numbers. The Duke had already given offence by his measures against the press, and his declaration against reform now roused the people to a state of excitement little short of fury. On the 15th of November the government were in a minority in the House of Commons, and on the 16th the Wellington ministry ceased to exist, and was succeeded by that of Earl Grey. On the 22nd of April 1831 the king dissolved the parliament, in order to ascertain the sense of the people respecting the proposed alteration in the representation of the House of Commons. The new parliament met on the 14th of June, and the Reform Acts for England, Scotland, and Ireland were passed June 7, July 17, and August 7, 1832. The Duke of Wellington opposed the Reform Bills steadily, and spoke frequently in opposition. Hence he became excessively unpopular, and the bitterness of the feeling—at least of the lower orders—may be inferred from the fact, that when he returned from a visit to the Tower, June 18, 1832, he was hooted and roughly treated by the mob, and would scarcely have reached his residence (Apsley House) in safety, if some gentlemen and soldiers had not placed themselves around his horse, and escorted him. The windows of Apsley House were also broken, and he afterwards protected them by iron casings.

The office of Chancellor of the University of Oxford became vacant by the death of Lord Grenville, January 12, 1834, and on the 29th of the same month the Duke of Wellington was unanimously elected to succeed him. The ceremony of installation took place on the 9th of June following, and was attended by a vast concourse of persons.

On the 8th of December 1834 Sir Robert Peel was gazetted as First Lord of the Treasury, and the Duke of Wellington as Secretary of State for Foreign Affairs. This first Peel ministry terminated on the 8th of April 1835. Lord Melbourne, who had succeeded Earl Grey as premier, again resumed that office. William IV. having died on the 20th of June 1837, was succeeded by Queen Victoria, and Lord

Melbourne retained the office of premier till August 30, 1841, when he resigned, and Sir Robert Peel again became prime minister. The Duke of Wellington accepted a seat in the Cabinet, but without taking office. After the death of Lord Hill, December 10, 1842, the Duke of Wellington succeeded him as Commander-in-Chief of the Forces, and continued uninterruptedly to perform the duties of that office till the termination of his life. The Duke's last political difficulty occurred in 1846, when the repeal of the Corn-Laws had become a necessity. Sir Robert Peel saw the necessity: he knew that there would be a large majority in the Commons, but success in the Lords depended on the influence of the Duke, who refused to support the measure, and Sir Robert Peel resigned office. The Queen then sent for Lord John Russell, but he was unable to form a ministry, and Sir Robert Peel was recalled. The Duke then saw the necessity of the repeal. He put aside his own opinion, stood by his friend Sir Robert, told the Lords distinctly that they must yield to the Queen and the Commons, and by his influence and his proxies passed the measure through the House of Lords, May 28, 1846, by a majority of 47.

The Duke of Wellington died Sept. 14, 1852, at Walmer Castle, aged 83, seeming as if he had fallen asleep in his chair, after a slight illness in the morning. He was buried in St. Paul's Cathedral, London, under the dome, and beside the remains of Lord Nelson. The funeral was public, and similar to that of Nelson, which had taken place Jan. 9, 1806; and during the procession to the cathedral, Nov. 9, the deep sympathy of all classes of the people for the loss of the greatest of Britain's military commanders was as strongly manifested as it had been at the funeral of her greatest naval hero. He was succeeded in his title and estates as Duke of Wellington by his eldest son Arthur, Marquis of Douro, who was born in 1807. The Duchess of Wellington died in 1831.

The leading characteristic of the Duke of Wellington's mind seems to have been sound good sense, based on patient examination into details, and a careful study of the whole in order to arrive at a right conclusion. He made allowance for contingencies, passions, interests, estimated things at their real value, and was rarely wrong. His great principle of action seems to have been a sense of duty rather than the stimulus of glory or ambition. His manner was in general singularly calm. He never seemed to be elated by success, nor depressed by discouragements or difficulties. Quickness of decision and energy of execution marked his character during the whole of his life. He was not inflexible however in carrying out his plans as a commander or his views as a statesman; but altered his course when new information or a change of circumstances offered a sufficient reason for a change of determination. He was regular in his attendance in the House of Lords, and spoke frequently. His influence over the members of that House was such as probably has never been possessed by any other individual. As a public speaker, his delivery, without being fluent or rapid, was emphatic and vehement. In private life he was simple and methodical. He was temperate in the use of food and wine, slept on a hair-mattress on a simple camp-bedstead, was an early riser, and was indefatigable in his attention to business. He seldom made use of a carriage, and continued to ride on horseback when from the infirmities of age he could no longer sit erect, and he also used the exercise of walking even to the last, though his steps were slow and faltering.

WERGELAND, HENRIK ARNOLD, a very distinguished Norwegian poet and political writer, was born on the 17th of June 1808 at Christiansand, where his father, Nikolai Wergeland, a clergyman, was one of the assistant masters at the Latin school. The father, who was much respected, and who survived the son, was one of the deputies who, when in 1814 Norway was severed by the allied powers from Denmark and united to Sweden, met and framed the constitution of Eidsvold, the acceptance of which by Sweden laid the foundation of a new and much more prosperous and glorious period in the annals of Norway. He was afterwards appointed priest of the parish of Eidsvold, the place from which the constitution takes its name, which is at the distance of about 40 English miles from Christiania; and it was there and at Christiania, first at the cathedral school and afterwards at the university, that his son received his education. It was in 1825 that Henrik Wergeland commenced his literary career under the assumed name of Siful Sifadda, by a farce or dramatic satire entitled 'Ah.' It was afterwards followed by twelve other farces of a similar kind, some in verse and some in prose, and mostly of an Aristophanic vein, with a political bearing and a seasoning of personalities. It was not surprising that these productions should arouse the animosity of the parties to whom they referred, and for the ten years from 1827 to 1837 Wergeland's life was passed in what is familiarly called 'hot water.' His contributions to the Norwegian newspapers, some of which he occasionally edited, were very frequent; and his poems, many of which were on political subjects, were hardly less numerous. His admirers were at this time fond of calling him 'the Byron of Norway;' but Dr. R. G. Latham, who knew him personally, and in his 'Norway and the Norwegians' gives an interesting account of a visit to the parsonage of Eidsvold, observes that his productions rather reminded him of those of Elliott, the Corn-Law Rhymer, and that he might be called an 'Elliott Ossian.' His political feelings were intensely and exclusively Norwegian, and so narrow as to be antagonistical even to the other members of the Scandinavian family, the Danes and Swedes. For some time he drew the whole youth of Norway with him, but in 1832 the appearance of an attack upon him by Welhaven, another rising poet and critic—'Henrik Wergelands Digtekunst og Polemik' (Henry Wergeland's Poetry and Polemics)—began to turn the current, though Wergeland's father wrote vigorously in his defence, and at present it may be considered that the public opinion of Norway is in favour of the united action of the three Scandinavian countries. It was regarded however as a great triumph of Wergeland's views that, in 1837, Sweden conceded the point of allowing a separate national flag to Norway. In the following year King Charles John (Bernadotte) paid a visit to Christiania, and Wergeland wrote a complimentary poem on the occasion, which was said to have been received by the sovereign with peculiar gratification. The Norwegian public was surprised to hear afterwards that the king had manifested his feelings by conferring on Wergeland, hitherto regarded as the chief 'radical' of Norway, an annual pension from his own privy purse, and a storm of indignation burst on the head of the poet. His position up to that time had been a somewhat precarious one. So far back as 1834 he had given up the clerical profession, after passing in 1829 his examination as candidate in theology, and officiating for some time as curate to his father. A poem which he had published, under the title of 'Creation, Man, and the Messiah,' which he regarded as his best work, and which many even of his admirers declared themselves unable either to admire or comprehend, contained views and opinions which were not considered compatible with the position of a minister of the church; and the general freedom of his life and opinions was also against him. On quitting theology he studied medicine; in 1836 he was appointed keeper of the university library, and in 1840 keeper of the Norwegian archives. Giving up political writing after his pension, he devoted himself to poetry; and though his productions at this time did not meet with the enthusiastic reception their predecessors had enjoyed, it is now acknowledged that they are the best of his whole career. In 1840 he married, and was enthusiastically attached to his wife. But his constitution, originally athletic and corresponding with his stature of six feet three, was irrecoverably shattered by an immoderate indulgence in brandy, and he died on the 12th of August 1845, at the age of thirty-seven.

A collected edition of the principal works of Wergeland was commenced in 1851 by the Student's Society of Christiania, under the editorship of H. Lassen. The last volume we have seen of it is the eighth, published in 1856, and it was to be completed in nine. The editor, who had the task of collecting many of these writings from magazines, reviews, and newspapers, has also had that of adding notes, which on some occasions were necessary to render them intelligible to those not intimately acquainted with the passing history of Norway at the time during which they appeared. Three volumes of the eight are occupied with poetry, among which 'Jan Van Huysum's Flower-Piece' and 'The Spaniards' are considered by far the best. One volume is filled with the farces: two others with dramatic poems. An early tragedy, entitled 'Sinclair's Death,' is founded on a well-known incident in the annals of Norway, the destruction of a body of Scottish mercenaries in Swedish pay by a treacherous attack of the Norwegian peasantry. An opera entitled 'The Campbells,' and two tragedies, 'The Child-Murderess' and

'The Venetians,' are of particular merit. 'Creation, Man, and the Messiah,' is given in a revised and corrected shape, as left by the author. Of Wergeland's prose writings the most interesting are a volume of short biographies of distinguished Norwegians, and a history of the formation of the constitution of Eidsvold.

WERNERITE. [Scapolite.]

WESTALL, WILLIAM, A.R.A., younger brother of Richard Westall, was born at Hertford, October 12, 1781. He studied at first under his brother, and subsequently at the Royal Academy. Here however his studies were interrupted, by his appointment, in 1801, on the recommendation of the President, West, to accompany Captain Flinders in the Investigator as a draughtsman on his voyage of discovery. Westall was with Flinders for two years, when, the Investigator having been abandoned, he was transferred to the companion ship, the Porpoise, in which he was wrecked on a coral reef on the north coast of Australia on his voyage home. The ship which picked up Westall and his companions was bound to China, and he remained some months in that country, when he secured a passage to India. Here he also remained some time, making a journey into the interior and occupying himself, as elsewhere, in sketching the more striking scenery and objects. Not finding, on his return to England, employment as readily as he anticipated, he made a voyage to Madeira and the West India Islands; and on his return opened, in 1808, an exhibition of the large collection of water-colour drawings and sketches he had made of the various countries he had visited: it proved however an unsuccessful speculation. Captain Flinders returned to England in 1810, and Westall was directed by the government to prepare his sketches for engraving to illustrate the account of the voyage; he was also commissioned to paint several views of the coasts and interior of Australia. Of these he exhibited at the Royal Academy, in 1812, his views of 'Port Bowen,' and 'Seaforth's Isle in the Gulf of Carpentaria;' and the striking character of the scenery, and the rich and novel herbage, which he had depicted with the fidelity of a botanist, rendered them very attractive. They secured his election as Associate of the Royal Academy in the same year: he had for some time previously been a member of the Society of Painters in Water-Colours. Unfortunately perhaps for his reputation, he did not steadily follow up the path he had thus opened. He turned his attention to making drawings for engraving, in which he for many years found ample and profitable employment, but he thus contracted a neatness and prettiness of style which proved destructive of all grandeur of effect when applied in his paintings. Among his best known series of engraved designs are his views of the lakes of Westmoreland and Cumberland, which are drawn with great fidelity, though with some deficiency of power: he was a frequent visitor to this district, where he enjoyed the warm friendship of Southey and Wordsworth, by both of whom he was greatly esteemed. He also drew and engraved in aquatint a series of views of the Caves, and of the Abbeys and other Monastic Ruins of Yorkshire, of the Isle of Wight, Oxford, Cambridge, the Residences of the Poets, &c. His contributions of oil paintings to the exhibitions of the Royal Academy were comparatively few, and in his later years they became fewer than they might else have been, from finding himself in reality excluded from the full honours of that institution. Mr. Westall met with a severe accident, in 1847, by which his left arm was broken,,and he received some internal injuries, from the effects of which he never wholly recovered. He died January 22, 1850.

WESTERN AUSTRALIA, in its widest sense, extends over the western portion of the Australian continent, and comprehends all the countries lying west of 132° E. long., the boundary west of South Australia and North Australia; so that the boundary-line between it and the other parts of the continent joins the Indian Ocean east of Cambridge Gulf, and the Southern Sea near the Australian Bight, at Cape Adieu. Thus Western Australia contains about one-fourth of the whole continent, and lies between 35° and 14° S. lat., 115° and 132° E. long. The limits of the British colony, originally established under the name of the Swan River Settlement, are much less, but the boundary has not been definitely settled, and is constantly being extended. It may be said to lie between 30° and 35° 8′ S. lat., 115° and 119° E. long., or about 400 miles from south to north, and about 250 miles in breadth.

Coast.—The coast-line presents a much greater variety than most other parts of Australia. In some parts the sea to some distance from the shore is covered with numerous islands, islets, and rocks, which render these countries difficult of access. From this cause an extent of coast-line, about 500 miles in length, has not been surveyed. Tasman Land, between Point Gantheaume and Cambridge Bay, to the northward, has a coast more broken than any other part of Australia, and indented with wide bays, and some narrow inlets, which penetrate a considerable distance into the interior. The coast of Tasman Land has been but slightly examined, so that our information in respect of the natural products of the country is very limited. Within the confines of the colony there are numerous æstuaries, each of which receives several rivers. Of the few good harbours along this coast the best are Rockingham in Cockburn Sound, Albany in King George's Sound, Bunbury in Port Leschenhault, and Augusta, near Cape Leeuwin, on the southern side of the south-western promontory of the island. At the mouth of the Swan River, and at the head of the Melville Water, which runs inland for nearly 80 miles, is the port of Perth, the capital of the colony of Western Australia. The entrance is encumbered and rendered dangerous by several rocks. A lighthouse is placed on Rottenest Island at the entrance, and on some of the more dangerous rocks there are beacons.

Mountains, &c.—A range called the Darling Mountains extends along nearly the whole length of the colony. Its distance from the coast varies from 50 to 150 miles, and its height is from 800 to 3000 feet. It is generally sterile; the granite appears in some places in masses. A profusion of coarse herbage appears on the surface, and plants which resemble the English heath grow in considerable numbers. There are forests of large mahogany and blue gum-trees. In the Darling Mountains have been found roofing-slate, limestone, marl, selenite, siliceous and calcareous petrifactions, magnetic iron-ore, chromate of lead, galena, and copper. Wide valleys bordered by fertile plains occur where basaltic rocks are developed. Columnar basalt is found around Geographe bay, and from thence to Shark Bay a band of coal has been traced a distance of 600 miles.

In that part of Western Australia which borders on the south coast, there are three distinct parallel ranges of mountains running from north to south. The highest and most eastern of these has its southern termination near to King George's Sound, in 35° 6′ S. lat. The second terminates at Cape Chatham, 35° S. lat.; Cape Leeuwin, in about 34° 20′ S. lat., is the southern termination of the third range, which is inferior in altitude, as well as in extent, to the other two: it terminates on the north at Cape Naturaliste, 33° 27′ S. lat. The highest point is Tulbanop, which is stated to attain an elevation of 5000 feet. On the mountains and higher hills the surface is rugged and stony; on the lower sides of both the soil is excellent; but in the principal valleys and the lower grounds, where the sandstone formation prevails, it is of a very inferior description, except where the rivers have brought down an alluvial deposit.

Rivers.—The rivers on the west coast of Australia generally rise at no great distance from the sea. Near their sources they are mountain torrents, but in the lowlands they become slow streams. They are liable to rise suddenly, owing, it is supposed, to the rain which falls near their sources. At other times their channel, in some places many feet deep, is quite dry. They offer little or no facility for internal navigation. The Swan River rises on the western side of the Darling Range. At its mouth is a bar, after passing which the river is navigable, though with difficulty, for some distance. The other rivers are the Avon, the Murray, the Canning, the Harvey, the Preston, the Collie, the Vasse, the Blackwood, the Donnelly, and the Kalgan. The Canning rises in the Darling Range: it is smaller than the Swan, and only navigable for a few miles. Shoals impede the navigation, and in dry weather boats must be pushed over them for fully half a mile. The Murray takes its rise also in the Darling Range, and empties itself into Peel's inlet. The Preston and the Collie unite about 50 miles south of the Murray, and the united stream runs into an æstuary called Leschenhault, and forms a bar, over which the river is very shallow.

For the botany and zoology of Western Australia, see Australia.

Climate.—The climate of Western Australia has the same general character as that of Eastern Australia. [Australia.] It has not generally been found prejudicial to Europeans, while in the case of some persons it has proved highly favourable. Though variable, the western part of this colony is not so uncertain as New South Wales in the supply of rain and moisture. The average winter temperature is about 58°, that of the summer about 76°.

The wet season begins generally in March and ends in November, the rain being most abundant in August and September. The height of the dry season is during the harvest, in January, when the nights are distinguished by heavy dews. The seed-time lasts from early in May to the end of August. By December the grain is ripe: hay is cut in November. Tomatas, pumpkins, gourds, vegetable-marrow, chillies, egg-plants, besides every English vegetable, ripen in the open air; and also the following among other fruits—melons, bananas, almonds, figs, grapes, peaches, and strawberries. The olive, pomegranate, apricot, plum, mango, lemon, and orange; the mulberry, apple, nectarine, pear, and several others are grown. Fig-cuttings produce fruit the first year, and vines the second or third.

Population.—The aborigines do not amount to more than 1700. The European population here increases very slowly. In 1852 it amounted to 8711, including 705 enumerated among the military, 1432 bond, and 6574 free. According to an official return, Dec. 31, 1855, the European population was 12,818, of whom 8536 were males, and 4282 females. This number included 1470 ticket-of-leave holders, 1310 conditional-pardon-holders, 140 military and their families, and 705 prisoners. Schools are provided at the government expense for children of all religious denominations, as well as for natives, those who are able paying a small sum; and there are other schools in connection with the Wesleyan Methodists. There are about 70 churches and chapels in the colony, of which 20 belong to the Church of England, 4 to Presbyterians, and 3 to Roman Catholics.

Government.—There is a lieutenant-governor, with his staff of officials. The colony is divided for government purposes into 32 counties. On the first establishment of the colony in 1829, it was decided that no convicts should be sent thither, and a system of colonisation was projected, to be carried forward by means of land-sales, but it did not work well. The labourers sent out became landowners, and hired labour became excessively dear. Convict labour has since been requested by the colonists, and has succeeded well; but it prevents free emigration to a considerable extent, for as the pursuits of the colonists are chiefly agricultural, the demand for free labour is not large nor constant. The assisted emigration in 1855 was only 93, and the land-sales in 1856 only amounted to 1779 acres. The public works had been executed under the superintendence of the Royal Sappers and Miners, and consisted of the permanent prison at Fremantle; commissariat stores and offices at Fremantle, Guildford, York, Toodyay, and Bunbury; jails at York, Toodyay, and Bunbury; 272 miles of road made; 28 bridges built, one of which, over the Swan at Guildford, is 480 feet long, and others of considerable size; a jetty 216 feet long, built at Fremantle as a landing from the river, and another 455 feet long, as a landing from the harbour; the lakes at the back of Perth drained, and the swamps in Fremantle filled up; with some minor works. The conduct of the convicts had on the whole been good, and considerable improvement had been developed in their characters.

Commerce.—Though most of the English grains are grown, and the soil is tolerably productive, the exertions of the settlers are chiefly directed to the raising of stock. Wool is one of the chief articles of export; horses, which are sold to supply the cavalry at Madras, are another large article of export; as is sandal-wood, and a species of mahogany, of which there are large forests in the interior. Guano has been found on the islets that lie round Shark's Bay. Attempts have been made to prosecute the whale fishery; and something is done in fishing off the coasts to furnish provisions for the inhabitants. There are many salt-lakes and springs, and a considerable quantity of salt is manufactured.

Towns.—*Perth*, the capital, is situated on the right side of the estuary of the Swan River, near its junction with the Canning. The population is small. The town is however improving, but the houses are scattered over a large area. A bridge has been built across the Canning, another over the Swan, and there is a new jail. *Fremantle* is on the opposite side of the Swan River æstuary, a few miles lower down. It is the seat of the convict establishment, and there is a jail. A lighthouse has been erected upon Arthur's Head, a promontory in front of the town. There are two jetties, one from the river and another from the harbour. *Albany* is a port-town in the south-eastern part of the colony, in King George's Sound. It has a jail, and some trade in timber. *Augusta* is a small port on the eastern side of Cape Leeuwin, on the æstuary of the Blackwood River. *Bunbury* is the port town of a district formerly called Australind, of which a small village still retains the name. The harbour of Port Leschenhault, upon which it stands, is a good and large one, but it has little commerce. *Geraldton* is an inland town on the Murchison River, founded in consequence of the commencement of the working of lead-mines there by a company. *Guildford* is a small inland town, a few miles east of Perth. *Northam* is a small inland town, in an agricultural district, east of the Darling Range, on the river Mortlock, and is about 60 miles in a direct line E.N.E. from Perth. *Rockingham* is on Cockburn Sound, and has a good port, and some trade. *Toodyay* is an inland town, about 20 miles N.W. from Northam, and about 50 miles N.E. from Perth, upon the river Toodyay, which pierces the Darling Range, and falls into the Melville Water, but is not navigable. *Vasse* is a small port on Vasse Inlet, in the centre of Geographe Bay, about 20 miles S.S.W. from Bunbury, about 50 miles S. from Vasse, across a fine country, forming the promontory bounded by Cape Leeuwin and Cape Naturaliste. Other small towns of little importance are named York, Picton, Clarence, and Waterloo.

WESTMACOTT, SIR RICHARD, R.A., was born in London in 1775. His father was a sculptor of some eminence in his day, and in his studio (Mount-street, Grosvenor-square), the young Westmacott learned the use of the chisel. In 1793 he went to Rome, where he had the benefit of instruction from Canova. His career as a student in Italy was a distinguished one. He carried off the first prize in sculpture at the Academy of Florence, in 1794; and in 1795 the medal given by the pope. He was elected a member of the Academy of Florence in 1795. After a somewhat prolonged stay in Italy, he returned to London, and was soon recognised as one of the best of the young sculptors of the day; and his future career was on the whole a very prosperous one. His imaginative works were of an exceedingly graceful, chaste, and poetic character, classic in feeling, and in execution resembling that of the modern Italian school; several of these will retain their place among the best poetic works of the English school of sculpture. The most popular is his very pleasing statue of 'Psyche,' executed for the Duke of Bedford, and now, with a companion 'Cupid,' at Woburn. Among the best known of his other poetic works are the 'Euphrosyne,' executed for the Duke of Newcastle; an exquisite figure of 'A Nymph unclasping her Zone,' the property of the Earl of Carlisle; 'The Distressed Mother,' executed for the Marquis of Lansdowne; 'The Homeless Wanderer;' 'Devotion,' &c. He also executed several important works in alto and bas-relief; one of the first of which was probably his portion of the frieze on the Marble Arch (now at Cumberland Gate), the sculptors of other portions being Flaxman and Baily. His latest work in this style was the pediment of the British Museum. He also executed for the late Earl of Egremont, a large alto-relievo in marble of the 'Death of Horace' for the gallery at Petworth. A large portion of his time was however occupied, and much of his reputation now rests, on public monumental statues. Of these it will suffice to mention his statues of Pitt, Fox, Spencer Perceval, and Addison (1809), which, with his monuments of the Duc de Montpensier, and Mrs. Warren, and her Child, are in Westminster Abbey; Sir Ralph Abercromby, Lord Collingwood, and Generals Pakenham and Gibbs, in St. Paul's Cathedral; Lord Erskine in the Old Hall of Lincoln's Inn; Fox in Bloomsbury-square; Francis, Duke of Bedford, in Russell-square; and the Duke of York on the column at Waterloo-place. The so-called 'Achilles,' copied from the statue at Monte Cavallo, Rome, and inscribed by the Women of England to the Duke of Wellington, was modelled by Westmacott, but whether the choice of the figure is to be laid to the charge of his taste, or that of the women of England, we do not know.

Westmacott was elected A.R.A. in 1805, and R.A. in 1816. In 1827 he succeeded Flaxman as Professor of Sculpture at the Royal Academy, which office he held till his death. He was a man of extensive reading and sound judgment, and his lectures were marked by these qualities, and by the absence of pretension. Shortly after her accession to the throne, her Majesty conferred on him the honour of knighthood. He died on the 1st of September, 1856.

WHALEBONE. [Whales.]

WHEATON, HENRY, an eminent American diplomatist and writer on international law, was born at Providence, Rhode Island, U.S., in November 1785. Having completed his education at Brown University in his native city, he graduated there in 1802; studied law under Mr. N. Serle, and was admitted to the bar. He then passed a couple of years in Paris and London, during which he acquired considerable acquaintance with civil law, and rendered himself a complete master of the French language. On his return to America he settled in New York; commenced practice in his profession, and in 1812 became editor of the 'National Advocate,' which journal he continued to conduct for about three years with merited success. He contributed to it, among other things, a series of disquisitions on the law of nations. In 1815 he was appointed one of the justices of the Marine Court, and the same year he published a 'Digest of the Law of Marine Captures and Prizes,' which was received by the profession with much favour. He was about this time appointed reporter to the Supreme Court of the United States, an office he held for twelve years; his 'Reports of Cases Argued and Determined in the Supreme Court of the United States,' in 12 vols., are considered to be of great value. He had besides written a life of William Pinckney; contributed numerous articles to the 'North American Review;' published several orations and addresses; and edited several English and other law books. Mr. Wheaton had by this time taken high rank as a civilian. The degree of LL.D. was conferred upon him by Harvard University in 1819, and by Brown University in 1820. He was called upon to lecture upon the subject of international Law, before the New York Historical Society, the New York Athenæum, and other learned societies. He was appointed in 1821 a member of the convention for revising the constitution of New York; and in 1825, a commissioner for revising the laws of that state. He resigned his offices, however, in 1827, on being appointed by President J. Q. Adams as first chargé d'affaires to the court of Denmark. This important post he held until 1834, when he was transferred to the court of Prussia. During his residence in Denmark Mr. Wheaton greatly increased his reputation as a publicist by his conduct on several matters of considerable importance, and by his despatches, in which various questions of international law and policy were discussed. But he also found time to devote to the study of Scandinavian history and literature, the result of which he published in London in 1831, under the title of 'The History of the Northmen, or Danes and Normans, from the Earliest Times, to the Conquest of England by William of Normandy;' this work he afterwards revised, and greatly extended for a French version by M. P. Guillot. He also, in conjunction with Mr. Crichton, wrote a history and description of Norway, Sweden, and Denmark, under the title of 'Scandinavia.'

On the accession of Mr. Van Buren to the Presidency (1837) Mr. Wheaton was raised to the rank of minister plenipotentiary to the King of Prussia; and during his nine years' tenure of this high office, he was regarded as at the head of the American diplomatists in Europe, and his advice was almost invariably sought by other American ministers in all matters of difficulty, whilst his attainments as a publicist, and his personal character and bearing, gave him great weight, and won for him high esteem and respect with the courts and cabinets of the continent. He was recalled by President Polk in July 1846.

Mr. Wheaton's chief literary production, 'The Elements of International Law,' was published in 1836, and at once took its place as a standard work on the important subject of which it treats, and of which it affords a complete survey. This work he followed up by a history of International Law, which he wrote in French in consequence of the Academy of Moral and Political Sciences of the Institute of France offering a prize for a treatise on the subject; it was published at Leipzig in 1841, under the title of 'Histoire du Progrès du Droit des Gens en Europe depuis la Paix de Westphalie jusqu'au Congrès de Vienne, avec un précis historique du Droit des Gens Européen avant la Paix de Westphalie.' The author afterwards remodelled the work, and published it in English in one thick volume (New York, 1845), under the title of 'History of the Law of Nations in Europe and America from the Earliest Times to the Treaty of Washington.' Notwithstanding his advancing years Mr. Wheaton continued after his return to America to pursue his usual studies. He had even accepted the offer of the chair of International Law in Harvard University, and was preparing to enter upon its duties, when he was suddenly cut off on the 11th of March 1848. Since his death there has been published a fourth edition of the 'Elements of International Law. By the late Hon. Henry Wheaton, LL.D. Revised, annotated, and brought down to the present time, with a Biographical Notice of Mr. Wheaton, and an account of the Diplomatic Transactions in which he was concerned. By Hon. William Beach Lawrence, formerly Chargé d'Affaires at London.'

WHEEL-ANIMALCULES. [Rotifera, *S.* 2.]

WHELK (*Buccinum*). [Entomostomata.]

WICHTINE. [Mineralogy, *S.* 1.]

WIDIN, a fortified town in Turkey, capital of Upper Bulgaria, is situated on the right bank of the Danube, opposite the straggling village of Calafat on the left bank, about 130 miles E.S.E. from Belgrade, and has a population of about 25,000. The fortifications, which were previously decayed and weak, were repaired and greatly strengthened by the Turks in 1853-54. The town contains pretty wide streets for a Turkish town; many mosques surmounted with graceful minarets; small bazaars, &c. It is the residence of a Greek bishop, and of the pasha of the province of Widin. The trade of the town is in rock-salt, corn, wine, and agricultural produce. The Austrian Danube steamers put into Widin. The inhabitants of Widin consist of Turks, Greeks, and Armenians: the Christians inhabit suburbs outside the line of the fortifications.

WIFE AND HUSBAND. The chief alterations in the laws affecting the relation of husband and wife have been already stated, but may be shortly summed up in this place. A wife when deserted by her husband may obtain an order to protect her earnings from him or his creditors, and she will then be able to contract as if she were a *feme sole* (20 & 21 Vict. c. 85, s. 21). When the desertion of the husband extends over a period of two years, or when he treats her with cruelty, or commits adultery, the wife may obtain a judicial separation. [Separation, *S.* 2.] When the husband commits incestuous adultery, or to adultery adds the crimes of bigamy or rape, cruelty or desertion for two years, or is guilty besides the adultery of an unnatural offence, the wife may obtain a dissolution of the marriage. [Divorce, *S.* 2.] The Act 20 & 21 Vict. c. 85, which has effected these alterations in the law, makes various other provisions, for which however the statute itself must be referred to.

WIFFEN, JEREMIAH HOLME, was born in the neighbourhood of Woburn, in 1792, of Quaker parents, and was educated for the profession of a schoolmaster, a vocation which he followed for several years. He very early however displayed a taste for poetry and literary composition. In 1812 he published a 'Geographical Primer,' for the use of the junior classes of a school, and he contributed some poetical effusions of considerable merit to a volume entitled 'Poems by Three Friends.' He next wrote some spirited stanzas on the portraits in Woburn Abbey, inserted in the Rev. Mr. Parry's 'History of Woburn,' and afterwards reprinted separately as 'The Russells.' In 1819 he published 'Aonian Hours,' and other poems, which attracted the notice of the Duke of Bedford, who appointed him his librarian at Woburn, and his private secretary. From this time he lived in the enjoyment of literary ease, but continued to employ himself actively. In 1820 he published 'Julia Alpinula, the Captive of Stamboul, and other Poems;' in 1822, a translation of the poems of Garcilaso de la Vega; and for many years he contributed original poems and translations to 'Time's Telescope,' and various other periodical works. Among the original pieces may be mentioned 'The Luck of Eden Hall,' as a successful effort in the old ballad style. In 1830 he published a translation of Tasso's 'Jerusalem Delivered,' on which he had been engaged for several years. He adopted the Spenserian stanza, and the versification is free and flowing, but as a whole it is certainly not calculated to supersede the bold and vigorous translation by Fairfax. In 1833 he published in one 8vo volume 'Historical Memoirs of the first race of ancestry whence the House of Russell had its origin; from the subjugation of Norway to the Norman Conquest:' which was followed immediately by two other volumes of 'Historical Memoirs of the House of Russell, from the time of the Norman Conquest.' The first volume is little more than a series of guesses as to the early history of the family, tracing its origin from Olaf, the sharp-eyed king of Berik: but the other two are interesting from the events in which the family can be traced authentically to have been engaged, and they are told with faithfulness, though with pardonable partiality. He latterly studied Hebrew and Welsh, from the last-named of which he made several successful poetical translations. Mr. Wiffen maintained his connection with the Society of Friends, holding offices of trust in it occasionally, until his death, which took place suddenly on May 2, 1856, at Woburn Abbey.

WILL AND TESTAMENT. The 'Wills Act,' 1 Vict. c. 26, has been amended by the Statute 15 & 16 Vict. c. 24. Simple apparently as are the requirements of the first statute, an immense number of questions had arisen upon the language of its provisions; and probate had over and over again been refused to wills, the authenticity of which was beyond any moral doubt. The recent statute is a very curious specimen of legislation; as the simple perusal of it will show, that it is passed not to amend the law, but to provide against the consequences which have been held to follow from the negligence of testators, in not paying strict attention to that enactment of the Wills Act, which requires the instrument to be signed at the "foot or end."

WILLEMS, JAN FRANS, the originator of what is called 'the Flemish movement' for the revival of the cultivation of the Dutch language in Belgium, was born at Bouchout, a village near Antwerp, on the 11th of March 1793. The French sans-culotte army, under Dumouriez, was at that very time advancing to the siege of Antwerp; a party of his soldiers entered Bouchout on the night that Willems was born, and on hearing the state of affairs politely withdrew from his father's house, observing that the new comer would be the first French citizen of the district, and little foreseeing how effective an opponent he would prove to the influence of France in Flanders. The attachment of Willems to the Flemish language first showed itself at the town of Lierre, where he was sent from the age of twelve to fifteen, to learn singing and playing on the organ, and where he was fortunate enough to meet with a protector and educator in the person of Mr. Bergmann, who, in the then cessation of public means of education in Belgium acted as tutor to his own family, and allowed young Willems to share their instructions in Latin and literature. Lierre was still in possession of some of the 'Rêderyk-Kamers,' or Chambers of Rhetoric, the existence of which was one of the most familiar literary features of olden Belgium, and they were in the habit of getting up theatrical entertainments. "The Cecilian Society of the principal church, St. Gummar's, where I every day sang or played the organ, being," says Willems, in a history which he afterwards wrote of the Chambers of Lierre, "in the mind to act some pieces for the benefit of the church, this was the occasion of first bringing me on the stage, and I represented the angel Gabriel bringing the annunciation to the Virgin Mary, in the piece entitled 'The Nativity and Youth of Jesus Christ.' I remember that our manager, Mr. Van den Brande, churchwarden of St. Gummar's, a very pious man, every evening before the curtain rose made us kneel down on the stage, and read the Litany of Our Lady that the performance might go off well. It was strange to see how all the characters were mingled together on their knees, and how St. Joseph and our Lady (N.B., an Our Lady with a beard), Herod, the three kings, the Jewish Scribes and Pharisees, the angels and the devils all joined in the responses, 'Pray for us, pray for us.' I shall never forget it." The mysteries of the middle ages were thus, it will be seen, flourishing in the 19th century in Belgium, as well as in some more remote corners of Europe.

When Willems was a boy of fourteen at Lierre he wrote a poetical satire in Flemish on the authorities of Bouchout, who had arbitrarily dismissed his father from the post of tax-collector. This and some other proofs of talent led his patron Bergmann to advise his parents not to bury him in the obscurity of his native village but send him to Antwerp, where he was placed as clerk to a notary, and, in 1812, contended victoriously against twenty-six competitors for the prize that was offered for the best poem on the battle of Friedland and the peace of Tilsit. An amateur theatre was his favourite recreation, and two plays of his composition, 'The Rich Antwerper' and 'Quintin Matsys,' met with success both on the stage and in print. The union of Belgium with Holland, which followed the overthrow of the French dominion in both countries in 1814, naturally directed attention to the fact that the so-called Flemish language and the language of Amsterdam are in reality but very slightly differing dialects of one common language which was at one time more cultivated in Flanders and at another in Holland. Willems took the lead in reviving and making permanent what it is very singular should ever have been overlooked or forgotten. A spirited poem by him—'Aen de Belgen' (To the Belgians)—published in 1818, exhorted his countrymen not to continue to abandon the language of their fathers, which was also the language of Vondel and Bilderdyk. This poem, which produced a strong sensation, was accompanied by a French translation, which it may be remarked was not a very faithful one. It formed the prelude to Willems's 'Dissertation on the Dutch Language and Literature in connection with the Southern Provinces of the Netherlands' ('Verhandeling over de Nederduytsche Tael- en Letterkunde opzigtelyk de Zugdelyke Provintien der Nederlanden'), which was commenced in 1819 and completed in 1824. In this work, which extends to two octavo volumes, he aimed at tracing the literary history of Flanders and Brabant from the 13th to the 19th century, showing that literature had flourished in those countries as long as the national language was cultivated, but that it had declined since the religious wars which led to the separation of the North and the South Netherlands, because from that period Latin, and particularly French, had been looked upon as the only instruments of literary cultivation in the Catholic Netherlands, while the use of the native dialect, or of one nearly akin to it, had been abandoned to the Protestants of the Seven United Provinces. There was an outcry against the author of this work on two accounts, one from the antagonists of the union of Belgium with Holland, who stigmatised him as a sycophant of the government because his views tended to recommend the government measure of the introduction of Dutch as the official language, the other from zealous Catholics, who were indignant that a Catholic should maintain the superiority of the literature of the Protestant North to the Catholic South. The dissertation had great value at the time of its appearance as the only attempt at a connected history of Flemish literature, but the additional light since thrown on the subject by the researches of Willems himself and of several others has had the effect of rendering it in some degree obsolete. From the time of its publication Willems was looked upon as the champion of the Flemish cause, which he defended against all enemies and in particular against Van de Weyer in a French pamphlet, entitled 'De la Langue Belgique,' which appeared in 1829, only a year before the violent severance of Belgium and Holland.

The revolution of 1830 appeared at first sight to be a mortal blow to the prospects of the Flemish language, and also to the fortunes of its champion. Willems had been placed by the Dutch government in the advantageous post of a receiver of some public dues at Antwerp, where he had been previously appointed by the city as an assistant keeper of archives. He had also been, in conjunction with Van de Weyer, one of the commission for publishing the historical monuments of the South Netherlands. Of these posts he was deprived by the provisional government of Belgium, and sent in an obscure position, with a reduced salary, to the small town of Eecloo, where, declining the offers of the Dutch government to place him in a more advantageous position in Holland, he remained for four years. By that time the indignant remonstrances of some of the chief literary men of Belgium, and in particular of his old opponent Van de Weyer, aroused the government to a sense of his unworthy treatment, and in 1835 he was placed at Ghent in a situation similar to that he had occupied at Antwerp. While at Eecloo he had published a modern Flemish version of the celebrated mediæval poem of 'Reynard the Fox,' which he maintained to be of Flemish origin. On the sale of a copy of an old Flemish manuscript of the poem at London, in the auction of Richard Heber's library, he applied to the Belgian government to secure it for Belgium; it was purchased at his recommendation for 160*l*., and in 1836 the poem was printed under his editorship, with a preface, in which he maintained his views with great ability. From this time his life flowed in a course of literary labours and honours. A society was formed at Ghent "for the encouragement of the Low-Dutch language and literature," which published a periodical, the 'Belgian Museum' (Belgisch Museum), under the editorship of Willems, which was so entirely his work, that at his death it suddenly ceased, and was brought to a close, with, for its last article, the life of Willems, from which this notice has chiefly been taken. It extends to ten volumes, and is full of interesting matter. The cultivation of the Flemish language, which he had first promoted, went on increasing. In 1841 a Flemish festival was held at the University of Ghent;

two years later a meeting of the 'Taelverbond,' or 'Language Association,' at Brussels, at which Willems officiated as president. The movement was too powerful to be withstood by the government. Willems had no longer to fear disgrace for his exertions, and had already, in 1838, been named a knight of the order of Leopold. The Flemish movement still appears to make progress, and the meetings which have been held of distinguished literary men of both the North and South Netherlands appear likely to result in placing the language in Belgium in a higher degree of estimation than it has been for centuries. Willems however was not destined to witness this triumph. He died at Ghent on the 24th of June 1846, after a very brief illness, of an apoplectic attack.

His works, according to the list given in the 'Belgisch Museum,' are 43 in number, 35 in Flemish, 5 in French, and the remainder in both languages. The most important that have not been already mentioned are his 'Mengelingen van vaderlandschen Inhoud' (Miscellanies on National Subjects), Antwerp, 1827-30; the 'Rhymed Chronicle of Jan van Heelu;' the 'Rhymed Chronicle of Brabant, by Jan de Klerk,' edited for the Belgian Historical Commission; and the 'Chronicle of Edward the Third, king of England, written in rhyme in 1347 by Jan de Klerk,' and first published by Willems at Ghent in 1840.

WILLIAM II. (FREDERICK GEORGE LOUIS), King of the Netherlands and Grand Duke of Luxemburg, was born on December 6, 1792, and under the care of his father was educated in the military academy at Berlin, completing his education in the university of Oxford, where he showed much talent. He entered the military service early, serving his first campaign with the English army in Spain, and in 1811 accepted the rank of lieutenant-colonel in the Spanish service. His courage and activity procured him the esteem of the Duke of Wellington, who made him his aide-de-camp. At the siege of Ciudad Rodrigo he was among the foremost in the storming party, and at that of Badajoz he entered at the head of an English column, whose retreat he had checked. He also distinguished himself at the battle of Salamanca, and on other occasions, for which he was promoted to be aide-de-camp to the king of Great Britain. When in 1814 his father was restored to his kingdom, the Belgians received him gladly as their future sovereign. In 1815 he commanded the army of the Netherlands, and displayed bravery and military skill in the battle of Quatre Bras, and in that of Waterloo, at which he headed his troops, and was wounded in the shoulder. On his recovery he attended the Congress in Paris, and here was made the proposal of his union with the Princess Charlotte of England, which however failed, because, it is said, the prince was unwilling to become an English subject only, even if the first; and he shortly afterwards married Anna Paulowna, the sister of the emperor Alexander of Russia. On the breaking out of the revolution in Belgium in 1830, he repaired first to Antwerp and then to Brussels, where his appearance made a great impression. But his endeavours at a reconciliation failed, and at length, overstepping his commission, on October 16 he recognised the independence of Belgium, for which his father immediately cashiered him, and he withdrew to England, whither he brought his two eldest sons to be educated. In the following year however he was recalled to the command of the army of Holland in the short war against Belgium, in which he was at first victorious, but was at length compelled to retreat by the armed intervention of France. He was then appointed to the command of the army of observation on the Belgian frontier. On the resignation of his father, on October 7, 1840, he succeeded to the government, in which he showed great regard to economy, and a desire to promote financial improvements, but opposed all constitutional reforms. On the breaking out of the revolutionary storm, which spread so widely through Europe in 1848, he was forced to consent to extensive changes, which probably might have been avoided by smaller concessions made earlier. He did not however live long to witness the effect of the alterations, as he died on March 17, 1849.

WILLIAM-HENRY, or SOREL. [CANADA, *S.* 2.]

WILLIAMS, SAMUEL, a skilful designer and engraver on wood, was born at Colchester, Essex, on the 23rd of February 1788. The son of parents in humble circumstances, his early desire to become an artist met with little encouragement, and though he taught himself drawing and painting, he was at the usual age apprenticed to a printer in his native town. While serving his apprenticeship however he taught himself etching, and subsequently wood-engraving. So attached had he become to the latter art, that on the expiration of his term of service he determined to adopt it as his calling, and, possessing some skill in design, he found on proceeding to London little difficulty in procuring employment among the publishers of low-priced works. His earliest patron is said by his son ('Athenæum,' 1853, p. 1261) to have been Mr. Crosby, by whom "a series of 300 cuts was given into the hands of the then untried country artist." Gradually working his way upwards, he eventually took his place among the best designers and wood-engravers of his time. His earlier engravings executed for Whittingham's Novelists and Poets, for Wiffen's 'Tasso,' and the architectural publications of Mr. J. Britton, displayed great freedom and ability—qualities strikingly apparent in his vigorous, characteristic, and original, though occasionally somewhat rude designs made for Hone's 'Every Day Book.' In his later engravings and designs—as those in Howitt's 'Rural Life,' Scrope's 'Days of Salmon-Fishing,' and 'Deer Stalking,' Thomson's 'Seasons,' &c.—he shows much more elaboration and neatness, with an equal evidence of the devoted study of rural life and scenery, but perhaps some loss of power. Throughout life he retained his early ambition of painting in oil, but we are not aware that he executed any works of consequence in that branch of art. He died on the 19th of September 1853. Two of his sons still sustain the reputation of the name of Williams as wood-engravers.

WILSON, PROFESSOR JOHN, was born on the 19th of May 1785, at Paisley in Scotland, where his father was a wealthy manufacturer. He was the eldest son: one of his brothers, James, became distinguished as a naturalist; one of his sisters became Mrs. Ferrier, and the mother of Professor Ferrier of St. Andrews; and another of his sisters married Sir John Macneil. At an early age, the future poet and essayist was sent to a school at Glenorchy in the Highlands kept by the Rev. Dr. Joseph McIntyre; and here he acquired his first enthusiasm for Highland scenery and his love of open air exercises. At the age of thirteen he went to the University of Glasgow, whence, after five years of study, he removed in 1803 to Magdalen College, Oxford. At Oxford he was distinguished no less for his literary genius and attainments—as shown in his carrying off, among other honours, the Newdegate prize in 1806, for an English poem 'On the Study of Greek and Roman Architecture,'—than for the exuberance of his animal spirits, his great physical strength and beauty, and his fondness for athletic sports. He was the best boxer, leaper, and runner about the University. He graduated B.A. in 1807, and in 1810 he took the degree of M.A. "A fair-haired Hercules-Apollo," says a writer, sketching his life at this time, "and with plenty of money enabling him to gratify his tastes whatever they might be, he had scarcely left Oxford, when he signalised his double character by purchasing, or having purchased for him by his father, the small, but beautiful estate of Elleray on Lake Windermere, where as Hercules, he might yacht about at his pleasure, beat the best boatman at the oar, and wrestle or box with the strongest dalesman, and, as Apollo, he might revel in the quiet beauties of the finest of English scenery, indulge undisturbed in poetic dreams of his own, and cultivate with due reverence the society of Wordsworth." Here, besides Wordsworth, he became acquainted with Coleridge, Southey and De Quincey, the last of whom describes the extraordinary manliness of his character at this time, dashed with an eccentricity which showed itself in all kinds of freaks and projects—and among them that of becoming a traveller in Africa. It was at this time (1810) that he married an English lady of wealth whom he met when she was on a visit to the Lakes with her family, and, falling in love with her at first sight, wooed and won with romantic rapidity. He had by this time published some anonymous writings in Coleridge's 'Friend,' and elsewhere; and in 1811 he published anonymously in Edinburgh, 'Lines sacred to the memory of the Rev. James Grahame,'—i.e. the poet Grahame, the author of 'The Sabbath.' Though his summer head-quarters were at Elleray, Wilson spent part of every year in Edinburgh, and the following extract from a letter of Scott to Miss Joanna Baillie will show the impression which he had begun to make in Edinburgh: "The author of the Elegy upon poor Grahame is John Wilson, a young man of very considerable poetical powers. He is now engaged on a poem called 'The Isle of Palms,' something in the style of Southey. He is an eccentric genius and has fixed himself on the banks of Windermere, but occasionally resides in Edinburgh, where he now is. . . . . He seems an excellent, warmhearted, and enthusiastic young man; something too much perhaps of the latter quality places him among the list of originals." The 'Isle of Palms' here alluded to, was published in 1812, and gave Wilson a place among the Lake Poets. In 1815 he was called to the Scottish bar, at which however he never practised; and from that time forward Edinburgh was his accustomed place of residence. He wrote for the 'Edinburgh Review' a criticism on the 4th canto of 'Childe Harold'—his only contribution to that periodical. "His prepossessions, both political and literary, led him to attach himself to the little band of young Tories, with Scott as a cautious veteran to advise them, who were disposed to break out in rebellion against Jeffrey's Whig supremacy in the northern world of letters; and, accordingly, when Blackwood (1817) started his magazine to afford an outlet for native Scottish Toryism similar to that which had been already provided in the 'Quarterly Review' for British Toryism in general, Wilson was one of the first to join him. He had just then added to his laurels, as one of the Lakists, by the publication (1816) of a poem of some length, entitled 'The City of the Plague;' his magnificent physique was the admiration of Edinburgh, so that, as he walked hurriedly along Princes-street in somewhat wild costume, and with his fair hair streaming from under his broad white hat, heads were turned to look at him; and his reputation in social circles was that of a young Goth of genius with powers undeveloped, which would one day astonish Britain." At first Wilson was associated with Lockhart and others in writing for 'Blackwood,' so that it was not till 1824 or 1825, that that publication was identified with him to the full extent.

The connection with Blackwood was an important event in the life of Wilson; and it was speedily followed (1820) by his appointment to the chair of Moral Philosophy in the University of Edinburgh, then vacant by the death of Dr. Thomas Brown. The appointment was made rather on the grounds of Wilson's political opinions and his promising genius than on the evidence of any special works already produced on metaphysics or philosophy, and Sir William Hamilton, afterwards Wilson's colleague, was a defeated candidate on the occasion. Scott, who used all his influence in behalf of Wilson, wrote to Lockhart expressing his hope that if he obtained the appointment, it would give him "the consistence and steadiness of character which are all he wants to make him the first man of the age." The appointment, together with his connection with Blackwood (both of which came at a time when some pecuniary reverses had obliged him to break up his little establishment at Elleray) had, at all events, the good effect of determining Wilson's genius permanently to prose rather than to verse. He still, indeed, wrote verse in the Lakist style in quantity sufficient, when added to what he had already written, to make two octavo volumes of poetry in all in 1825; but this is no proof that in verse he would ever have been more than one of the minor Lake poets. It was in prose, and more especially as a poet in prose, that his genius was to display itself in its full capacity; and both the magazine and the lecture room gave him the necessary opportunities. "He wrote," says the author of the sketch already quoted, "tales for the magazine, in which, while his imagination had as free scope as it had in verse, his constitutional Scotticism, his shrewd observation of Scottish humours, his sensibility to the woes of real life, and his powers of eloquent description and delineation of character, had a still freer and more minute range. Some of these tales, with others written independently, formed collectively his first professed prose-work, published, in 1822, under the title of 'Light and Shadows of Scottish Life,' and followed in 1823 by a one-volume novel called 'The Trials of Margaret Lyndsay.' He wrote also political articles on the questions of the day, in which he blazed out as a Tory in a manner heartily satisfying to his instincts, and yet not possible had he kept to metre. He wrote literary criticisms, in which he advanced and expounded canons of taste, especially in poetry, deeper than those of Jeffrey, and vindicated against that critic and his disciples the poetic claims of Wordsworth and the writers associated with him. He wrote, either as lectures or as articles, subtle philosophical disquisitions, not very connected or systematic perhaps, but gleaming with brilliant ideas, and tinged throughout with that rich and highly-coloured mode of metaphysics which Coleridge was diffusing through England. Lastly, careless of the formality conventionally identified with the gown of a Scotch professor, and that the gown of a professor of moral philosophy, he wrote papers for the magazine in which he was seen relapsing ideally into his character as an untrammelled human being, a bruiser at country-fairs, a sportsman on Scottish hills and rivers, a boon-companion among bacchanalians, commenting on men and manners, on life and literature, from the point of view of an inspired king of the gypsies or from amid the uproarious conditions of a city orgy." Among these papers of riotous phantasy, the most famous were the series called the 'Noctes Ambrosianæ,' which had been begun in 1822 when Lockhart, as well as Wilson, was a contributor to Blackwood, but which, taken up in 1825 by Wilson for himself, after Lockhart's departure for London, were continued by him till 1836, when the death of the Ettrick Shepherd, their principal supposed character, naturally put an end to them. It was these 'Noctes' that carried the name of 'Christopher North' over the world as the pseudonym of Wilson. They were followed by a series called 'Dies Boreales,' which extended from 1836 to 1846, but were less popular.

After the death of his wife, which took place about 1840 and left a profound sorrow in his heart, Wilson was much less active than he had till then been. He still figured as Christopher North in stray papers in 'Blackwood;' in 1842 he even published separately, under the title of 'Recreations of Christopher North,' a selection of his contributions to the magazine; and still as 'The Professor' he was one of the lions of Edinburgh society and the idol of successive classes of students "to whom he lectured his moral philosophy from the backs of old letters, and who cheered him till the roof rang at the end of every eloquent period;" but on the whole, the best of his career was over. Latterly, too, ill-health reduced his once abundant vigour. He continued in the discharge of his professional duties till 1852-53, when paralysis and decay incapacitated him. A pension of 200*l.* a year had been granted to him by government. He lived for a time in retirement at Lasswade, near Edinburgh; and died at Edinburgh on the 3rd of April 1854. In the following year his nephew, Professor Ferrier, who is also his son-in-law, began the publication of a collected edition of his works. Twelve volumes have appeared, including the 'Noctes Ambrosianæ,' the 'Essay on Burns,' which was published separately long ago; the Tales; and the Poems. The series of volumes is now completed, and the world has for the first time the materials before them for an estimate of the genius of Wilson, both as to quantity and variety of production, and as to quality. It is understood that either Professor Ferrier, or Professor Aytoun, who is also a son-in-law of Wilson, will write a biography of their distinguished relative.

WILSON, GENERAL, SIR ROBERT THOMAS, the son of Mr. Benjamin Wilson, a painter in Bloomsbury, was born in 1777. Having been educated at Westminster and Winchester, he went to Flanders as a volunteer in 1793, and in the following year obtained a commission in the 15th Dragoons; by a daring act he saved the Emperor of Germany from being taken prisoner at Villers en Couche. He subsequently served in Ireland during the rebellion of 1798, and also in Holland, and in 1800 succeeded to a majority in Hompesch's Mounted Rifles. He also for a time held a military command in the South West District. Having served for a short time in the Brazils and at the Cape of Good Hope, he was sent on a secret mission to the Continent under Lord Hutchinson. In 1808 he superintended the embodiment of a regiment of Portuguese refugees, and raised and formed the Lusitanian Legion. He afterwards commanded a Spanish Brigade under Sir Arthur Wellesley, and took an active part in the battle of Talavera. From 1812 till 1814 he was British military correspondent at the head-quarters of the allied armies, and for some time held command of the Prussian reserve; at the head of this force he drove back the French to Lützen. He incurred the displeasure of the military authorities by assisting in effecting the escape of Count Lavalette, who had been condemned to death as an accomplice of Napoleon. A narrative of this adventure may be found in the 'Gentleman's Magazine,' vol. 86, part i. p. 625. On the funeral of Queen Caroline he expressed his disapproval of the course pursued by the government with respect to that unfortunate lady, and in consequence was dismissed from the army and deprived of the many foreign orders which he had won by his gallantry. He sat as member for Southwark, in the Liberal interest, from 1818 till 1831, when he retired in favour of Mr. W.

Brougham. Having been restored to his rank in the army, he became a general in 1841, and held the post of governor and commander-in-chief of Gibraltar from 1842 till 1849. He died suddenly in London, soon after his return to England, May the 9th, 1849. He was the author of a translation of General Regnier's 'Campaign in 1801 in the East and in Egypt,' and afterwards of a more correct original narrative of those events, printed in 4to, under the title of an 'Historical Account of the British Expedition to Egypt.' His other publications were 'An Enquiry into the Military Force of the British Empire' (1804), 'Campaigns in Poland with Remarks on the Russian Army' (1811), and a 'Sketch of the Military Power of Russia' (1817), which was severely criticised at the time of its appearance in the 'Quarterly Review:' Sir R. Wilson replied in an animated pamphlet.

WINT, PETER DE, was born at Stone, in Staffordshire, in 1784. He was apprenticed to Raphael Smith, the mezzotinto engraver, and had for a fellow pupil, Hilton, the Academician, whose sister he afterwards married. Abandoning engraving, Mr. De Wint adopted painting in water-colours as his line of art; and was elected a member of the Society of Painters in Water-Colours, in 1810, six years after its foundation. For nearly forty years his pictures were among the leading attractions of the annual exhibitions of that society. He painted almost exclusively home scenery:—Views in Kent, Lincolnshire, &c.; among the lakes and mountains of Cumberland, Westmoreland, and Wales; on the Thames, the Wye, and other rivers; corn-fields, hay-fields, water-mills, and the like, being especial favourites with his pencil. His style was broad, bold, and vigorous, his colour fresh; and in general effect his pictures represented with fidelity the ordinary aspects of English scenery. But he was wanting in refinement, and in aiming at breadth of effect he was often negligent of details. His touch and texture were peculiar; but, allowing for an almost inevitable mannerism, very agreeable and effective. Avoiding all the methods adopted by the younger generation of water-colour painters for producing force and brilliancy, he to the last continued to paint according to the method of the founders of the English school with washes of transparent colours only, but what he thus lost in power and variety he, to some extent, made up in clearness and freshness. He died on the 30th of June, 1849, in his sixty-sixth year.

WITCH-ELM, or WYCH-ELM. [Ulmus.]

WOHLERITE. [Mineralogy, *S.* 1.]

WOOD-PIGEON. [Columbidæ.]

WOODRUFF. [Asperula, *S.* 2.]

WOODSTOCK. [Canada, *S.* 2.]

WORDSWORTH, REV. CHRISTOPHER, D.D., was born June 9, 1774, at Cockermouth, Cumberland. He was the youngest son of John Wordsworth, and the youngest brother of William Wordsworth the poet. He was educated at Hawkshead grammar-school, and at Trinity College, Cambridge, where he went in 1792, and took his degree of B.A. in 1796. He was elected Fellow of Trinity College, October 1, 1798, and in 1799 took his degree of M.A. In 1802 he published 'Six Letters to Granville Sharp, Esq., respecting his Remarks on the Uses of the Definitive Article in the Greek Text of the New Testament,' 8vo, a volume which was praised by Bishop Horsley and Bishop Middleton, and procured him the patronage of Dr. Manners Sutton, Archbishop of Canterbury, who appointed him his domestic chaplain. He married October 6, 1804, Priscilla, daughter of Charles Lloyd, Esq., banker, of Birmingham, and in the same year was preferred to the rectory of Ashby and Obey-with-Thirne in Norfolk, whence he was promoted to the deanery of Bocking, in Essex, May 30, 1808. In 1809 appeared the first edition of his 'Ecclesiastical Biography, or the Lives of Eminent Men connected with the History of Religion in England,' 6 vols. 8vo, which was reprinted in 1818, and again in 1839, with additions, in 4 vols. 8vo. He received by royal mandate the degree of D.D. in 1810, and in that year Dr. Wordsworth published his 'Reasons for declining to become a Subscriber to the British and Foreign Bible Society,' a 'Letter to Lord Teignmouth,' in vindication of his 'Reasons,' and a 'Second Letter to Lord Teignmouth.' In 1814 he published 'Sermons on various Occasions,' 2 vols. 8vo. He was appointed rector of St. Mary's, Lambeth, Surrey, and of Sundridge in Kent, April 10, 1816. Soon afterwards he served as chaplain to the House of Commons. On the 26th of July, 1820, he was installed Master of Trinity College, Cambridge. In the same year he exchanged the livings of Lambeth and Sundridge for the rectory of Buxted, with Uckfield, in Sussex. In 1824 and 1828 he produced two elaborate volumes on the authorship of 'Icōn Basilikè,' which he unhesitatingly ascribed to Charles I. The first volume is entitled 'Who wrote Ικῶν Βασιλικὴ, considered and answered,' 8vo; the second, 'King Charles the First the Author of Icōn Basilikè further proved, in a Letter to his Grace the Archbishop of Canterbury, in Reply to the Objections of Dr. Lingard, Mr. Todd, Mr. Broughton, the Edinburgh Review, and Mr. Hallam,' 8vo. Dr. Wordsworth's last important literary work was his 'Christian Institutes,' 4 vols. 8vo, 1837, designed specially for the use of students in the university and candidates for holy orders. He resigned the Mastership of Trinity College in 1841, and was succeeded by the present Master, Dr. Whewell. From that time he resided at Buxted, where he died February 2, 1846. He was buried in Buxted Churchyard. He had three sons. 1. Rev. John Wordsworth, born July 1, 1805, was Fellow of Trinity College, Cambridge, and died there December 31, 1839. 2. Right Rev. Charles Wordsworth, M.A. and D.C.L., graduated at Christchurch, Oxford, was second master of Winchester College, and is now (1858) Bishop of the United Diocese of St. Andrew's, Dunkeld, and Dunblane, Scotland, to which he was consecrated in 1853. 3. Rev. Christopher Wordsworth, canon of Westminster, the author of many works, and among them Memoirs of his uncle William Wordsworth.

WORDSWORTH, WILLIAM, was born at Cockermouth, Cumberland, on the 7th of April, 1770, the second son of John Wordsworth, attorney-at-law, and law-agent to Sir James Lowther, afterwards Earl of Lonsdale, by Anne, only daughter of William Cookson, a mercer at Penrith. The Wordsworths came originally from Peniston, in Yorkshire, where they had been settled from the Norman Conquest; and the name of Wordsworth's maternal grandmother was Crackanthorpe, of the Crackanthorpes of Westmoreland. The poet was therefore by pedigree a thorough North-of-England man. He had three brothers—Richard, who was two years his senior, and who became a London attorney, and died in 1816; John, who was nearly three years his junior, and who became commander in the navy, and perished by shipwreck off Weymouth in 1805; and Christopher, the youngest, noticed above. [Wordsworth, Rev. Christopher.] He had also a sister, Dorothy, born between William and John. The mother of the family died in 1778, when the poet was only eight years old; the father died in 1783, when the poet was but thirteen.

Till about the time of his mother's death, Wordsworth's early life was spent partly at Cockermouth and partly with his parents at Penrith, where he attended a dame's school; but about that time he was sent, with his elder brother, to a public school at Hawkshead, in Lancashire, whither his two younger brothers followed him. Here he remained till 1787, left very much at liberty to read what he chose, and to wander about in the neighbourhood. "I read," he says, "all Fielding's works, 'Don Quixote,' 'Gil Blas,' and any part of Swift that I liked; 'Gulliver's Travels' and the 'Tale of a Tub' being both much to my taste." Here also he first began to write verses, as school-exercises, and to store his memory with observations of English rural nature. He became a fair Latin scholar, and was taught something of mathematics; but, upon the whole, the acquisitions possible at the school were not great. On the death of Wordsworth's father, which occurred while he was still at school, it was found that the principal part of his property consisted of a debt of 5000*l.* owing to his estate by Lord Lonsdale; a considerable part of what there was besides was expended in a lawsuit with a view to recover this; but enough remained, when scraped together, to complete the education of the children, under the guardianship of two uncles. By them Wordsworth was sent, in October, 1787, to St. John's College, Cambridge, of which college he continued a student till January, 1791, when he quitted Cambridge altogether, having taken his B.A. degree. His recollections of his *Alma Mater* were by no means affectionate or reverential. He says:—

> "I did not love,
> Judging not ill perhaps, the timid course
> Of our scholastic studies; could have wished
> To see the river flow with ampler range
> And freer pace"—

and, in particular, he was repelled by the mechanical manner in which religious forms and exercises were gone through. "Intellectually," says his nephew and biographer, "he and the university were not in full sympathy with each other. He had never been subject to restraint: his school-days were days of freedom; and latterly, since the death of his parents, he was almost entirely his own master. In addition to this, his natural temperament was eager, impetuous, and impatient of control." At college, however, he read and thought much; he studied Italian; and he began to feel himself a poet. He employed the vacations in tours, to gratify his passion for the open air and for scenes of natural beauty and grandeur; and one of these tours, made in the autumn of 1790, with a fellow-collegian, was a pedestrian one through France and Switzerland, at the very time when the French Revolution was in its full tide of progress. In 1791, after taking his degree, he spent some time in London, and made a pedestrian tour in North Wales; and in the autumn of that year he went over to France, where he spent fifteen months in all, partly in Paris, partly in Orleans, and partly in Blois. "It was," he says, "a stirring time. The king was dethroned when I was at Blois: and the massacres of September took place when I was at Orleans." Wordsworth was no mere indifferent spectator of the scenes of the Revolution. At this time of his life he was a vehement republican, and an ardent partisan of revolutionary France against all the rest of the world. He had friends too among the revolutionists of the Girondist party, and so fully did he share their enthusiasm that he even entertained the intention of becoming a naturalised Frenchman, and throwing himself, heart and soul, into the struggle for liberty—believing that what it chiefly wanted to ensure a glorious success was the activity of a few steady, virtuous, and lofty minds, such as he was conscious of possessing. Of this he was still more convinced after Robespierre began to exercise his power. Had he carried out his intention, the probability, as he himself says, is that he would have been one of Robespierre's victims, and have died on the scaffold with some of his Girondist friends. Circumstances however fortunately obliged him to return to England towards the end of 1792, a little before the execution of the king. He took up his abode for the time in London; but his thoughts were still on the other side of the Channel, and he followed the farther course of the Revolution with intense interest, complicated by the feeling that Britain, in declaring war against France, had engaged in an unjust enterprise. Much of the influence of this time, though greatly modified, remained with Wordsworth throughout his life.

From 1792 to 1795, Wordsworth lived in a desultory manner in London and other parts of England. He had been destined for the church, and his friends were much disappointed at his preferring what seemed to them an idle and aimless life. His religious, as well as his political, principles, at this time were not of a kind conformable to the society in which he moved. Poetry, next to republican politics, was his passion; and he had already conceived the possibility of a new kind of descriptive poetry, which should do justice to "the infinite variety of natural appearances that had been unnoticed by the poets of any age or country." In the year 1793 he published his first literary venture, two poems of this kind in the heroic couplet—'An Evening Walk, addressed to a Young Lady,' and 'Descriptive Sketches, taken during a pedestrian tour among the Alps.' It was the time of the rise of a new poetical spirit in England, Bowles and Crabbe having just appeared in the field after Cowper, and the Scottish poet Burns being then in the full flush of his fame. New poets were also springing up; and one of these, Coleridge, thus describes the impression made on him by the volume which Wordsworth had published: "During the last year of my residence at Cambridge, I became acquainted with Mr. Wordsworth's first publication; and seldom, if ever, was the emergence of an original poetical genius above the literary horizon more evidently announced." The volume did not however attract general attention; and for a while, Wordsworth's prospects were very uncertain. Having no independent means of livelihood, he contemplated entering the legal profession and supporting himself meanwhile as a political writer on the liberal side for the London newspapers. From this situation he was rescued by the discerning generosity of a young friend, named Calvert, who on his death in 1795, left him 900*l.*, expressly as a token of his admiration and of his wish that he would devote himself to poetry. This sum, judiciously managed, enabled Wordsworth and his sister (who came to live with him about this time, and who exercised a wonderful influence over his spirits and his plans), to live for some seven years, without any necessity on his part to undertake any employment incompatible with his freedom as a poet; and as it fortunately happened that, at the end of that time (1802), a sum of 8,500*l.* was paid over to the family by the second Earl Lonsdale in liquidation of the debt owing to their father by his predecessor, there was again a sufficiency of means for the poet's purposes.

In the autumn of 1795, Wordsworth and his sister settled at Racedown Lodge, near Crewkerne, in Dorsetshire; and here, living in a quiet and happy manner, he wrote his 'Salisbury Plain, or Guilt and Sorrow,' and began his tragedy of 'The Borderers,' neither of which was published till long afterwards. In June 1797, Coleridge, then residing at Bristol, paid his first visit to the Wordsworths; and "for the sake of being near him when he had removed to Nether-Stowey in Somersetshire, we removed," says Wordsworth, "to Alfoxden, three miles from that place." This was in August 1797, and one result of the intimate association thus formed between the two poets was the appearance in 1798 of the 'Lyrical Ballads,' a small duodecimo volume, published by Mr. Cottle of Bristol, the first composition of which was the 'Ancient Mariner' of Coleridge, and the rest, to the number of twenty-two pieces, Wordsworth's. The edition consisted only of 500 copies, the greater portion of which remained unsold; and when Mr. Cottle shortly afterwards gave up business, and sold his copyrights to the Messrs. Longman of London, the copyright of this little volume was valued at *nil*. Mr. Cottle, therefore, begged it back and presented it to the authors. Little affected by the indifference with which the volume had been received, or by the contemporaneous rejection of tragedies which they had respectively submitted to London theatre-proprietors, they were engaged in a new work. In 1798-9, they travelled together in Germany; and on their return, Wordsworth and his sister settled at Grasmere. Grasmere was his residence from 1799 to 1808, when he removed to Allan Bank in the same neighbourhood, and it was on account of his residence in this Lake-district, and the congregation or occasional stay in the same beautiful region of other and kindred spirits, such as Coleridge, Southey, De Quincey, and young Wilson, that the nickname of the 'Lake School' was invented as a designation for him and his companions and disciples. From Grasmere and Allan Bank he made occasional excursions of business or pleasure. Thus in 1802 he made another tour in France; on his return from which he married Mary Hutchinson, whom he had known from her childhood. Wordsworth's sister still continued a member of the household, and the intellectual companion of William in all his labours. In 1803, the poet, his wife, and his sister, set out on a tour in Scotland, in the course of which they made the acquaintance of Scott, and gathered observations and impressions which served as future materials and hints for many poems. Before their departure for Scotland, the poet's eldest child, a son, named John, was born; and the poet's other children were all born either at Grasmere or at Allan Bank—a daughter, Dora, in 1804; a son, Thomas, in 1806; a second daughter, Catharine, in 1808; and the youngest, a son, named William, in 1810.

The period of Wordsworth's residence at Grasmere and Allan Bank (1799-1813) was the period of his memorable struggle against the critics, and of the slow and gradual recognition of his poetic genius. He was incessantly active, turning his observations and thoughts into poems, and he had projected and was occasionally labouring at his great philosophical poem in blank verse, of which 'The Prelude' and the 'Excursion' are the accomplished fragments. What he presented to the public however was his minor pieces. In 1800 appeared a second edition of the 'Lyrical Ballads,' in two volumes, with numerous additions; and there were subsequent editions in 1802 and 1805. In 1807 appeared a distinct collection of pieces, entitled 'Poems in two Volumes;' and in 1809 appeared his political prose 'Essay on the Convention of Cintra.' This last work was published contemporaneously with the first numbers of Coleridge's 'Friend,' to which Wordsworth contributed his 'Essay on Epitaphs.' In 1810 the poet wrote a portion of the letter-press for a volume entitled 'Select Views in Cumberland, Westmoreland, and Lancashire,' edited by the Rev. Joseph Wilkinson—a fine mark of his interest in the lake scenery, and his desire to diffuse the love of natural beauty. It seems to have been Wordsworth's theory not only that the enjoyment of nature has a medicinal effect on the minds of men in general, worthy of being systematically taken into account and resorted to, but also, that it is part of the functions of the poet to minister this influence of nature, by permanently connecting himself with some one spot or district, so as to transfer its peculiar facts and teachings into his poetry. Hence a greater fitness in the name 'Lake Poets' than was intended by those who invented it.

Wordsworth appeared professedly not only as a new poet, but also as the representative and champion of a new theory of poetry. In the volumes he had published up to this time he had not only exemplified his principles of composition in the poems themselves, but he had also propounded and illustrated those principles didactically in prose prefaces and dissertations. He believed, with Coleridge, that the period in the history of English Literature intervening between Milton's age and his own had been, with a few exceptions, a kind of interregnum in English poetry—a period during which poetry had been prosecuted on false principles, both as to themes and as to style; and what he claimed for himself and for those who were associated with him, was the merit of reviving the true notion and art of poetry. The following summary has been given of his views:—"Poetry, according to Wordsworth, takes its origin from emotion recollected in tranquillity; what the poet chiefly does, or ought to do, is to represent out of real life, scenes and passions of an affecting or exciting character. Now, men originally placed in such scenes or animated by such passions use a nervous and exquisite language expressly adapted for the occasion by nature herself; and the poet therefore in imitating such scenes and passions, will recall them more vividly in proportion as he can succeed in employing the same language. Only one consideration should operate to make him modify that language—the consideration, namely, that his business as a poet is to give pleasure. All such words or expressions therefore as though natural in the original transaction of a passionate scene, would be unpleasant or disgusting in the poetic rehearsal, must be omitted. Pruned and weeded in accordance with this negative rule, any description of a moving occurrence, whether in prose or in verse, would be true poetry. But to secure still more perfectly their great end of giving pleasure, while they excite emotion, poets use the artificial assistance of metre and rhyme." In illustrating these views, as to the true nature of poetic subjects, and the true nature of poetic diction, Wordsworth was very severe in his criticism of the poets of the 18th century. Very few of them, he said, had looked at nature for themselves, satisfied with repeating over and over again images and allusions which had become a kind of *property* of the poetic corporation or guild, and which, though originally they might have arisen from genuine observation of nature, had by incessant repetition and attrition become mere lying artificialities; and so, also, very few of them had employed a diction at all resembling the language of real men and women under any circumstances, counting it rather the essence of their craft to use a certain conventional phraseology, called *poetic diction*, in which words were distorted out of their natural order, and the distortion regarded as metrical art.

These views naturally provoked opposition, as similar views had already done when urged by Bowles; and Wordsworth's own poems, exemplifying the views, were either neglected or severely criticised. In the interest of his views he had selected, for many of his pieces, very simple subjects, and had written a language as close as possible to that of real life; and these pieces were fastened on by the adverse critics and held up to ridicule as childish, grotesque, &c. Thus began the great literary controversy as to Wordsworth's poetry—a controversy which lasted almost to the end of Wordsworth's life, though by that time his triumph was, on the whole, decisive, and his admirers included the best part of the nation. The triumph was partly the result of time as affecting the appreciation of what he had already published, partly of the appearance of other poems, thrown out at intervals from his retreat among the Lakes, each making a new impression and some revealing the poet's powers dissociated from those peculiarities which had jarred most on the critics of the old school. In 1813 he took up his residence at Rydal Mount, not far from his former habitations; and here he remained till his death, allowing for occasional visits to London, a second tour in Scotland in 1814, a new continental tour in 1820, a tour in Holland and Belgium in 1823, in North Wales in 1824, on the Rhine in 1828, in Ireland in 1829, in Scotland again in 1833, in Italy in 1837, &c. Before his removal to Rydal Mount, his children Catharine and Thomas had died, leaving two sons and a daughter still alive. His poems were as yet no source of income to him; but just at the time of his removal to Rydal Mount, he was appointed, through Lord Lonsdale's influence, to the distributorship of stamps for the county of Westmoreland, a post which, with light duties and the advantage of permitting him to remain in the district of his affections, afforded him about 500*l.* a year. In 1814 he published his great philosophical poem of 'The Excursion.' It had little commercial success and drew down the critics upon him more than before—including Jeffrey's famous verdict "this will never do;" but here and there it found readers who did not hesitate to recognise in it, as the world now recognises in it, one of the greatest poems in the English language. It was followed in 1815 by 'The White Doe of Rhylstone;' this in 1819 by 'Peter Bell,' dedicated to Southey, and which, though not less attacked than his former poems, was more immediately popular; this, very shortly, by 'The Waggoner,' dedicated to Charles Lamb, and 'Sonnets on the River Duddon.' These poems had, most of them, been in manuscript long before they were published. In 1822 (by which time there had been new editions of some of the previous volumes, and in spite of all opposition, Wordsworth's name was pronounced everywhere as that of a literary power of the highest order appeared Sonnets and other Poems under the title of 'Memorials of a Tour on the Continent;' several years afterwards appeared his noble series of 'Ecclesiastical Sonnets,' increased in subsequent editions; and in 1835, he published and dedicated to Rogers 'Yarrow Revisited, and other Poems,' the result chiefly of his recent Scottish tour. Other collections of the pieces which he either had written long before or had recently penned were subsequently published; and in 18 he published a collected edition of his poems in seven volumes, re-arranging them in a new order on a peculiar principle of his own, and with new titles to the separate divisions. Various editions of the whole, in different shapes have been since published; and after Wordsworth's death appeared his autobiographical poem, 'The Prelude,' written in the early part of the century, and bringing down the narrative of his life till the period of his determination to Poetry after his first political schemes. The death of Wordsworth took place at Rydal Mount on the 23rd of April 18 when he had just completed his eightieth year; and he was buried in Grasmere Churchyard. In 1839 he had been made D.C.L. of Oxford; in 1842 he had resigned his post of Distributor of Stamps in favour of his younger son, receiving a pension of 300*l.* a year; and in 1843 he had succeeded Southey as Poet-Laureate. His wife and his sister and his two sons survived him. His only daughter Dora had married in 1841 Edward Quillinan, Esq., a gentleman who had been in the army and who is known by various literary works. She was taken for her health to Portugal and Spain, of her travels in which countries she published a journal; and after her return she died in 1847.

The 'Memoirs of Wordsworth' in two volumes were published by his nephew Canon Wordsworth in 1851; and contain many letters, dictations, and conversations, illustrative of the occasions of his poems, of his character and habits generally, and of his progressive views of men and things. Though his life was one of stately retirement, he was a shrewd and diligent observer of all that occurred at home and abroad; and he expressed strong and decided views on the great political events and movements of his time, such as the war with Napoleon, Catholic Emancipation, the French Revolution of 1830, the Reform Bill, the Railway Mania, &c. His views on these subjects were generally Conservative and in contrast with those which he had held so strongly in early life; and in some of his letters and conversations he alludes to this apparent change and gives the philosophy of it. In 1818 he even mixed himself up with local politics in the Conservative interest by publishing 'Two Addresses to the Freeholders of Westmoreland.' He was during the last forty or fifty years of his life a zealous and devout supporter of the Established Church of England. A lofty and serene toleration however pervaded all his views; and his whole life was consecrated from first to last to the service of the great, the permanent, and the noble. His influence on the literature and especially on the poetry of Britain and America in this century, has been immense, and is far yet from being exhausted.

WORM-SEED. [SPIGELIA.]

WORMS. [PHYSIC, PRACTICE OF, *S.* 2.]

WORONZOW, MIKHAIL SEMENOVICH, PRINCE, a very distinguished Russian statesman and soldier, was born at Moscow, in 1782, the son of Semen or Simon Woronzow, who was nephew of the chancellor Woronzow and brother of Princess Dashkov. Semen Woronzow was for many years Russian ambassador to England, where he was first sent by the influence of Prince Potemkin, in 1784, and where he remained in that capacity till 1806, when, retiring from the service, on account of ill-health, he obtained permission from his government to remain in England, and resided in London as a private gentleman till his death in 1832, at the age of eighty-nine. His son was educated in England, his daughter, who died in 1856, married the late Earl of Pembroke, and was mother of the Right Hon. Sidney Herbert. Mikhail Woronzow, living in England to the age of sixteen, was as familiar with the English language and manners as many of his countrymen are with the French. He was a warm admirer of England, and the country of his education certainly had no cause to blush for its pupil. At the age of nineteen he entered the Russian army, in which he fought under Kutuzov against the Turks, and took a distinguished part in the great campaigns against Napoleon I. He commanded a division at the battle of Borrodino, where he was severely wounded, and he led the Russian cavalry at the battle of Leipzig. It is said that on a subsequent occasion, in 1814, his conduct in action elicited from Napoleon the exclamation, "That is the stuff of which marshals are made." Several interesting notices of his opinions and conversation at the time of the occupation of Paris by the allies after Waterloo, are to be found in the diaries of his friend, Sir John Malcolm, printed in the recent Life of Sir John, by Kaye. He commanded the Russian contingent in France from 1815 to 1818, and is said to have paid an enormous sum from his private purse to avoid the disgrace of leaving the debts of Russian officers unpaid when they evacuated the country. In 1823, after his return to Russia, he was appointed Governor of New Russia and Bessarabia, a post which he held for many years, only quitting it for a short time in 1828, to take the command of the Russian army after Menshikov had been wounded at the siege of Varna. To this command was added in 1844, that of the Caucasian Provinces, with an authority superior to that of any preceding governor, Woronzow being made dependent on the Czar alone. He adopted as far as possible a policy of conciliation to the native tribes, while at the same time he pursued the war with such vigour as to capture in 1845 the stronghold of Shamyl, the town of Dargo. The bravery and obstinacy of the mountaineers rendered his military successes in Circassia of no permanent value, but he succeeded in introducing great improvements into the other countries under his government, building towns, making roads, promoting the cultivation of the vine, and setting in general an example of disinterestedness and high feeling. He always continued partial to the land of his youth, he was fond of receiving Englishmen, and his country-seat or palace at Alupka in the Crimea, the finest in the country after the imperial residence of Orianda, was built from the designs of an English architect, Mr. Papworth. He is understood to have been averse to the Russian war with England and France on the Turkish question, in which, by a somewhat singular combination of circumstances, his nephew was the English secretary at war. During the early progress of it he was kept by ill-health at Tiflis, and in March 1854 he obtained a six months' leave of absence, which he spent at Karlsbad and Schlangenbad, but with so little benefit, that in October of the same year he solicited and obtained permission to retire. He died on November 18th 1856 at Odessa, leaving behind him a high reputation among both natives and foreigners for probity and independence.

WORTHITE. [MINERALOGY, *S.* 1.]

WRIT. As to proceedings by *plaint* in the county court, see COUNTY COURTS, *S.* 2. As to writs of recent introduction as part of the process of the superior courts, see INJUNCTION, *S.* 2; MANDAMUS, *S.* 2; SCIRE FACIAS, *S.* 2.

WRIT OF INQUIRY. This writ is no longer issuable in actions in which a debt or liquidated demand in money is sued for. In such cases there is an inquiry as to the amount owing to the plaintiff, before one of the Masters of the court in which the action is brought. In most of such cases, however, a judgment by default for the exact sum due may now be obtained. (Common Law Procedure Act, 1852.)

WRIT OF TRIAL. A proceeding in the nature of a writ of trial may now be resorted to, if either of the parties to an action, in which a sum not exceeding 50*l.* is sued for, so desire. It consists in obtaining the order of a judge to have the cause tried in the county court, on which order, when made, the cause is taken down for trial and there disposed of, precisely as issues are by the sheriff on a writ of trial.

WYATT, RICHARD J., an eminent sculptor, was born in Oxford-street, London, on the 3rd of May 1795. Having chosen sculpture as his profession, he was placed as a pupil with Charles Rossi, R.A.; and about the same time he entered the Royal Academy as a student. During the seven years which he served with Rossi, he twice carried off medals at the Royal Academy. He afterwards worked for a short time in the atelier of Bosio at Paris, and he completed his professional education under Canova, whose acquaintance he had formed in London, and who kindly invited him to Rome, and offered him his advice and assistance in the prosecution of his studies. In the atelier of Canova, he had Gibson for a fellow-student, and the friendship here formed between the young students, who were ultimately to rank together as the first English sculptors in Rome, remained unbroken through life. With Canova Wyatt likewise retained the warmest friendship, till the death of the great Italian master. Wyatt went to Rome in 1821, and he made that city his permanent abode, only once making a brief visit to his native country in 1841. He died suddenly at Rome on the 29th of May 1850.

Wyatt was a man of singularly gentle unassuming temper, and quiet retiring habits. His whole life was spent in the diligent prosecution of his profession—at which he laboured often from dawn till near midnight. The number of his works is very great, and they are of a very unusual order of merit. He was greatest in poetic and classic subjects, in which he displayed a fertility and grace of invention, a singular elegance of thought, and a degree of finish beyond most of his contemporaries. He was undoubtedly one of the purest and most refined of our poetic sculptors. His figures, and especially his female figures, are beautifully modelled, always posed with grace and animation, and always present pleasing forms from whatever side they are viewed. His draperies too are invariably well cast, and he expresses textures truly, yet without breach of sculpturesque propriety. As examples of his style may be mentioned his statues of 'A Nymph entering the Bath'—one of his most beautiful of his many versions of which, was that executed for Lord Charles Townshend; 'Nymph leaving the Bath;' 'Shepherdess with a Kid;' 'Shepherd Boy;' 'Glycera;' 'Musidore;' 'Bacchus;' and 'Penelope,'—an exquisite statue executed for her Majesty; and his admirable groups of the 'Nymph Eucharis and Cupid;' 'Ino and Bacchus;' 'Nymph of Diana taking a thorn from a greyhound's foot;' and 'A Huntress with a Leveret and Greyhound'—his last work. He also produced many excellent portrait busts, some rilievi, and monumental sculpture. At the Great Exhibition of 1851, several of his works were exhibited, and the medal for sculpture was awarded to him though dead. Mr. Wyatt was not a member of the Royal Academy, a bye-law of that institution rendering artists ineligible unless resident in England. Casts from several of Wyatt's works—including most of those named above—are in the Crystal Palace at Sydenham.

WYCH-ELM. [ULMUS.]

WYON, WILLIAM, an engraver and designer of medals and coins, was born at Birmingham in 1795. The pursuits and associations of his family (of German descent) were peculiarly calculated to give direction to his mind and to foster whatever natural abilities he possessed. His grandfather, George Wyon, engraved the silver cup embossed with a design of the assassination of Julius Cæsar, which was presented by the city of London to Wilkes. His father, Peter Wyon, to whom, in 1809, William was apprenticed, was a die sinker of reputation at Birmingham, and with him was associated William's uncle, Thomas, as partner, to whom young Wyon was much indebted. The earliest of his productions of which we find any marked notice were copies of the heads of Hercules and of Ceres; the latter won the gold medal of the Society of Arts, and was purchased by it for distribution as an agricultural prize. A second gold medal from the same body marked the appearance of Wyon's group—'Victory drawn by Tritons.' A few years later he completed a figure of Antinous, which so delighted his father, that he had it set in gold, and wore it constantly until his death.

Wyon came to London in 1816, and won his way through a competition to the post of second engraver at the Mint. Sir Thomas Lawrence was the umpire, and the trial piece the head of George III. His prospects were now most favourable, and his situation altogether agreeable to him—for the chief engraver, Thomas Wyon, was his friend and cousin.

But unexpectedly the latter died, and Mr. Pistrucci was nominated in his place. The new engraver and his chief assistant could not agree. Pistrucci, a skilful artist, is said to have been indolent, and while reserving to himself the greater share of the honour and emolument, to have left the greater amount of labour to Wyon. Under a new Master of the Mint these differences were compromised by an arrangement, which left Pistrucci nominally chief engraver until his death, but gave half his salary to Wyon. We need not dwell on the literary wars that arose out of these occurrences, further than to observe that the younger man found an enthusiastic champion who issued a memoir of his life, and a list of his works, then exceeding two hundred in number. The Royal Academy marked its opinion of this controversy, and of Wyon's own merits, by electing him in 1832, an Associate, and in 1838 an Academician, the first of his department who had ever obtained these honours.

Wyon's works may be divided into coins—pattern pieces of coins not used—medals, and seals. His coins include those of the later years of the reign of George IV., all those of William IV., and all those of her present Majesty which appeared in Wyon's lifetime. He followed Chantrey's models in the coins of both the kings, but was his own designer in the coins of Victoria. The pattern pieces include one of ten pounds for William IV., and one of five pounds (among several others) for the present Queen, which bore a figure of Una on the reverse. These pattern pieces did not become coins through the influence of the body, who, at that time, under the title of moneyers, were the privileged coiners of the country, and who knowing that increased expense would be necessary, took care of their profits, and did not trouble themselves about Wyon's disappointment or the interests of art. His medals include a great range of subjects, and were produced for many different and admirable objects. There are war medals for the Peninsular victories, for Trafalgar, for Jellalabad and Cabul; scientific medals for the Royal Society, Royal and London Institutions, Geological, Geographical, and similar societies, native and foreign; artistic medals, as for the Royal Academy and Art Union; educational, as for Harrow, a gift by Sir Robert Peel; and testimonial, as in the case of the Brodie medal, which bore a head of the man in whose honour it was struck. Most of these medals have for their obverses heads taken from the antique, a few modern, and in some cases, then living personages; and the author had generally aimed, as a matter of course, at a characteristic fitness betwixt the portrait and the accompanying circumstances. Thus, Cicero adorned the Peel-Harrow medal, while heads of Lord Bacon, Sir Isaac Newton, Dr. Wollaston, and Sir Francis Chantrey, were respectively and appropriately connected with the medals of the Royal Institute, the University of Glasgow, the Geological Society, and the Art Union. Many—and among them some of the best—of the reverses were from his own designs; while for others Wyon was indebted to Flaxman, for whom he had an enthusiastic veneration, Howard, and Stothard, who contributed the reverse to a medal of Sir Walter Scott. Wyon's increasing eminence was shown in the various commissions he received from foreign countries; we may especially mention his engagement for a series of Portuguese coins.

The characteristics of Wyon are the combination of two (often opposing) qualities, strength and delicacy, with the indispensable merit of likeness in his portraitures; taken for all in all, we have had no such medal engraver since the days of Simon, the artist who shed so much lustre on this department in the days of the Commonwealth. Wyon died at Brighton, October 29, 1851, in his fifty-seventh year, leaving a son, Leonard, who having aided him in his lifetime, inherited much of his skill at his death. To the latter we owe the well-known medal of Wordsworth; and his name is honourably remembered in connection with the awards of the Great Exhibition; and is thus gratifyingly associated in art as in blood with the subject of our present notice, whose latest works were in commemoration of that same assemblage of the world's industrial and artistic fruits.

Y

YARRELL, WILLIAM, a celebrated British naturalist, was born in Duke-street, St. James's, Westminster, in June, 1784. His father was a newspaper agent, and to his business his son succeeded, and continued in it till nearly the close of his life. When young he was fond of field-sports, and was not only the first shot, but the first angler of his day. The accurate habit indicated by his superiority in these sports, was the prevailing character of his mind. He was not only the first shot in London, but for many years the first sporting authority upon all that had to do with the habits, locality, and appearance of British birds. It was the same with fish. Not satisfied with obtaining his prey, he examined it, preserved it, and described it, and thus became a naturalist. At the age of forty he became a Fellow of the Linnæan Society, and from this time he gave up the gun and rod for the pen. From 1825 to the year of his death, 1856, he became a constant contributor to the Transactions of the Linnæan Society, and the various Journals devoted to natural history literature. His earlier papers were devoted to birds, as the following titles of some of his first scientific contributions show:—'On the Change in the Plumage of some Hen-Pheasants' ('Philosophical Transactions,' 117); 'On the Occurrence of some rare British Birds' ('Zool. Journal,' II.); 'On the small horny appendage to the upper mandible in very young chickens' (Ibid.); 'On the Anatomy of Birds of Prey' ('Zool. Journal,' III.); 'On the Structure of the Beak and its Muscles in the Crossbill' ('Zool. Journal,' IV.) He was one of the first members of the Zoological Society, and contributed many papers to the Proceedings of the Committee of that body. In the first volume of papers published by the Society, Mr. Yarrell contributed no less than seventeen. They exhibit a wide and accurate knowledge of the forms not only of birds but of fishes and mammals. In these papers his dissections are very numerous, and they are very accurate. This is the more remarkable, as Mr. Yarrell had not the benefit of a medical education nor any further means of instruction than those supplied by his own industry. It was in these earlier papers that he demonstrated the true nature of White Bait, and showed that this pet morsel of the London epicure is a true species of fish, and not the young of the Shad, the Herring, or any other species of fish, as had been supposed up to his time. He did not, however, confine himself to British zoology, many of his papers being devoted to foreign animals, as the following:—'On the Anatomy of the Lesser American Flying Squirrel;' 'On the Woolly and Hairy Penguins of Dr. Latham;' 'On the Trachea of the Stanley Crane;' the subjects of his research being in this case the animals dying in the menagerie of the Zoological Society in Regent's Park. He was always an active fellow of the Society, and one of its vice-presidents at the time of his death. He took a deep interest in the progress and development of the Gardens, as well as in the diffusion amongst the people of a taste for his favourite science. His various papers, amounting to upwards of seventy, the names of which are given in the 'Zoological Bibliography of the Ray Society,' prepared him for the two great works of his life, the histories of British Birds and British Fishes. The 'History of British Fishes' appeared in two vols. 8vo, in 1836. It contained original descriptions, with an account of the habits, and a wood-engraving of every British fish. It was in every way an admirable work, containing accounts of several new fishes, with such descriptions as enabled the naturalist to distinguish them, whilst they were rendered by the agreeable style in which they were written attractive to the dullest of anglers. A second edition of this work appeared in 1851. 'The History of British Birds' appeared in 1843. It was on the same plan as that of the fishes. The illustrations in wood were accurate and beautiful, and highly creditable to the enterprise and taste of his publisher Mr. Van Voorst. No work on this subject since the time of Bewick's 'Birds' has been so popular. In many of his details, especially his picturesque tail-pieces, he imitated his great predecessor, but in point of accuracy of description and the homely truthfulness of his account of the habits of birds Mr. Yarrell has had no equal. At the time of his death Mr. Yarrell was treasurer of the Linnæan Society, and had been elected vice-president during the presidency of Robert Brown. Although one of his earlist papers was published in the 'Philosophical Transactions,' Mr. Yarrell was never made a Fellow of the Royal Society. He was once proposed, but some unworthy objections having been made to his admission he withdrew his certificate, and although in the latter part of his life, the Royal Society would have gladly admitted him amongst its fellows, and his certificate was signed, it was too late, he positively refused. In August 1856 he was attacked with paralysis, but although he sufficiently recovered to make a voyage to Yarmouth, he was seized with another fit on the evening of his arrival, and died on the morning of September 1st, 1856. He was interred at Bayford in Hertfordshire.

YEAST, a substance found on the surface of fermenting liquids, and when removed capable of producing fermentation in other liquids susceptible of this action. On placing Yeast under the microscope it presents a number of cells immersed in a mass of amorphous matter. The cells are sometimes single, and at other times several are united together in a kind of chain. These cells are supposed to partake of a fungoid character, and they have been called the Yeast-Fungus, or Ferment-Cells. A genus and species have been constituted for the reception of this organism, under the name of *Saccharomyces Cerevisiæ*.

This plant has been supposed to be the active cause of fermentation, and the carbonic acid given off during that process has been regarded as the result of the growth of the plant. This seems to be a misinterpretation of the phenomena, as the plant is probably the result of the carbonic acid given off during the process of fermentation rather than its cause. Schleiden supposes that these ferment-cells originate in liquids, independently of other cells, and are truly instances of the formation of cells in a free fluid. He observes, however, that they have no power of reproducing other cells. The whole subject of the nature of these cells, their mode of production, and the history of their development, as well as the phenomena of fermentation in general, require further elucidation.

(Schleiden, *Principles of Scientific Botany; Micrographic Dictionary*, articles 'Fermentation,' 'Torula,' 'Yeast.')

YELLOW COPPER ORE. [MINERALOGY, *S.* 1.]

YOUNG, THOMAS, M.D., was born June 13, 1773, at Milverton, in Somersetshire. He was the eldest of ten children of Thomas and Sarah Young, who were both Quakers. In 1780 he was placed at a boarding-school at Stapleton, near Bristol, and in 1782 was sent to the school of Mr. Thompson, at Compton in Dorsetshire, where he remained nearly four years. During this period he studied, besides Latin and Greek, the French, Italian, and Hebrew languages. After his return home he devoted himself almost entirely to the study of Hebrew, and to the practice of turning and telescope-making, which he had been taught by an usher of Compton school. In 1787 he accepted, in conjunction with Mr. Hodgkin, an engagement as private tutor to Hudson Gurney, grandson of Mr. David Barclay, of Youngsbury, near Ware, in Hertfordshire. There he remained till 1792, devoting his leisure hours to the prosecution of his studies in Greek, Latin, and modern languages, Oriental as well as European, and also to mathematics, algebra, fluxions, natural philosophy, and the 'Principia' and 'Optics' of Newton. Mr. Hodgkin in 1793 published 'Calligraphia Græca,' which he dedicated to Young, who had suggested the work, and furnished the writing.

In the autumn of 1792 Thomas Young removed to London, in order to study medicine by the advice and on the invitation of Dr. Brocklesby, an eminent physician, who was his maternal uncle. Young was by him introduced to Mr. Burke, Sir Joshua Reynolds, and other distinguished men; and he attended the lectures of Drs. Baillie, Cruikshank, and John Hunter. In the autumn of 1793 he entered himself a pupil at St. Bartholomew's Hospital, and in October 1794 proceeded to Edinburgh, still further to prosecute his medical studies. Before quitting London for Edinburgh, he had resolved to give up some of the external characteristics of the Quakers; but the change of habits and associations in a short time led to a total and permanent separation from them. He mixed largely in society, began the study of music, and took lessons on the flute, and also private lessons in dancing, and frequently attended performances at the theatre. In the summer of 1795 he made a tour in the Highlands of Scotland.

In October 1795 he left London, in order to make a tour on the Continent. He took a doctor's degree at the university of Göttingen, and prosecuted his studies there during nine months. In May 1796 he made a tour to the Harz Mountains, ascended the Brocken, and descended some of the deepest mines. After leaving Göttingen, he visited Gotha, Erfurt, Weimar, Jena, Leipzig, Dresden, and Berlin, and returned to England in February 1797.

Almost immediately after his return Thomas Young was admitted a Fellow Commoner of Emmanuel College, Cambridge. Dr. Brocklesby died December 13, 1797. He had fostered the promising talents of his nephew, had provided for the completion of his general and professional education, and now left him by will about 10,000*l.*, and his house in London, with furniture, library, and a choice collection of pictures, mostly selected by Sir Joshua Reynolds. After this, Young resided sometimes at Cambridge, and sometimes at Bath, Worthing, and elsewhere.

Having, in 1799, completed his last term of residence at Cambridge, in 1800 he settled in London, and commenced the profession of medicine. His practice, however, was never large, so that he was enabled to devote much of his time to his favourite literary and scientific pursuits. Several years were then required to elapse between the date of admission of a student at Cambridge and the granting of his degrees in medicine, so that Young did not obtain his degree of M.B. till 1803, nor that of M.D. till 1807. As early as 1799 he had written his memoir, 'Outlines and Experiments respecting Sound and Light,' which was read before the Royal Society, and printed in their 'Transactions.' Other papers 'On the Theory of Light and Colours' followed, which the Council of the Royal Society selected for the Bakerian lectures.

In 1801 he accepted the office of Professor of Natural Philosophy at the Royal Institution, which had been established the year preceding. His first lecture was delivered January 20, 1802. His lectures were not popular. His matter was too much compressed and his style too laconic. In 1802 he was appointed Foreign Secretary to the Royal Society, an office which he held during the remainder of his life, and for which he was well qualified by his knowledge of the principal languages of Europe. He married June 14, 1804. After fulfilling for two years the duties of Professor of Natural Philosophy to the Royal Institution he resigned the appointment.

During his connection with the Royal Institution he delivered sixty lectures, which form the substance of his great work, which was published in 1807, and entitled 'A Course of Lectures on Natural Philosophy and Mechanical Arts,' 2 vols. 4to. This work includes also his optical and other memoirs, and a classed catalogue of scientific publications. A new edition was published in 1845, 'with References and Notes, by the Rev. P. Kelland, M.A., F.R.S., &c., illustrated by numerous Engravings on Copper,' 8vo. These lectures embody a complete system of natural and mechanical philosophy, drawn from original sources; and are distinguished not only by extent of learning and accuracy of statement, but by the beauty and originality of the theoretical principles. One of these is the principle of interferences in the undulatory theory of light. "This discovery alone," says Sir John Herschel, "would have sufficed to have placed its author in the highest rank of scientific immortality, even were his other almost innumerable claims to such a distinction disregarded." The first reception, however, of Dr. Young's investigations on light was very unfavourable. The novel theory of undulation especially was attacked in the 'Edinburgh Review,' and Dr. Young wrote a pamphlet in reply, of which only one copy was sold. He communicated frequently with the French philosopher Fresnel, who entertained views similar to his own on the nature of light. The undulatory theory is now generally received in place of the molecular or emanatory theory. Among the other difficult matters of investigation in which Dr. Young was engaged was that of the Egyptian Hieroglyphics, in which in fact he preceded Champollion. [CHAMPOLLION, J. F.]

In 1809 and 1810 Dr. Young delivered at the Middlesex Hospital a series of lectures on the elements of medical science and practice. In January 1811 he was elected one of the physicians of St. George's Hospital, a situation which he retained for the remainder of his life. His practice there, as elsewhere, is stated to have been eminently successful, but he never became popular. In 1813 he published 'An Introduction to Medical Literature, including a System of Practical Nosology, intended as a Guide to Students and an Assistant to Practitioners,' 8vo. In 1816 Dr. Young was appointed secretary to a commission for ascertaining the length of the seconds' pendulum, for comparing the French and English standards with each other, and for establishing in the British empire a more uniform system of weights and measures. He drew up the three reports, 1819, 1820, 1821. In 1818 Dr. Young was appointed secretary to the Board of Longitude, and on the dissolution of that body he became sole conductor of the 'Nautical Almanac.'

Dr. Young at various times contributed eighteen articles to the 'Quarterly Review,' of which nine were on scientific subjects—the rest on medicine, languages, and criticism. Between 1816 and 1823 he wrote sixty-three articles for the 'Supplement to the Encyclopædia Britannica,' of which forty-six were biographical. In 1821 he made a short tour in Italy in company with his wife. In August 1827 he was elected one of the eight foreign associates of the Academy of Sciences at Paris, in place of Volta, who died in 1826. Dr. Young died May 10, 1829, and was buried in the vault of his wife's family at Farnborough, Kent.

In 1855 was published a 'Life of Thomas Young, M.D., F.R.S., &c., by George Peacock, D.D., F.R.S., Dean of Ely,' 8vo. In the same year was published 'Miscellaneous Works of the late Thomas Young, M.D., F.R.S., &c., vols. i. and ii. including his Scientific Memoirs, &c., edited by George Peacock, D.D., F.R.S., &c., Dean of Ely, 8vo. 1855: vol iii., Hieroglyphical Essays and Correspondence, &c., edited by John Leitch. These volumes contain all Dr. Young's contributions to the 'Transactions' of the Royal Society; the principal articles furnished for the 'Supplement to the Encyclopædia Britannica;' many essays from Nicholson's 'Journal' and Brande's 'Journal;' some reviews on scientific subjects from the 'Quarterly Review;' and several essays either separately published or dispersed in different publications.

Z

ZAGOSKIN, MIKHAIL NIKOLAEVICH, a Russian dramatist and novelist, was descended from a Tartar family, and was born on the 14th of July (o.s.) 1789, at the village of Ramzay, in the government of Penza. He remained in his native village till the age of fourteen, receiving but a slender education, and learning no language but Russian, but was early remarkable for his literary tastes, reading all he could obtain, and composing a tale at the age of eleven. At fourteen he was sent to St. Petersburg as a clerk in a government office, and continued in that kind of employment till the outbreak of the war of 1812, when he became an officer in the St. Petersburg Opolchenie or Militia, took part in the campaign against the French, was wounded at the battle of Polotzk, and before the close of the war rose to be adjutant to General Lewis at the siege of Danzig. By this time he had acquired some knowledge of French and German, his long dormant literary tastes revived, and not long after he had taken leave of a military life—he sent anonymously a comedy, called 'Prokaznik' or 'The Wag,' to Prince Shakhovsky [SHAKHOVSKY, *S.* 2], director of the St. Petersburg theatre, who had himself just returned to the duties of management, from the command of a regiment of Cossaks. The reply was so unexpectedly favourable, that Zagoskin at once made himself known, and Shakhovsky even procured for him a post connected with the theatre, and another as an honorary librarian at the Imperial library, where we are told that for his services in assisting to arrange the books and to catalogue the Russian ones, he received the Order of St. Anne of the third class. This was the commencement of his career as a dramatist, which he pursued first at St. Petersburg, and after 1820 at Moscow, to which city he was transferred as director of the theatre. He wrote altogether seventeen original comedies, some in verse and some in prose, several of which met with distinguished success, and none failed except the last. The best are 'Mr. Bogatonov, or the Country Gentleman in the Metropolis:' 'Bogatonov the Second, or the Metropolitan in the Country;' 'A Romance on the Highroad,' and 'The Journey Abroad.' It is worthy of remark that till beyond his thirtieth year Zagoskin had not written a line of verse, his ear being singularly insensible to cadence and metre, and that in 1821, on some of his friends laughing at him for pretending to give his opinion on poetry when he laboured under this deficiency, he was piqued into saying that he would show he could write verses after all; and setting doggedly to work, and making progress at the rate of four lines a day, correcting the metre on his fingers, he produced some verses that were not only rhythmically correct, but remarkable for their grace and freedom. After this he frequently wrote in verse, but detested the occupation; and when he determined to write a romance in imitation of Walter Scott, one chief inducement was to enjoy a double freedom from the trammels of rhyme and the rules of the drama. The tale he produced, 'Yurii Miloslavsky ili Ruskie v 1612 Godu' (George Miloslavsky, or the Russians in 1612), 3 vols., Moscow, 1829, delineates the state of Russia at the time that it was nearly conquered by the Poles. The success it met with was prodigious. "The appearance of this romance," says Zagoskin's biographer Aksakov, "made an epoch both in the literary and social career of Zagoskin. The enthusiasm was universal and unanimous; few indeed were there who did not fully share it. The public of both the capitals, and after them, or rather with them, the public of all the provincial towns, fell into raptures. Up to this day (in 1852) 'George Miloslavsky' is read by all Russia that can read, and not without cause; the Russian mind and soul, and even the Russian way of speaking, were for the first time represented in Russia in this Romance." An English translation of it appeared in London in 1834 under the title of 'The Young Muscovite, or the Poles in Russia, edited by Captain Frederic Chamier, R.N.,' and was said in the preface to be 'edited' from a manuscript translation of the book made into English "by a Russian lady of high rank and her two amiable daughters," to which the editors, for it appears that there were more than one, took the liberty of adding "an underplot by which the characters of the chief actors are further developed." Although of course these alterations detract from the value of the book as a picture of Russian life and character, stamped by native approbation as correct, they are not so extensive as to spoil it. Speaking of it from a full perusal of the original, we should say that 'George Miloslavsky' was an amusing third-rate tale, rather unequal in its progress, and falling off sadly towards the end. Zagoskin was hailed as the Russian Walter Scott. For his next tale 'Rostavlev,' a story of Russia in 1812, in which he introduced some of his own adventures, there was an unheard-of competition in the Russian publishing world, 4800 copies were printed, and an enormous price given for the copyright, but it was far from attaining the success of its predecessor. Zagoskin went on writing novels and romances, and in general founding a play on each after it appeared; but the merit and popularity of his works went on diminishing, and none of his subsequent productions was considered to rival 'Yurii Miloslavsky,' or even 'Rostavlev.' He continued to reside at Moscow, where he enjoyed the additional appointment of director of the Armoury of the Kremlin, and was a well-known and popular member of the best society, which his never-failing good humour and disposition to merriment qualified him both to enliven and to enjoy. Almost his only work besides his plays and novels was a collection of essays entitled 'Moskva i Moskvichi' (Moscow and the Moscowers), which ran to three or four volumes. After a tedious illness, originating in gout, which he combated by homœopathy, he suddenly expired at Moscow on the 23rd of June (o.s.)

1852. Soon after his death a life of him by Aksakov appeared in the 'Moskvitianin,' from which the foregoing particulars have chiefly been taken. His best works have an interest both to the native and foreigner from the purely Russian tone of their language and spirit, as indeed in every country the most popular national romance is a valuable clue to the knowledge of national character.

ZAHRTMANN, VICE-ADMIRAL CHRISTIAN CHRISTOPHER, Hydrographer to the Danish Admiralty, entered the naval service of his country as a cadet in the year 1805, and afterwards served as a lieutenant in many arduous and perilous undertakings during the war which terminated in 1815; acquiring the character of being one of the most able and accomplished officers of the Danish navy. At the general peace he betook himself entirely to geodetical and hydrographical labours; among which he assisted the late Professor Schumacher in the measurement of the Danish arc of the meridian. After a cruise to the West Indies, during which he made a chart of a portion of their seas, and set up an observatory on the island of St. Thomas, he was appointed successor to Admiral Lövernörn as director of the Hydrographic Office at Copenhagen. In this capacity, notwithstanding much prejudice respecting the publication of documents, he brought the labours of his department in an available form before the world, and with the highest degree of finish and exactness. The works, so important to the navigators of all nations, on which his fame rests, are the charts of the coast of Denmark, with accurate soundings between the numerous islands, accompanied by determinations of the currents and trigonometrical surveys of the coast. His chart of the North Sea (1843) was indeed the greatest boon to all seamen, and to those of Britain in particular; whilst the 'Danske Lods' (Danish Pilot), which is a complete description of all the seas surrounding Denmark, has been found so useful that it has been translated, under the direction of Admiral Sir Francis Beaufort, F.R.S., late Hydrographer to the British Admiralty, into both the English and French languages. He was also master-general of the naval ordnance of Denmark, inspector of the chronometer bureau of Copenhagen, and a chamberlain of his sovereign, as well as a knight grand cross of the order of Dannebrog and Dannebrogsman, and a knight of four foreign orders, Russian, Prussian, French, and Greek.

Admiral Zahrtmann died suddenly on the 15th of April, 1853, in the sixtieth year of his age. The estimation in which he was held by his countrymen was evinced by the attendance at his funeral of the princes of the royal family, the ministers of state, the corps diplomatique, and many officers of the naval, military, and civil services.

He was an honorary member of the Royal Geographical Society of London, and communicated to that Society, in 1830, shortly after its foundation, an account of Danish discoveries on the East Coast of Greenland in the preceding year: a translation of his official report on which, sent to the Geographical Society of Paris, appears in the first volume of the Journal of the former Society. In the same work, vol. v., is an elaborate paper by him entitled 'Remarks on the Voyages to the Northern Hemisphere, ascribed to the Zeni of Venice;' in which, communicated to the society in 1835, he arrives at the conclusion that these voyages, at least in the main points, are mere fabrications.

ZANTHORNIS. [STURNIDÆ.]

ZARAGOZA. [SARAGOSSA.]

ZEALAND, NEW, a British colony in the Pacific Ocean and in the southern hemisphere, consists principally of two large islands, separated from each other by a wide strait called Cook's Strait. There is also a much smaller island south of the two others, besides several islands, or rather islets, scattered along the shores. The more northern of the two large islands is called by the natives Te Ika a Maui, "The Fish of Maui," from a legend of its having been fished up out of the sea by Maui. It has been named New Ulster, but is generally called North Island. The native name of the other large island is Te Waki Pounamu, "The Place of Pounamu," that is, of jade, used by the natives in forming their instruments of war. This island has been named New Munster, but is generally called Middle Island. The small island has been named New Leinster, but is mostly called South Island, or Stewart Island. The islands lie between 34° 25′ and 47° 20′ S. lat., 166° and 178° 35′ E. long. The two large islands are about of equal length, and the entire length of the two is about 1000 miles. The width varies from a few miles to 250 miles. Stewart Island is about 60 miles in length and 60 in width. They are about 1200 miles eastward from Australia. The European population, according to the census taken in 1851, was 26,656, of whom 14,996 were males, and 11,660 females. The European population is now estimated at 40,000. The native population is estimated at from 80,000 to 100,000, of whom by far the largest number are inhabitants of North Island.

The British government in 1852 purchased the claims of the New Zealand Company for 268,370*l.*, to be paid out of the sale of waste lands in New Zealand. In the same year, by an Act of the British parliament (15 & 16 Vict. c. 72), a constitution was granted to the colony, the legislative and administrative powers being vested in a Governor, Legislative Council, and House of Representatives. The seat of government is at Auckland. The colony is now divided into six provinces—Auckland, Wellington, and New Plymouth, in North Island; Nelson, Canterbury, and Otago (or Otako) in Middle Island. Each province is placed under the management of a Superintendent and Provincial Council.

The colony has now four bishoprics—the bishopric of New Zealand, created in 1841, the bishopric of Christchurch, created in 1856, the bishopric of Nelson, created in 1857, and the bishopric of Wellington, created in 1858.

In 1849 the revenue was 48,589*l.*; in 1850 it was 57,743*l.*; it is now (1858) about 200,000*l.*, the customs' duties amounting to 100,000*l.*, and the land sales 80,000*l.* to 90,000*l.*

The greater part of the commerce of New Zealand is inter-colonial, but in 1856 the imports into Great Britain amounted to 100,000*l.*, and the exports from Great Britain to New Zealand, during the same year, were valued at 300,000*l.* The principal staple is wool, of which, in 1849, only 487 bales were imported from New Zealand into Great Britain, but in 1857 the import amounted to 8325 bales. Wheat is exported in large quantities to Australia, and also maize, but the maize-crop is not so certain as that of wheat. Potatoes are grown extensively, as well as kumeras (the native sweet potatoes). All the cereals and vegetables of temperate climes flourish. Water-melons, Cape gooseberries, figs, and oranges, thrive in the open air. Whale oil and whalebone are exported, but not so largely as formerly. A large quantity of kauri-gum is imported into Great Britain. It is a resinous exudation from the kauri-pine. The New Zealand flax (*Phormium tenax*) has not yet become a successful article of commerce. A better method of cleaning and dressing it remains yet to be discovered. Wood is abundant on North Island, but is very scarce on Middle Island. The mean annual temperature at Auckland is 58·43° Fahr., at London is 50·39°, at Naples is 61·40°. The mean temperature of the hottest month (January) is 67½° Fahr., and of the coldest month is 51½° Fahr.; at London the mean temperature of the hottest month is 64°, and of the coldest month 37°. Little is known of the mineralogy of New Zealand. In October 1852 gold was discovered at Coromandel, about 40 miles E. from Auckland, on the peninsula forming the eastern side of Hauraki Gulf, between the harbours of Waihou on the western side and Mercury Bay on the eastern side. Gold has since been discovered in Nelson Province, and diggers are at work there. The whole quantity obtained has not hitherto been very large. Specimens of quartz-rock have been found exceedingly rich in gold. Copper has been found and wrought to some extent, but no lead or silver. Both islands contain coal, which is found at the surface, but mining for it has not yet been attempted.

The chief towns and villages in the colony of New Zealand are the following:—

Auckland, the seat of the government of the colony, is built on the southern shores of the harbour of Waitemata, which opens into the Gulf of Hauraki. The harbour has sufficient depth for vessels of considerable burden. The town stands on cliffs of sandstone of moderate elevation, backed by rising ground. Several volcanic cones rise in its immediate neighbourhood, at the base of which are hard scoriæ, fit for buildings and roads, and easily worked; the sandstone of the cliffs, though soft, hardens by exposure to the air, and is also a good building material. Some of the caves that occur in the cliffs have been used by the natives as places of sepulture, and the bottoms are covered with human bones. The houses in the town are mostly of wood. The town is situated in a part of the island where the soil, though light, is fertile and easily cultivated, and it has an easy communication with all the countries both to the north and to the south. Many of the English, who settled on the island before the foundation of the colony, reside in the harbours north of Auckland, and a great number of small coasting-vessels visit Auckland. Around Auckland are four pensioner-villages for discharged soldiers. Auckland was incorporated as a borough on July 29th, 1851, the district by which it is formed extending 16 miles in length, and from 5 to 7 miles in width. It is divided into 14 wards, of which three are in the town itself. The Tamaki Creek intersects the borough, is navigable for boats, and is made available for the commerce of the district. The borough is governed by a mayor, aldermen, and burgesses. The principal buildings in the town are—St. Paul's church, a handsome building; two sets of barracks built of scoriæ; a public hospital; a market-house; a native hostelry; public washing, bathing, and drying grounds; several chapels; and a bank. There are also several bridges, wharfs, and landing-places. The governor's residence and the bishop's are closely adjacent, and four miles from the town, on the banks of the Tamaki, is St. John's College. There is a church at each of the pensioner-villages mentioned above. The population of the town is about 4000; in the district in 1851 there were 8840, of whom 4921 were males, and 3919 females. The flag-staff of the barracks is in 31° 51′ 27″ S. lat., 174° 45′ 20″ E. long.

Wellington, the principal settlement of the New Zealand Company, founded in 1840, is on the shores of Port Nicholson, in the island of New Ulster, but for government purposes the town and the whole of the district are comprised in the province of New Munster. Port Nicholson lies in 41° 15′ S. lat., 174° 47′ E. long.; it is surrounded by mountains, except at the alluvial tract through which the river Hutt, or Eritonga, reaches the sea. These mountains rise abruptly from the water's edge, except in the most south-western corner of the harbour, where a strip of flat land extends at their base, about one-third of a mile broad and two miles long, the soil of which is composed of sand, shells, shingle, and vegetable earth. On this flat ground, which surrounds that portion of Port Nicholson called Lambton Harbour, the town of Wellington has been built. It extends about three miles in the form of a semicircle round the harbour. The flat ground not being considered sufficient for the town, the hills south of it were included. As these hills are generally too steep to build on, only the more convenient parts were selected for that purpose, and thus the most distant points of the town are nearly four miles from the harbour. In 1848 there were 525 houses, of which 45 were of brick or stone, 303 of wood, and 177 of clay and wood, or other materials. Other houses, and large warehouses of brick have been constructed since, near the wharfs and jetties, which have been built so that vessels of 70 tons can unload alongside of them. There are two churches, and an Episcopal chapel, a Presbyterian chapel, five Wesleyan chapels, three other Dissenting chapels, and one Roman Catholic chapel, with a Roman Catholic bishop; there are also an hospital, a bank, a savings bank, a mechanics institute, a horticultural society, a custom-house, an exchange, a jail, two sets of barracks, and the residence of the lieutenant-governor. There are also 38 schools of various kinds. Most of the public buildings are of wood only. The population of the district in 1851 was 5722, of whom 3135 were males and 2587 females. The town is well supplied with water by streams which run through it; it is lighted at night by lamps, which every public-house is compelled by the terms of its licence to keep burning; the streets are not paved, but excellent roads have been made in several directions along the coast to the valley of the Hutt, and towards that of Wairarapa. Two newspapers are published in the town. Three cemeteries have been provided, all of them at some distance outside the town, one for the Jews, one for Roman Catholics, and the other, a large one, picturesquely situated, is used by all the Protestant sects, European and native. The harbour is safe and has good holding ground. In 1855, the vessels registered at Auckland, or belonging to it, consisted of 3 steamers, 41 foreign-going vessels (6618 tons total burthen), 75 coasters belonging to English owners, 49 coasters belonging to native owners, and 158 small craft averaging 10 tons, of which 34 belonged to native owners, besides innumerable canoes 10 to 70 feet in length.

Akaroa is a small settlement formed, in 1840, by the French, who had attempted to land in the Bay of Islands, but were prevented by Governor Hobson; and under his direction, and accompanied by an English magistrate under the British flag, they were settled at Akaroa. Akaroa is near the south-east point of Banks Peninsula in New Munster, in 43° 52′ S. lat., 173° E. long. The harbour is an inlet 7 miles in depth, with steep shores, and has a bar at the entrance, but it is perfectly landlocked within, though exposed to furious gusts from the highlands around it, and there is 14 fathoms water inside the harbour. The town contains a church, the residence of the magistrate, a jail, and the cottages of the inhabitants, who are chiefly agriculturists. *Bay of Islands*, at the northern end and east coast of New Ulster, was originally the seat of a whaling station, and was at first selected by Governor Hobson for the site of the capital, but was abandoned in favour of Auckland. Two towns however sprung up, Russell and Kororarika; the first was burnt down and the inhabitants expelled by Heki, and from the other they withdrew to Auckland. Still some Europeans have kept their position here, and the government returns state the population as 400. *Canterbury* is the name of a settlement in New Munster, first founded in 1849, upon strictly Church of England principles, and with a large ecclesiastical establishment. It comprises the whole of Banks Peninsula, and a large district running back westward to the range of mountains, and extending along the eastern coast for a direct length of about 100 miles. The population in 1850 was estimated in the government returns at 1600; but Mr. Fox, in his 'Six Colonies of New Zealand' (1852), gives the number at 3734; and two towns had been formed, Lyttelton, at Port Victoria, and Christchurch, on the plains, where temporary churches had been built, and a College and schools founded. *Kaitaia* is a native village, and a missionary settlement in New Ulster, in the valley of the Awaroa, a few miles S.W. from Doubtless Bay, and 8 miles from the western coast. The natives in the valley are estimated at 8000. The village is extremely picturesque, and much resembles an English one. There is a large church, with a wooden steeple, the work almost entirely of native builders; the houses are adorned with gardens in front, where roses and other flowers are cultivated; as are also various fruit-trees, the vine, vegetables, and some tobacco; they grow wheat and hops, and they have cut a road 32 miles long through the forest to Waimate on the Bay of Islands. *Monganui* is a small settlement on an excellent harbour within Doubtless Bay, on the eastern coast, towards the northern end of New Ulster. *Motueka* is a native village, with a slight admixture of Europeans, about 50 miles E.N.E. from Nelson. In this village, of which the population is about 1400, agriculture seems to be the chief pursuit, though lying close on the shore of Queen Charlotte Sound in Cook Strait. *Nelson*, situated on Nelson Harbour, in Blind Bay, New Munster, on the southern side of Cook Strait, in 41° 15′ S. lat., 173° 16′ E. long., was the second settlement of the New Zealand Company, and was made in 1843. The port is a good one, but the district is chiefly agricultural. The population of the whole district, which is extensive, amounted in 1851 to 4287, of whom 2317 were males, and 1970 females. There are in the town one church, one Wesleyan chapel, two other chapels for Dissenters, and one Roman Catholic chapel. There are three other churches and six chapels at various villages. We have noticed the great extent of sheep farming in this district, and as the pastures lie wide it has led to the construction of a great length of road; from 60 to 70 miles have been already formed, and a communication by land has been opened with Canterbury, a direct distance of about 170 miles, to Lyttelton. Coal exists in great abundance in the vicinity; one seam at Nelson and one at Waikati have been worked for some years, and in the latter end of 1852 a new seam of superior quality was discovered by a landslip at South Wanganui, at the north-west corner of the island, about 60 miles from Nelson in a direct line by land, but easily accessible by sea. Copper is also found near the Dun Mountain, about 8 miles from Nelson. *New Plymouth*, in New Ulster, is situated between two small streams, the Huatoki and the Henui, near their entrance into the sea, on the northern side of the peninsula of which Cape Egmont is the western termination, and in the midst of which stands the extinct volcano of Mount Egmont. There is no harbour properly so called, as the rivers are not navigable, and the mouths are small, nor is the roadstead a secure one. But this is the only drawback, for the country around has been called the garden of New Zealand. The land is so dry and so level that good roads are made with but little trouble, and the soil is the most fertile of any yet cultivated in New Zealand. The settlement was founded in 1841. In 1851 the population was 1532, of whom 845 were males, and 687 females. The town fronts the sea about half-a-mile from the beach, lying scattered on the slope of a hill, and contains two churches, one of them of stone, a Wesleyan chapel also of stone, two other Dissenting chapels; a jail, schools, and some other buildings, all constructed of wood; and there are a brewery and three flour-mills. Several bridges have been formed over the various small streams that descend from the sides of Mount Egmont and traverse the country. Iron and coal exist in the neighbourhood. Coal is found in abundance near the Mokau River, about 50 miles N. from New Plymouth. *Otago*, in New Munster, is the district in which a settlement has been made by members of the Free Church of Scotland. It is towards the southern end of the island, on the eastern coast. The town named *Dunedin* is on the Molyneux River, which has been re-named the Clutha. The harbour formed by the mouth of the river is an excellent one; it is 13 miles long, and averages 2 miles in width; but the channel had difficulties which have been guarded against by laying down guiding buoys. The settlement was made early in 1848; in 1851 the population was 1740, of whom 994 were males and 746 females. The chief town, Dunedin, stands at the head of the harbour, and another has been formed nearer the mouth, named *Port Chalmers*, which lies in 45° 46′ S. lat., 170° 43′ E. long. There was in 1848 only one place of worship, a Free Church chapel; but in 1850 the number of adherents to that doctrine barely reached a majority. The Clutha is a fine river, and, though difficult of entrance from a bar and consequent surf at its mouth, is said to be navigable for 60 miles for vessels of considerable burden. Coal is found at Coal Point, about 10 miles N. from the mouth of the Clutha, and at a spot within a quarter of a mile of the left bank of the Clutha, about 4 miles inland; traces have also been found in other places. A kind of green serpentine or jade is found here. *Otaki* is an exclusively native village on the western shore of Cook Strait, about 50 miles N.N.E. from Wellington, and was the village where the celebrated Rauperaha lived, and where he died. The church missionaries have taken much interest in this village, and not without success. Mr. Tyrone Power ('Sketches in New Zealand') describes it in 1848 as consisting of "houses neatly built, in the midst of well-fenced gardens; and there is abundant proof of prosperity in the number of pigs, cattle, and horses feeding about." The houses are of Maori architecture, with English doors, windows, &c. Mr. Power adds, that several of the chiefs kept a banking account at Wellington, and relates a story of one of them asking an English officer to cash a cheque for him, having immediate occasion for money, which was done, and the cheque duly honoured. Rauperaha, after peace was restored, exerted himself greatly in forwarding the building of a church, which was done entirely by the Maories. It is only of timber, but it is the largest building they have ever yet erected, being 300 feet long, and in the churchyard attached to it Rauperaha was buried in 1849 with due Christian rites. His son is still the acknowledged chief, and is described as dressing in black, and looking like a clergyman. The population in 1850 was 664. *Petre* is a small but flourishing little place on the west coast of New Ulster, and on the right bank of the Wanganui River, 4 miles from its mouth, and about 100 miles N. from Wellington. The population in 1850 was 452, of whom 276 were males and 176 females. It consists of about 40 houses, a church, a school, a post-office, and a small jail, all of wood. It was founded in 1842, soon distinguished itself by its agriculture, and acquired a great local reputation for its hams and bacon. In 1847 however an unfortunate quarrel with the natives of the valley led to the destruction of the place. On peace being restored the colonists returned, and resumed their occupations successfully. A small detachment of military is stationed at Petre. *Putikiwaranui* is a native village on the Wanganui, opposite to the town of Petre. It has about 2000 inhabitants, but the whole number in the district probably amounts to 5000. The inhabitants have now applied themselves sedulously to industrial pursuits, bringing their produce down the Wanganui in canoes, which they manage with great dexterity down the rapids, with a cargo sometimes weighing a ton, and contrive even to ascend them with their canoes light. *Waikenae* is a native village about 20 miles S. from Otaki, at the mouth of a small river of the same name. It is in the same style as Otaki, but smaller. In this village one of the natives set up an ordinary—an unlimited dinner for a shilling; but as his fellow-citizens prepared themselves for it by fasting the whole of the previous day he found it unprofitable, and restricted the meal to two pounds of pork, two pounds of potatoes, and a pint of coffee. It has a timber church—like a huge barn, says Colonel Mundy ('Our Antipodes')—and the military coast-road from Wellington passes through it. *Wangaroa Bay* (celebrated as being the scene of the massacre of the crew of the Boyd in 1809) is about 25 miles N. from the Bay of Islands in New Ulster. The entrance to the harbour is narrow, between steep rocks of great height; but the water is deep, and the inner harbour is very spacious, and sheltered from all winds. The country around is mountainous, and not adapted for cultivation; but the hills are covered with timber, among which the Kauri pine was particularly abundant, but has been much thinned. A few Europeans are settled here, and there is a native village of about 2000 persons, with Protestant and Roman Catholic missions, both persuasions having chapels. Timber is still occasionally exported, and some small craft have been built here.

About 20 newspapers are published in New Zealand, at Auckland, at Wellington, at Nelson, at Dunedin, and elsewhere. Several of them are issued twice a week.

ZETLAND, the ancient name of the SHETLAND ISLANDS, and still occasionally applied to them. Shetland was called by the Norwegian colonists Hjaltland and Healtland, which became changed into Yetland and Zetland. From this name the late Lord Dundas, one of the principal proprietors of Shetland, took the title of Earl of Zetland when elevated to that rank in the peerage in 1838. The name is also retained in the title of the lord-lieutenant and sheriff of Orkney and Zetland.

ZEUS, a genus of Fishes belonging to the family *Scomberidæ*. The Boar-Fish of English writers is referred by Jenyns and others to this genus, but Cuvier, Lacépède, and Yarrell, refer it to *Capros*. [CAPROS.]

ZEUZERA, a genus of nocturnal *Lepidoptera*. The male antennæ are furnished at the base with a double row of teeth, which are terminated by a thread: those of the female are single at the base.

Z. Æsculi, the Wood-Leopard, is a rare species, of a white colour, with numerous steel-blue spots. The larvæ are found in the interior of decaying trees.

ZHUKOVSKY, VASILY ANDREEVICH, a Russian poet of the first order of eminence, was born at the village of Mishensky, about two miles from the town of Bielev, in the government of Penza, on the 29th of January (o.s.), 1783. The year of his birth, which has often been differently stated, is given on his own authority as reported by Sneguirev. At a very early age he lost his father, and he was chiefly brought up by his mother, grandmother, and aunt, in a household which contained nine girls and three young women, and in which he was the only boy. At school he had at first the reputation of being lazy and very averse to dry studies, while at home his good looks and good nature made him a general favourite. He formed all the girls into a troop of actors, and at an early age got up a play of his own composition, 'Camillus, or Rome Preserved,' in which he acted the part of the hero with great applause from the neighbours who were invited to the performance. At the age of thirteen, on the subject of 'Hope' being given him for a theme at school, he produced an exercise of such excellence that it has been inserted as a classical piece in several Russian compilations of the nature of Enfield's 'Speaker.' At the age of fourteen he began to appear in print by contributing to one of the Moscow periodicals under the signature of the 'Hermit of the Mountain;' and it was remarked, that while gay and lively in society, he was disposed in composition to be mild and meditative. His time appears to have been divided for some years between different towns in winter and his native village in summer; and while at the schools of Tula and Moscow he gradually won his way into notice and distinction by proficiency in study, at the village of Mishensky, which was picturesquely situated on the banks of the Oka, he cultivated his talents for poetry, music, and drawing, for all of which he had a natural gift.

It was at a house within sight of the church and churchyard of Mishensky that he wrote his translation of Gray's 'Elegy in a Country Churchyard,' the first production of his pen which made an impression on the public. Gray's 'Elegy' is at this moment the most universally known and universally popular piece of poetry in existence. Bowring, in 1821, mentioned that he had seen a collection of more than one hundred and fifty different versions, and among them Zhukovsky's is undoubtedly one of the best. This fortunate translation, which was published in 1802, was, like Moore's 'Anacreon,' the foundation of a fame which encircled its author for a succeeding half century. It first appeared in the 'Viestnik Evropui,' or European Intelligencer, then the leading periodical of Russia, of which Karamzin, its most popular author, was at the time the editor, and it introduced him at once to the friendship of Karamzin and Dmitriev, and a position amid the best literary society of Moscow. A few years later, in 1808 and 1809, Zhukovsky became himself the editor of the same periodical, but he soon relinquished the employment, though he had now devoted himself to a literary career. In the war of 1812, both Karamzin and Zhukovsky were anxious to bear arms, but the bodily infirmities of Karamzin would not allow him to sit on horseback, and Zhukovsky took leave of him at Moscow at the house of Count Rostopchin, where he was residing, to hasten to the ranks of the army. As a lieutenant of the Moscow volunteers, Zhukovsky fought at the great battle of Borodino, and he took an effective part in the subsequent memorable campaign, both as a bard and a soldier. It was in the former capacity however that he most distinguished himself; his 'Minstrel in the Russian Camp,' a series of songs on the war, created unbounded enthusiasm among the soldiery, were struck off at a military printing-press, and circulated and sung throughout the army. The poet, however, unaccustomed to the fatigues of a military life, was attacked by fever, and obliged to quit the army early in 1813. The Empress mother, Maria Theodorovna, who had been delighted with his poems, was anxious to see and reward the 'Minstrel;' a splendid edition of the work was issued with a poetical epistle to herself, and Zhukovsky, who had been decorated with the order of St. Anne for his military services, received from the Emperor Alexander a pension for life of 4000 rubles. For some years afterwards his time was chiefly spent at court at St. Petersburg in the enjoyment of imperial favour, of great success in society, and till the rise of the Russian Byron, Pushkin, of the reputation of being the first poet of Russia.

His most popular productions in this his most productive period were a number of ballads, a species of composition which he was the first to introduce into Russian literature. His first poem of the class, 'Ziudmilla,' an imitation of Bürger's 'Lenore,' startled the Russian public into a burst of enthusiastic admiration. He afterwards treated the same subject with variations in a poem entitled 'Svietlana,' which is still considered his masterpiece, and finally he translated 'Lenore' itself simply from the German into Russian. Almost all his subsequent ballads are founded on foreign originals, and constitute what some of the Russian critics are fond of calling the "inimitable imitations" of Zhukovsky. But how far the imitation extends it is not always easy to ascertain, for in most cases he takes the liberty of suppressing the name of the original author. The reader who is acquainted with the poetical literature of England, France, and Germany, in looking through the ballads of Zhukovsky, is continually meeting with old faces and old favourites. From Southey alone, the Russian poet borrowed, without the mention of Southey's name, 'Queen Orraca and the Five Martyrs of Morocco,' 'Rudiger,' 'The Old Woman of Berkeley,' and 'Lord William,' the title of the last of which he altered to 'Varvik,' the nearest approach which the Russian alphabet allows to the English 'Warwick.' Still more strangely, while the ballad of 'Smailholm Tower' is acknowledged to be taken from Walter Scott, a tolerably close version of the condemnation of Constance, from the second canto of 'Marmion' is presented to the reader of Zhukovsky's works, as 'The Trial Underground, a fragment of an unfinished poem.' This mode of proceeding is not confined to Zhukovsky, and seems to be in accordance with the Russian code of literary ethics: as, though the native critics must be aware of the fact, we have never seen it mentioned with blame. How apt it is to mislead, may be shown from the example of Merimée, who, in his life of the false Demetrius, speaks of the beauty of the Polish ladies as being so remarkable as to have drawn from the Russian Byron, Pushkin, the very curious compliment paid to it in the ballad of 'The Three Sons of Bodrys,' quite unaware that the ballad in question has been transferred without acknowledgment from the Polish Byron, Mickiewicz.

Leaving their origin out of view, the ballads of Zhukovsky are beautiful specimens of animated narrative, and in his own poem of 'Svietlana' (which has been translated into English by Bowring) there is a power and force of what is now called 'word-painting,' which have rarely been equalled in any language. In his first romantic poem, 'Ruslan and Liudmilla,' Pushkin showed a similar power, and Zhukovsky sent a present of his works to him with the inscription, "From the conquered teacher to his conquering pupil." They became intimate friends, and around them were grouped for several years all the most eminent literary society of St. Petersburg, which was in the habit of meeting at Zhukovsky's house. All shades of opinion were represented. Zhukovsky, a favourite at court, was a contributor to 'The Polar Star,' edited by Bestuzev and Ruilyeev, who afterwards perished on the gallows and in exile for their conspiracy against the Emperor Nicolas. Zhukovsky became more and more connected with the imperial family. When the Grand-Duke Nicolas married a Prussian princess, he was selected to teach her the Russian language; and when Nicolas became emperor, and the offspring of the marriage, the hereditary prince, was of an age to require a preceptor, Zhukovsky was appointed to the office. This withdrew him for some years from the active pursuit of literature, but enabled him in various ways to act efficiently for the benefit of his literary brethren. It was by the influence of Zhukovsky that Hertzen was allowed to return from exile, and that Mickiewicz [Mickiewicz, *S.* 2], the Polish poet, obtained permission to quit Russia, which he had entered as a captive. He too had probably a hand in obtaining a pension for Pushkin's widow after the decease of her husband, whose death he witnessed and described, but in a letter singularly jejune and destitute of his usual fire. It was remarked that, by a singular coincidence, the death of Pushkin took place on Zhukovsky's birthday, the 29th of January (o.s.). When the hereditary prince, now (1858) the Emperor Alexander II., made extensive tours through the vast empire which was to fall under his sceptre, Zhukovsky acted as his Mentor, and he also accompanied him in his visit to Germany, Italy, and England. The poet had made tours in Germany and Italy before, but to England this was his first visit; and though some of his poems had been translated by Bowring, and noticed by Byron, it is probable that the "Minstrel in the Russian camp" was recognised by few under the disguise of the French appellation on his cards—"M. de Joukoffsky." On his visit to the British Museum however, one of the assistant-librarians, who was a student of Russian literature, had the satisfaction of showing him an edition of his works which had just been added to the national library. Shortly after the prince's return to Russia, his preceptor's functions ceased. Zhukovsky's health had for some time been indifferent, and he transferred his residence to Germany, a country of which it is said he was "passionately fond," to have the benefit of the waters. He had always been a panegyrist and an admirer of domestic life, but he had now attained his fifty-ninth year and was still a bachelor. The Hereditary Prince in his European tour had been in search of a wife, and on the 28th of April 1841 he married the present Empress of Russia, the daughter of the grand-duke of Hesse. Within a month the preceptor followed the pupil's example. On the 21st of May 1841, at a little Russian chapel on a hill near Canstadt, which was erected over the remains of a Russian princess who had been queen of Wirtemburg, he was married to a beautiful girl of the name of Reutern, the daughter of an old officer and native of one of the Baltic provinces. Six years afterwards he wrote to a friend in raptures at the domestic happiness which had fallen to his portion. He chiefly passed his time at a retreat in the neighbourhood of Düsseldorf, and amused himself with translating into Russian poems by

Ferduci and Homer. Two children, both boys, were the offspring of the marriage, and his chief delight was in superintending their education, which he wished that his life might be prolonged to his eightieth year to see completed. Neither this wish nor that of revisiting Russia was fulfilled. On the 12th of April 1852, Zhukovsky died, calm and resigned, at Baden, in the bosom of his family. His remains were afterwards removed to his native country.

An edition of Zhukovsky's works which appeared at St. Petersburg in 1835-37, fills eight octavo volumes, and three additional ones were published under the title of 'New Poems' in 1849. Only one of these eleven volumes consists of prose, the remainder are all either original or translated poetry. Among the prose the palm is generally given to a tale entitled 'Marina Roshcha' (Mary's Grove), the name of a favourite resort of the inhabitants of Moscow, which ever since the tale appeared has been regarded in the light of a classic spot. There are some fragments of a diary kept by Zhukovsky on his tours in Italy and Germany, which are singularly vivid, but nothing apparently has been published from his pen of his visit to England. Among the poems 'Svietlana' is the masterpiece, and he is often called by his admirers 'the poet of Svietlana.' One of the volumes is occupied with a poetic version of La Motte Fouqué's 'Undine,' and most of another with a version of Schiller's 'Maid of Orleans,' in both of which Zhukovsky is thought by Russian critics to have surpassed the originals. His later works consist almost entirely of translations, one from the 'Shah-Nameh,' into a metre not in the least resembling that of Ferduci, the other from the 'Odyssey' of Homer, into hexameters. Zhukovsky informs us in the preface that, not understanding a word of Greek, he had composed his version by means of an interlineary translation of the original which a German professor (Grashof) had been kind enough to make for his exclusive benefit, and candidly admits that to the question "if he has succeeded" he can make no answer, as he can be no fair judge, not being able to make a comparison. Those who can make it are not likely to be satisfied with his success. Considering the genius of Zhukovsky, and the great resemblance in many points of the Greek and Russian languages, the difference between the exquisite beauty of the original and the unpleasing abruptness in the copy is very striking. In addition to the translations from the English that have been already noticed, it may be mentioned that Zhukovsky also rendered into Russian the 'Alexander's Feast' of Dryden, Moore's 'Paradise and the Peri,' which he entitled 'The Angel and the Peri,' Byron's 'Prisoner of Chillon,' and numerous other pieces, some of which bear the names of the original authors.

A critical essay on Zhukovsky by Sneguirev appeared in the 'Moskvitianin' for 1853, and has been separately published. It is accompanied by a minute chronology of all his writings by Tikhonravov.

ZOARCES, a genus of Fishes belonging to the family *Gobiadæ*. It has an elongated body, covered with a mucous secretion; the head is smooth, muzzle blunt; ventral fins situated before the pectorals; dorsal, anal, and caudal fins united; all the fins very thick; vent anterior to the middle of the body, its situation marked by a tubercle; teeth conical, placed in a single row; branchiostegous rays six in number.

Z. viviparus, the Viviparous Blenny, differs from the other British Blennies in the circumstance to which its name refers—that of bringing forth its young alive, which seem perfectly able to provide for themselves the moment they are excluded. The ventral fins of this fish assume the appearance and perform the functions of the legs of higher animals. It is said to use these limbs for the purpose of climbing on the rocks out of the water, where it will remain exposed to the air for some time, thus forming an approach to the reptile forms of life. When boiled, the bones of this fish are green; hence its name of Greenbone.

ZOSTERACEÆ, *Sea Wracks*, a natural order of Endogenous Marine Plants, resembling sea-weeds, and living among them. The species have grassy thin leaves, sheathing at the base. The flowers are very minute, absolutely naked, or surrounded by three scales. If we are to find anywhere a positive intercalation of flowering with flowerless plants, it is here, where, with naked flowers but distinct sexes, the pollen is in a condition that may be compared to the elaters of *Marchantia* and its allies, and totally different from all that is known of other flowering plants. The habit too is quite that of seaweeds. The manner in which fertilisation takes place among these plants is unknown. The bottom of the ocean is their locality, and they occur from the North Sea to the Mediterranean, the Indian Ocean, and the coasts of Arabia. One species only is seen on the shores of Australia, and another in the West Indies.

Zostera marina, the Sea Wrack, is a British species, and is used as a common material for packing, and for stuffing cottager's cushions; it has also been used medicinally as a poultice.

ZOUGA, River. [AFRICA, *S.* 2.]

ZSCHOKKE, JOHANN HEINRICH DANIEL, was born at Magdeburg in Prussia on March 22, 1771, and received the earlier part of his education in the Klosterschule and in the gymnasium of that town. When only seventeen he quitted his school and family, and became play-writer to a troop of strolling-players. In a short time however he returned to his family, and was sent to the university of Frankfurt-on-the-Oder, where, without any settled plan, he studied philosophy, theology, the fine arts, history, and finance. In 1792 he commenced private teaching in Frankfurt, but with little success; and he employed most of his time in writing for the stage, where his 'Abällino, the Bandit' (of which the story was borrowed by Monk Lewis for his 'Bravo of Venice'), and 'Julius von Sassen,' produced at this period, were favourably received. But he also wrote against a government edict respecting religion, and therefore when, in 1796, he applied for a professorship it was refused him. He then left Frankfurt, travelled about Germany and France, and at length settled at Reichenau in the Graubundten, where, in conjunction with Tscharner, he established a boarding-school for boys, which was so well conducted that the canton presented him with its freedom as a burgher, and he evinced his gratitude by writing his 'Geschichte des Freistaats der drei Bünde in Rhäeten' (History of the Free State of the Three Leagues in Rhætia), which was published in 1790. This is an account of the early associations of the canton for the establishment of its liberties, and was the precursor of several other works on the history of Switzerland. In that year however the Canton of Graubundten declined to join the Helvetic republic established under French influence; Zschokke was in favour of the union; he became unpopular, and his school was the sacrifice. Austrian troops entered the canton, and Zschokke withdrew to Aarau, where the central government of the Helvetic republic was then fixed. His reputation, his talents, and his political opinions, procured him employment under the government. He was made chief of the department of education, and was sent in the capacity of a fully empowered government commissioner to settle the affairs of Unterwalden, then suffering from the devastations of a foreign enemy and the effects of party violence, where he acted as a true benefactor and a restorer of peace. A memorial of this remarkable period is given in his 'Historischen Denkwürdigkeiten der Schweitzerische Staatsumwälzung' (Historical Memoirs of the Swiss Revolution). His commission was subsequently extended over the cantons of Uri, Schwytz, and Zug, and his appeals for the help of the miserable sufferers remain in proof of his powers of eloquence. During this time he wrote his 'Geschichte vom Kämpfe und Untergange der Schweitzerische Berg- und Wald-cantone' (History of the Conflicts and Fall of the Swiss Mountain and Forest Cantons), an excellent sketch, published in 1801. In 1801 the central government of Bern nominated him to the bailiwicks of Lugano and Bellinzona, where he executed his duties with the best results. On his return to Bern he was loud in his complaints against the French ambassador Bernhard, and the General Dumas, on account of their oppressive conduct and arbitrary proceedings; for Zschokke had opposed the desires of the Graubundten for independence rather from a conviction of their hopelessness than from any unpatriotic love of French domination, and he stated "that the Helvetic executive directory enjoyed no influence or consideration; it was in a manner foreign to the people it was appointed to govern;" but it was not cruel, and it avoided anarchy, so that he was contented to act under it. His remonstrances had produced no immediate effects, when he was created governor of Basel, where a commotion had arisen against the land-tax and tithes; he there threw himself into the midst of an armed assemblage of the people, and induced them to follow his advice and submit. When the central government at Bern, with the Landmann Aloys Reding at its head, prepared in 1801 to restore the ruptured federalism of the union, Zschokke resigned his office, as he doubted whether the attempt could be successful then, and he retired to Biberstein in Aargau, to devote himself to his favourite studies. Much civil contention arose, and a civil war seemed inevitable, when in October 1802, Bonaparte offered his mediation, and by it the federal union of Switzerland was established in 1803. The modification brought Zschokke again into political activity. He was presented with the citizenship of Aargau, and nominated by the government in 1804 a member of the council of mines and forests. In the same year he commenced his popular 'Schweizerboten' (Swiss Messenger), and in 1807 his 'Miscellen für die neueste Weltkunde' (Miscellany of the most recent Events), which was continued without interruption till 1813; it displayed a happy choice of subjects, a richness of contents, a conscientious liberalism, and in general a strong and correct judgment. In 1814, when the Swiss after the downfall of Bonaparte, again wished to reconstruct their constitution, Zschokke exerted himself to maintain peace in Aargau, while he strenuously defended its independence against the claims of Bern. In 1829, in consequence of some imputations against him as editor of the 'Schweizerboten,' he resigned his offices of church and forest inspector, but retained those of member of the council, of the school directory, and president of the directory of the school of education for artisans. In 1830 he was re-chosen a member of the church council, and he continued to exert himself actively and effectively in the promotion of education and all social reforms, though his time was now chiefly given to literary composition. With these duties and his literary works, which became extremely numerous, he continued to occupy himself until his death, which took place at Biberstein, on June 27, 1848. His published works are of very varied character. We have noticed some of his historical and political productions, but in this class the most valuable are his 'Geschichte des Baierischen Volks und seiner Fürsten' (History of the Bavarian People and their Princes), 1813-18; and 'Des Schweizerlandes Geschichte für das Schweizervolk' (History of Switzerland for the Swiss People), 1822; which are highly esteemed, have been frequently reprinted, and are distinguished by a lucidity of arrangement, clearness of perception, a keen insight into character, and warmth and strength of expression. His novels and tales exceed all other classes in number. Among the best are his 'Adventures of a New Year's Night,' which was translated in 'Blackwood's Magazine,' 'Jonathan Frock,' a serio-comic novel, 'The Dead Guest,' and 'The Goldmaker's Village.' His merits are a correct delineation of the nicer shades of character, a naturally simple pathos, a happy exposition of some of the weak points of our social institutions, a considerable amount of humour, and a constant maintenance of good principles and feelings. Some of these novels, like the 'Cottagers of Glenburnie,' aim at effecting the removal of social evils, national prejudices, or injurious customs, such as 'Die Branntweinpest' (The Brandy Pest); he is frequently tedious, and his plots are improbable, and the least happy of his attempts are of the historical class. His poetry seldom rises beyond mediocrity, nor are his dramatic attempts of a high character. He had much knowledge of a kind fitting him for his office of inspector of forests, and was acquainted with geology, particularly in reference to the country in which he resided, as is shown in his 'Gebirgsförster" and 'Die Alpenwälder.' By far the most popular of his works was his 'Stunden der Andacht' (Hours of Devotion), which was first published as a Sunday periodical, and which has gone through forty editions. It is one of the most complete expositions of modern rationalism, but its want of orthodoxy was held to be compensated by its fervid eloquence, and its zealous inculcation of every practical duty in all ranks. This work was not known to be his till the appearance of his 'Selbstchau,' a sort of autobiography of a somewhat singular character, which has been translated into English. He published a collected edition of his historical writings, in 1830, in 16 volumes, and a selection of his novels and poems in 10 volumes, in 1847; but an edition of his collected works, in 1825, occupied 40 volumes. Many of his works have been translated into French; and in English we have his 'Goldenthal,' a tale; 'Der Goldmachersdorf;' 'Love's Stratagem,' and other tales; 'The History of Switzerland;' a volume of select essays; and the 'Stunden der Andacht;' under the title of 'Hours of Meditation and Reflection.'

ZURLITE. [MINERALOGY, *S.* 1.]

THE END.

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